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COOPERATIVE EXTENSION
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UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

2018

SAMPLE COSTS TO ESTABLISH AND PRODUCE TABLE GRAPES



SAN JOAQUIN VALLEY – South Flame Seedless - Early Maturing

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 San Joaquin Valley south-2018
 Flame Seedless - Early Maturing

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INTRODUCTION

Sample costs to establish a vineyard and produce early maturing varieties of table grapes are presented in this study. It is intended as a guide only, and can be used to make production decisions, estimate potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the crop and area, but these same practices will not apply to every farming operation. The sample costs for labor, materials, equipment and custom services are based on January 2018 figures. A blank column titled “Your Cost”, is provided in Tables 2 and 3 to enter your estimated costs.

For an explanation of calculations used in the study refer to the section titled Assumptions. For more information contact University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, at 530-752-4651 or destewart@ucdavis.edu. You can contact the local UCCE Viticulture Advisor, through the county offices.

Costs and Returns Study Program/Acknowledgements. A cost and return study is a compilation of specific crop data collected from meetings with professionals working in production agriculture from the region the study is based. The authors thank the farmer cooperators, California Table Grape Commission, and other industry representatives who provided information, assistance, and expert advice. **The use of trade names and cultural practices in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of other similar products or cultural practices.** *The University is an affirmative action/equal opportunity employer.*

ASSUMPTIONS

The assumptions refer to Tables 1 to 8 and pertain to sample costs to establish a vineyard and produce early maturing table grapes in the southern San Joaquin Valley. Cultural practices and costs for table grape production vary considerably among growers within the region; therefore, many of the costs, practices, and materials in this study will not be applicable to every farm. The practices and inputs used serve as a guide only. Establishment and cultural practices vary by farm and the differences can be significant.

Farm. The hypothetical farm consists of 500 contiguous acres. The vineyard establishment and table grape production is on 40 acres, Flame Seedless is the variety used in this analysis. Other crops, including early and late season table grape varieties, are on 455 acres. Roads, irrigation systems, and farmstead occupy five acres. The farm is owned and managed by the grower.

Establishment Cultural Practices & Material Inputs

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 and laser levels the vineyard. A pre-plant herbicide is sprayed and incorporated in two passes with a disc and ring-roller. 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, vines planted and a cardboard carton placed around the vine. The grapevines are planted during the first spring on a 6-foot x 12-foot spacing (vine x row) with 605 vines per acre. In the second year, 2 percent or 12 vines per acre are replanted.

Vines. The vines are dormant, bench-grafted rootstock vines purchased from a commercial nursery. Flame Seedless vines cost \$3.25 per vine or \$1,966 per acre in the first year and \$39 per acre for replacements in the second year. Vines are trained during the second and third years. The grape vines 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. 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 lb/ft strength) are 8.5 feet long and placed 3 feet in the ground. The open gable is 90 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 with a 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.

Train. Beginning in spring one year after planting and continuing through the summer, five training passes are made. 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. If sufficiently vigorous, canes may be laid down to form cordons. 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), canes are laid down to form cordons, if this was not done in the previous year. Otherwise, vines are pruned much like an established vine except that short spurs or no spurs are left at node positions in the year that the canes are laid down to become cordons. On mature vines approximately six two-bud spurs will be left on each cordon. Prunings are placed in the row middles and shredded. Suckers from vine trunks are removed in April, a practice that continues each year but diminishes as the vineyard matures.

Irrigation. Water pumping costs and labor constitute the irrigation cost. Water is calculated to cost \$12.00 per acre-inch (\$144 per acre-foot). 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. Water cost are expected to rise as new regulations on groundwater are implemented in areas with long-term ground water overdraft as in the San Joaquin Valley. The vineyard is irrigated during the growing season from April through October during the establishment years. The amount of water applied to the vineyard varies through the establishment years and is shown in Table A.

Chemical Buildup/Acid Flush. The drip system requires chemical flushing to retard chemical buildup and emitter clogging. This operation can be done during the irrigation season. For this analysis the flushing is performed after harvest with N-pHuric acid applied through the drip system with 0.10 acre-inches of water.

Soil Salinity Management. Grapevines are relatively sensitive to sodium, chloride, and boron. If the salt levels within the soil are high, they must be leached from the soil. This process is typically done with either an application of a leaching fraction in-season or applications of water during the dormant season, when evapotranspiration rates are low.

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

Fertilizer. The amount of nitrogen applied each year increases as the vineyard matures as shown in Table B. Liquid nitrogen fertilizer, UAN32, is applied through the irrigation system in April of the first year at five pounds of N per acre. In the second year, a single application is made one month after bud-break, and in the third year the annual amount of nitrogen provided is split into two equal applications, the first occurring one month after bud-break, and the second after fruit set. It is important to identify other possible non-fertilizer sources of nitrogen in order to properly manage the nitrogen budget. For example, nitrogen found in irrigation well water should be considered when determining future irrigation and fertilizer needs. Potassium, K₂SO₄ is applied at 40 units K per acre in the second year, and 50 units K per acre (50 units of K is equal to approximately 116 lbs. K₂SO₄) the third year. Beginning in year three neutral zinc (50%), is applied at 5 lbs. per acre to prevent zinc deficiencies and is combined with the late April mildew application. Also beginning in year three, opposite cluster petioles are collected at bloom for tissue nutrient analysis.

Fruit Management (FM). In the first harvest year, third leaf, gibberellic acid (GA), a plant growth regulator, is applied at 6 grams per acre during bloom in May for blossom thinning (combined with insect and mildew spray). GA is applied two times at 48 grams per acre for each application to increase berry size. The first application is applied at completion of shatter, about two weeks after full bloom (June) (combined with mildew spray) and the second spray is applied a week later (combined with mildew and insect spray). Gibberellic acid rates should be reduced for berry sizing when color development has been a historical problem. Vines are

girdled to increase berry size 2 to 3 weeks after full bloom (June). Cluster tipping and hand thinning are done in late May to early June to loosen clusters and adjust cluster length and crop load. The growth regulator, Ethrel, at 1 or 2 pints/acre, is applied in late June to help improve fruit color.

Pest Management. The pesticides and rates mentioned 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.ucanr.edu. For information and pesticide use permits, contact the local county agricultural commissioner's office.

Pest Control Adviser/Certified Crop Advisor (PCA/CCA). An individual who is either or both a PCA and a CCA can monitor the field for pests and disease and collect samples for nutrient analyses. A CCA emphasizes fertilizer and plant nutrient management issues. A PCA is required to provide the grower written recommendations for pesticides that he/she advises a grower to use. The charges for the PCA begin in year three. In this region, a written recommendation by a CCA for applying fertilizers is currently not required.

Weeds (Vineyard Floor Management). In October of the year prior to planting, Treflan is applied to the vineyard floor and incorporated by disking. After planting, weeds in the vine rows and middles are managed with disking, 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 beginning in the second year with Roundup, Goal 2XL, and Surflan. The strip spray is applied to 30 percent of the acreage. Also beginning 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 the ATV-4WD with a sprayer attached.

Insects. Grape leafhopper (*Erythroneura elegantula*) is controlled with a systemic application of Admire Pro in May. If present, Admire Pro will also help control glassy-winged sharpshooter (*Homalodisca vitripennis*), vine mealybug (*Planococcus ficus*) and grape mealybug (*Pseudococcus maritimus*). Pacific spider mite (*Tetranychus pacificus*) is controlled with an application of Agri-Mek EC. Mite and mealybug populations are monitored weekly from April to October by a PCA. Costs associated with scouting are included within the per-acre charge for a PCA.

Diseases. Although many pathogens attack grapevines, phomopsis cane and leafspot (*Phomopsis viticola*) and powdery mildew (*Erysiphe necator*) are the two diseases of concern. 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. The grower applies Kocide (copper) and Rubigan (SI), and two Microthiol applications (one with Kryocide) in April. One Rubigan (SI) application in May and one Rubigan (SI) application in June. Dusting sulfur is applied 6 times from May through July. 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 Pests. 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. 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. Beginning in the third year the grapes are harvested by hand. Expected annual yields are in Table C. See Harvest section under Production for the description of operations. If the crop is harvested for wine, a labor contractor may be needed.

Production Cultural Practices and Material Inputs

Prune/Sucker/Canopy Management (CM). The vines are spur-pruned during the winter months (December to early February) and the prunings are placed in the row middles and shredded. Suckers and sterile shoots and basal leaves are removed from the vine trunks and crowns beginning in April. Shoot positioning is done in May. Hedging 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 at 6 grams per acre during bloom in May for blossom thinning (combined with mildew spray). GA is applied two times at 48 grams per acre for each application to increase berry size. The first application is applied at completion of shatter, about two weeks after full bloom (June) (combined with mildew spray) and the second spray is applied a week later (combined with mildew and insect spray). Gibberellic acid rates should be reduced for berry sizing when color development has been a historical problem. Vines are girdled to increase berry size 2 to 3 weeks after full bloom (June). Cluster tipping and hand thinning are done in late May to early June to loosen clusters and adjust cluster length and crop load. The growth regulator, Ethrel, at 1 or 2 pints/acre, is applied in late June to help improve fruit color. Pro Gibb LV Plus (2.0 grams AI/FIOz) and Ethrel (2 lbs. AI/gallon) were used for the analysis.

Trellis/Vines. Trellis repairs are done annually and the cost is not taken from any specific data. Weak or missing vines are replaced by new vines. Trellis repair and vine replacement costs increase with vineyard age.

Irrigation. 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. The irrigation costs are for water pumping and labor. Water cost is \$12 per acre-inch (\$144 per acre-foot). 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.

Fertilizer. Nitrogen (N) at 50 pounds per acre as UAN32 (32%) is applied through the irrigation drip system in April. Potassium as K₂SO₄ is applied at 50 units K per acre (50 units of K is equal to approximately 116 lbs. K₂SO₄) the third year and possibly every year thereafter. Neutral zinc (50%), is applied to prevent zinc deficiencies and is combined with the late April mildew (Microthiol, Rally) application. Each year, opposite cluster petioles are collected at bloom for tissue nutrient analysis. Growers may be applying additional micronutrients, biologicals or planting cover crops on part of their acreage. As these practices are specific to individual fields, these operations and costs, which can be significant are not included in this analysis.

Table A. Irrigation Water Applied

Year	AcIn/Year
1	8
2	18
3+	36

Table B. Applied Fertilizer*

Year	N	K ₂ SO ₄	Zn
1	5	0	0
2	40	40	0
3	50	50	5.0
4+	50	50	5.0

Table C. Expected Yields

Year	Tons/Ac	Boxes/Ac
3	5.7	600
4	7.6	800
5	11.4	1,200
6+	12.4	1,300

*Applied units; N - Lbs. N/ac, K₂SO₄ – 2.32lbs = 1lb K, Zn - 50%.

Pest Management. The pesticides and rates mentioned 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.ucanr.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 their costs are not included. Pesticide costs may vary by location, brand, and grower volume.

Weeds (Vineyard Floor Management). Vineyard middles are mowed three times each season: March, May, and July. Surflan, Goal 2XL, and Roundup herbicides are applied to the vine row in February. Roundup, a systemic herbicide, is applied as a spot spray to the vine row in June.

Insects. Vine mealybug (*Planococcus ficus*) is controlled with a foliar application of Movento in late April to early May followed by a systemic application of Admire Pro through the drip system a few weeks later. This insecticide combination also provides control of grape leafhopper (*Erythroneura elegantula*), glassy-winged sharpshooter (*Homalodisca vitripennis*) and grape mealybug (*Pseudococcus maritimus*), and may suppress nematodes. Western flower thrips (*Frankliniella occidentalis*) is controlled at bloom with an application of Delegate WG that also provides secondary benefit against omnivorous leafroller (*Platynota stultana*) and western grapeleaf skeletonizer (*Harrisina brillans*). Pacific spider mite (*Tetranychus pacificus*) is controlled with one application of Agri-Mek EC. If black widow spiders (*Lactrodectus hesperus*) are present it may be necessary to treat with a pyrethroid prior to harvest (not included in the cost study).

Decisions about insecticide sprays are made by a PCA based on weekly scouting of insect pests from April through October. This includes bloom assessments of thrips, weekly evaluations of mealybug and mite densities, and weekly worm evaluations through harvest. Scouting by the PCA may be assisted by pheromone traps for vine mealybug and omnivorous leafroller. All costs of scouting are included within the per-acre charge for a PCA.

Diseases. Diseases treated in this study are phomopsis cane and leafspot (*Phomopsis viticola*) and powdery mildew (*Erysiphe 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. Dusting Sulfur is applied six times - May, June, and 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) with the second berry size spray in June.

Growers have the option of using sterol inhibitors (SI), quinolins, strobilurins, or sulfur (micronized, wettable, dust, dry 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 Pests. 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, no specific control is used. The costs shown from March through October 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 and Revenue

Harvest. Beginning in August the grapes are hand-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 individual per hour. The assumption is made 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, bags the bunches, and packs them 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. Sales and marketing costs are paid by the grower and range from 7 to 10 percent of the selling price. A figure of 9 percent of the selling price is used.

Yields. Based on grower and cooperator information, a yield of 1,300 19-pound boxes over the remaining life of the vineyard is used to calculate returns. Average yields for late harvested table grape varieties are shown in Table C. The averages include all vineyards in production regardless of maturity.

Returns. Based on grower and cooperator information, an estimated price of \$17 per box for Flame Seedless grapes is used in this analysis.

Ranging Analysis. Table 5 has a range of return prices used for calculating net returns per acre with different yields. Agricultural producers target yield and prices such that lower yields tend to be associated with higher prices. Therefore the ranging analysis's do not show the cases of very high yields with very high return prices or very low yields with very low return prices. For this analysis, selected yields ranged from 850 to 1,750 boxes per acre and crop prices ranged from \$12.50 to \$21.50 per box.

The costs of harvesting table grapes increases with higher yields. This is easily varied and is shown in Table 5. The increase costs of cultural practices that can increase yields such as cluster management, fertilizer rates and timing are difficult to quantify or vary and are not shown in this analysis.

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).

Auditing and Compliance. The California Department of Food and Agriculture (CDFA) and the USDA's National Agricultural Statistics Service (NASS) conduct annual acreage and crop surveys of California grape growers. The time and cost involved for completing these surveys is included in the office expenses. Other private inspectors/buyers and environmental groups assess additional costs. For this analysis a combined cost of \$150/acre is shown.

Pickup Truck/All-Terrain Vehicle (ATV-4WD). It is assumed that the pickup is used for business in and around the farm. The all-terrain vehicle (ATV) is used for spot spraying weeds and is included in those line item operating costs. It is assumed that the (ATV) will be used on the ranch for checking the vineyards including the irrigation system.

Labor, Equipment and Interest

Labor. Hourly wages for workers are \$13.00 for machine operators and \$11.00 per hour non-machine labor. Adding 40.5 percent 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 \$18.27 and \$15.46 per hour for machine labor and non-machine labor, respectively. Workers' compensation costs will vary among growers, the cost is based upon the average industry final rate as of January 2018. Labor for operations involving machinery are 20 percent 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. Labor cost are expected to rise with reduced labor availability, increases in minimum wage rates and new overtime rules to be implemented starting in 2018.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by American Society of Agricultural and Biological Engineers (ASABE). Fuel and lubrication costs are also determined by ASABE equations based on maximum power takeoff (PTO) horsepower, and fuel type. Average prices for on-farm delivery of diesel and gasoline, based on January 2018 data from the Energy Information Administration, are \$2.92 and \$3.20 per gallon, respectively. The cost includes a 13.0 percent sales tax on diesel and 10.17 percent sales tax on gasoline. Federal and state excise taxes on diesel (\$0.36/gal) and gasoline (\$0.42/gal) are refunded for on-farm use when filing the farm income tax return.

Fuel, Lube & Repair. 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 percent 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 5.0 percent 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 business as of January 2018.

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 percent on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. County taxes are calculated as 1 percent 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. This provides coverage for property loss and is charged at 0.846 percent of the average value of the assets over their useful life.

Liability Insurance. A standard farm liability insurance policy of \$1,231 is included as a cost for the entire farm. A standard farm liability insurance policy will help cover the expenses for which the grower becomes legally obligated to pay for bodily injury claims on owned property and damages to another person's property as a result of a covered accident. Common liability expenses covered under a policy include attorney fees and court costs, medical expenses for people injured on this farm, or injury or damage to another's property.

Crop Insurance. A significant number of growers purchase crop insurance in this region. Due to variability in coverages, none is purchased. This is available to table grapes growers for unavoidable loss of production, damage or poor quality resulting from adverse weather conditions such as cool wet weather, freeze, frost, hail, excessive heat, rain, wind and damage from birds, drought, earthquakes and fire. Coverage levels are from 50-85 percent of the approved average yield as established by verifiable production records from the farm. Actual insurance coverage is by unit, not by acre. <http://www.rma.usda.gov/policies/2017policy.html>

Office Expense. Office and business expenses are estimated at \$80 per acre or \$39,600 annually for the farm. These expenses include office supplies, telephone/internet, bookkeeping and accounting.

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.

Owner/Management Salary. Management salaries include annual bonuses, and insurance, payroll taxes and benefits which are calculated at 40.5 percent. The salaries of the general manager and one assistant manager are included and allocated across the entire acreage of the farm and charged at \$500 per acre.

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

Non-Cash Overhead

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments. Although farm equipment used for table grapes may be purchased new or used, this study shows the current purchase prices for new equipment. The new purchase price is adjusted to 60 percent to reflect a mix of new and used equipment. Annual ownership costs (equipment and investments) are shown in Tables 2, 3 and 6. They represent the capital recovery cost for investments on an annual per acre basis.

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 5.5 percent is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending business conditions, but is the basic suggested rate by a farm lending agency as of January 2018.

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 southern San Joaquin Valley with established table grapes in full production ranges from \$30,000 to \$45,000 per acre (depending on vineyard age, variety and location). Cropland with district or well water in the area suitable for table grape production ranges from \$19,000 to \$26,000.

Shop 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 fuel tanks, diesel and gasoline 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 costs. The previous vineyard is assumed to have a well and pumping system that has been refurbished, therefore, water is delivered into a reservoir from a 400-foot depth using a 125-horsepower pump. The 40-horsepower booster pump brings water from the reservoir through the filter system and out into the drip lines.

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 *Accumulated Net Cash Cost* on Table 1, in the third year represents the establishment cost. The total cost is \$15,871 per acre or \$634,840 for the 40 producing acres. The establishment cost added

to the bare land value is consistent with the value of an established mature vineyard ($\$15,871 + \$22,500 = \$38,371$). The establishment costs are amortized over the remaining 22 years of the 25 year vineyard.

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 percent 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.

Risk. The risks associated with table grape production should not be underestimated. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability of agricultural production. Because of many potential risk factors, effective risk management must combine specific tactics in a detailed manner, in various combinations for a sustainable operation. Moreover, Table 5 of this study reflects a ranging analysis of returns based on various assumptions which is therefore hypothetical in nature. **It is important to realize that actual results may differ from the returns contained in this study.** Any returns above total costs are considered returns on risk and investment to management (or owners).

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

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UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. COSTS PER ACRE TO ESTABLISH TABLE GRAPES Flame Seedless
 Early Maturing San Joaquin Valley-south 2018

	Year:	Cost Per Acre		
		1st	2nd	3rd
Operations:	\$17/box, Boxes Per Acre:	0	0	600
Pre-Planting Costs:				
Vineyard Removal (50%)		443		
Chisel/Subsoil 2x, 5' Depth		400		
Laser Level		150		
Weeds: Apply/Incorporate Herbicide		36		
Survey/Mark/Layout Vineyard		284		
Install Irrigation System: (Labor), Hang Line: Yr. 2		309	247	
Install Trellis System: (Materials & Labor)		0	6,025	
TOTAL PRE-PLANTING COSTS		1,622	6,272	
Planting Costs:				
Dig/Plant/Wrap Vines		450	36	
Vines; 605 Per Acre, Replant: (Yr2-12)		1,966	39	
TOTAL PLANTING COSTS		2,416	75	
Cultural Costs:				
Well Test/Water Analysis		2	2	2
Pests: Vertebrate		44	27	25
Fertigate: (UAN32)		3	23	29
Fertilizer: (Banded) K ₂ SO ₄			35	43
Petiole Sampling				4
Irrigation: (Water & Labor)		181	301	517
Irrigation: Acid Flush		45	46	45
Weeds: Disc Middles – 2x/Yr 1		32		
Weeds: Mow Middles – 2x/Yr 1, 4x/Yr 2, 3x/Yr 3		21	32	31
Weeds: Hand Hoe		46		
Weeds: Spot Spray			40	40
Weeds: Winter Strip Spray			43	42
Prune: Dormant Prune/Tie (Spur Pruned)			145	1,133
Vine Re-Planting/Trellis Repair				109
Vine Training: Yr 2/Sucker: Yr3			798	155
Shred Prunings (All Middles)			14	19
Insects: Skeletonizer/Disease: Mildew/Fertilizer: (Zn)			39	43
Insects: Mealybugs (Systemic)			24	24
Disease: Phomopsis				70
Disease: Mildew (S1)				76
FM: Cluster Tipping/Thinning				557
FM: Bloom Size (GA)/Insects: Mites/Disease: Mildew				85
FM: Berry Size (GA)/Insects: Leafhoppers			67	88
FM: Girdling				155
FM: Berry Color (Ethrel)				54
Disease: Mildew (Sulfur Dust) 6x				101
CM: Shoot Position/Remove Late Spurs				866
FM: Fruit Exposure/Leaf Removal				773
CM: Hedging (Mechanical)				12
PCA/CCA				30
Pickup Truck 1/2 Ton		41	41	41
ATV-4WD		18	18	18
TOTAL CULTURAL COSTS		434	1,695	5,187
Harvest Costs:				
Pick & Field Pack (Labor)				2,226
Spread/Swamp/Haul (Bags/Boxes/Labor)				1,695
Water Truck				24
Commission: 9% Sales and Marketing Fees				918
Assessment & Inspection Fees				226
TOTAL HARVEST COSTS				5,089
Interest On Operating Capital @ 5.0%		170	342	124
TOTAL OPERATING COSTS/ACRE		4,642	8,383	10,399

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Table 1. CONTINUED Flame Seedless
Early Maturing San Joaquin Valley-south 2018

	Year:	Cost Per Acre		
		1st	2 nd	3rd
Operations:	\$17/box, Boxes Per Acre:	0	0	600
Cash Overhead Costs:				
Office Expense		80	80	80
Liability Insurance		2	2	2
Sanitation Service		4	4	4
Farm Management		500	500	500
Property Taxes		235	235	236
Property Insurance		20	20	20
Investment Repairs		41	41	41
TOTAL CASH OVERHEAD COSTS		882	882	883
TOTAL CASH COSTS/ACRE		5,524	9,265	11,282
INCOME/ACRE FROM PRODUCTION		0	0	10,200
NET CASH COSTS/ACRE FOR THE YEAR		5,524	9,265	1,082
PROFIT/ACRE ABOVE CASH COSTS		0	0	0
ACCUMULATED NET CASH COSTS/ACRE		5,524	14,789	15,871
Non-Cash Overhead Cost:				
Land: Table Grapes		1,238	1,238	1,238
Irrigation System: Single Line Drip		138	138	138
Building Pole Barn		8	8	8
Tools: Shop/Field		2	2	2
Fuel Storage Tanks and Pumps		2	2	2
Bait Stations		0	0	0
Equipment		33	43	148
TOTAL CAPITAL RECOVERY COST		1,421	1,431	1,535
TOTAL COST/ACRE FOR THE YEAR		6,945	10,697	12,818
INCOME/ACRE FROM PRODUCTION		0	0	10,200
NET COST/ACRE FOR THE YEAR		6,945	10,697	2,618
NET PROFIT/ACRE ABOVE TOTAL COST		0	0	0
TOTAL ACCUMULATED NET COST/ACRE		6,945	17,642	20,260

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Table 2. COSTS PER ACRE TO PRODUCE TABLE GRAPES Flame Seedless
 Early Maturing San Joaquin Valley-south 2018

Operation	Equipment Time (Hrs/A)	Cash and Labor Costs per Acre					Total Cost	Your Cost
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:								
Well Test/Water Analysis	0.00	0	0	0	2	0	2	
Prune: Dormant (Spur Pruned)	0.00	773	0	0	360	0	1,520	
Vine Re-Planting/Trellis Repair	0.00	77	0	0	40	0	109	
Shred Prunings (All Middles)	0.42	9	4	5	0	0	19	
Weeds: Strip Spray	0.33	7	2	1	31	0	42	
Pests: Vertebrate 8x	0.00	31	0	0	15	0	46	
Disease: Mildew Phomopsis	0.46	10	5	3	28	0	46	
Weeds: Mow Middles 3x	0.77	17	8	6	0	0	31	
Disease: Mildew (Sulfur Dust) 6x	2.35	52	24	10	16	0	101	
Vines: Sucker	0.00	155	0	0	0	0	155	
Insects/Disease: (SI)/Fertilize: Zn	0.46	10	5	3	93	0	111	
Fertigate: UAN32	0.00	0	0	0	29	0	29	
Irrigation: (Water & Labor)	0.00	85	0	0	432	0	517	
Insects: Mealybugs (Systemic)	0.00	0	0	0	24	0	24	
CM: Shoot Position/Remove Late Spurs	0.00	1,314	0	0	0	0	1,314	
Bloom Insects: Thrips/Disease: Mildew (SI)	0.46	10	5	3	87	0	105	
FM: Bloom Size: (GA)/Insects/Disease: Mildew	0.50	11	5	4	55	0	75	
FM: Fruit Exposure/Leaf Removal	0.00	1,160	0	0	0	0	1,160	
Petiole Sampling	0.00	0	0	0	0	4	4	
FM: Cluster Tipping/Thinning	0.00	850	0	0	0	0	850	
FM: Berry Size: (GA) 2x/Disease: Mildew (SI)	1.00	22	10	7	109	0	148	
CM: Hedging (Mechanical)	0.33	7	3	1	0	0	12	
Weeds: Spot Spray	0.33	7	0	0	8	0	16	
FM: Girdling	0.00	155	0	0	0	0	155	
FM: Berry Color (Ethrel)	0.46	10	5	3	36	0	54	
PCA/CCA	0.00	0	0	0	0	30	30	
Mealybug Trapping Fee	0.00	0	0	0	0	11	11	
Fertilizer: (Banded) K ₂ SO ₄	0.25	5	1	2	35	0	43	
Irrigation: Acid Flush	0.00	39	0	0	7	0	45	
Pickup Truck (1/2 Ton)	1.33	29	20	6	0	0	55	
ATV-4WD	1.17	26	1	1	0	0	28	
TOTAL CULTURAL COSTS	10.63	5,227	98	58	1,430	45	6,857	
Harvest:								
Pick & Field Pack (Labor)	0.00	4,793	0	0	0	0	4,793	
Spread/Swamp/Haul (Bags/Boxes/Labor)	1.25	599	16	11	3,055	0	3,682	
Water Truck	1.00	22	13	13	0	0	48	
Commission: 9% Sales & Marketing Fees	0.00	0	0	0	0	1,989	1,989	
Assessment & Inspection Fees	0.00	0	0	0	313	0	313	
TOTAL HARVEST COSTS	2.25	5,414	30	24	3,368	1,989	10,825	
Interest on Operating Capital at 5.0%							185	
TOTAL OPERATING COSTS/ACRE	13	10,641	128	82	4,798	2,034	17,867	

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Table 2. CONTINUED Flame Seedless
Early Maturing San Joaquin Valley-south 2018

Operation	Equipment		Cash and Labor Costs per Acre				Total Cost	Your Cost
	Time (Hrs/Ac)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent		
CASH OVERHEAD:								
Liability Insurance							2	
Office Expense							80	
Sanitation							4	
Farm Management							500	
Property Taxes							315	
Property Insurance							27	
Investment Repairs							40	
TOTAL CASH OVERHEAD COSTS/ACRE							969	
TOTAL CASH COSTS/ACRE							18,836	
NON-CASH OVERHEAD:								
		Per Producing Acre		Annual Cost				
				Capital Recovery				
Building Pole Barn		112		8			8	
Irrigation System: Single Line Drip		1,850		138			138	
Fuel Tanks and Pumps		21		2			2	
Land: Table Grapes		22,500		1,238			1,238	
Tools: Shop/Field		28		2			2	
Bait Stations		2		0			0	
Vineyard Establishment: Flame Seedless		15,871		1,261			1,261	
Equipment		1,861		184			184	
TOTAL NON-CASH OVERHEAD COSTS							2,833	
TOTAL COSTS/ACRE							21,668	

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Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE TABLE GRAPES Flame Seedless
Early Maturing San Joaquin Valley-south 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Flame Seedless	1,300	Box	17.00	22,100	
TOTAL GROSS RETURNS				22,100	
OPERATING COSTS					
Herbicide:					38
Surflan 4 AS	1.75	Pint	8.06	14	
Roundup WeatherMax	2.50	Pint	5.21	13	
Goal 2XL	1.00	Pint	12.18	12	
Insecticide:					192
Movento	8.00	FLOz	8.32	67	
Admire Pro	14.00	FLOz	1.70	24	
Delegate WG	5.00	FLOz	10.58	53	
Agri-Mek EC	16.00	FLOz	3.07	49	
Fungicide:					160
Abound	12.00	FLOz	2.20	26	
Microthiol Special	10.00	Lb	1.27	13	
Dusting Sulfur	35.00	Lb	0.45	16	
Rally 40W	8.00	Oz	4.89	39	
Flint	4.00	Oz	16.49	66	
Growth Regulator:					90
Pro-Gibb LV-Plus	51.00	FLOz	1.07	55	
Ethrel	64.00	FLOz	0.56	36	
Fertilizer:					68
Neutral Zinc 50%	5.00	Lb	0.92	5	
UAN32	50.00	Lb N	0.58	29	
Potassium Sulfate K ₂ SO ₄	116.00	Units	0.30	35	
Water:					441
Well Test/Water Analysis	1.00	Acre	2.00	2	
Water: SJV south	36.10	Acln	12.00	433	
N-pHuric Acid	0.12	Gal	47.54	6	
Custom:					45
Petiole Sampling	1.30	Acre	3.00	4	
PCA/CCA	1.00	Acre	30.00	30	
Pheromone Trap Monitoring	1.00	Acre	11.00	11	
Vine:					20
Vine Dormant: (Bench) Flame Seedless	6.00	Each	3.25	20	
Vine Aids:					404
Trellis Materials (Repairs)	1.00	Acre	40.00	40	
Tying Materials (Re-Planting)	6.00	Vine	0.60	4	
Tying Materials (Pruning)	1.00	Acre	360.00	360	
Harvest Aids:					3,055
Harvest (Bags/Boxes/Haul)	1,300.00	Each	2.35	3,055	
Assessment:					313
Table Grape Commission	1,300.00	Box	0.12	150	
Table Grape Quality Inspection	390.00	Box	0.04	14	
Auditing & Compliance	1.00	Acre	150.00	150	
Rodenticide:					15
Vertebrate Poison Bait	8.00	Lb	1.92	15	
Contract:					1,989
Commission: 9% of \$17	1,300.00	Box	1.53	1,989	
Labor:					10,641
Equipment Operator Labor	15.45	hrs	18.27	282	
Non-Machine Labor	3.00	hrs	15.46	46	
Pruning Labor	85.00	hrs	15.46	1,314	
Vertebrate Control Labor	2.00	hrs	15.46	31	
Irrigation Labor	8.00	hrs	15.46	124	
Canopy Management Labor	85.00	hrs	15.46	1,314	
Fruit Management Labor	140.00	hrs	15.46	2,164	
Harvest Labor	347.00	hrs	15.46	5,365	
Machinery					209
Fuel-Gas	6.61	gal	3.20	21	
Fuel-Diesel	36.52	gal	2.92	107	
Lube				19	
Machinery Repair				62	
Interest on Operating Capital @ 5.0%				185	
TOTAL OPERATING COSTS/ACRE				17,867	
TOTAL OPERATING COSTS/BOX				14	
NET RETURNS ABOVE OPERATING COSTS				4,233	

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Table 3. CONTINUED Flame Seedless
Early Maturing San Joaquin Valley-south 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS					
Liability Insurance				2	
Office Expense				80	
Sanitation				4	
Farm Management				500	
Property Taxes				315	
Property Insurance				27	
Investment Repairs				40	
TOTAL CASH OVERHEAD COSTS/ACRE				969	
TOTAL CASH OVERHEAD COSTS/BOX				1	
TOTAL CASH COSTS/ACRE				18,836	
TOTAL CASH COSTS/BOX				14	
NET RETURNS ABOVE CASH COSTS				3,264	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Building Pole Barn				8	
Irrigation System: Single Line Drip				138	
Fuel Storage and Delivery				2	
Land: Table Grapes				1,238	
Tools: Shop/Field				2	
Bait Stations				0	
Establishment: Flame Seedless				1,261	
Equipment				184	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				2,833	
TOTAL NON-CASH OVERHEAD COSTS/BOX				2	
TOTAL COST/ACRE				21,668	
TOTAL COST/BOX				17	
NET RETURNS ABOVE TOTAL COST				432	

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Table 4. MONTHLY COSTS PER ACRE TO PRODUCE TABLE GRAPES Flame Seedless
 Early Maturing San Joaquin Valley-south 2018

	JAN 18	FEB 18	MAR 18	APR 18	MAY 18	JUN 18	JUL 18	AUG 18	SEP 18	OCT 18	Total
Cultural:											
Well Test/Water Analysis	2										2
Prune: Dormant (Spur Pruned)	1,520										1,520
Vine Re-Planting/Trellis Repair	109										109
Shred Prunings (All Middles)		19									19
Weeds: Strip Spray		42									42
Pests: Vertebrate 8x			6	6	6	6	6	6	6	6	46
Disease: Phomopsis/Mildew			46								46
Weeds: Mow Middles 3x			10		10		10				31
Disease: Mildew (Sulfur Dust) 6x					34	34	34				101
Vines: Sucker				155							155
Insects/Disease: (SI)/Fertilize: Zn				111							111
Fertigate: UAN32				29							29
Irrigation: (Water & Labor)				71	71	104	104	104	32	32	517
Insects: Mealybugs (Systemic)				24							24
CM: Shoot Position/Remove Late Spurs				1,314							1,314
Bloom Insects: Thrips/Disease: Mildew (SI)					105						105
FM: Bloom Size: (GA)/Insects/Disease: Mildew					75						75
FM: Fruit Exposure/Leaf Removal					1,160						1,160
Petiole Sampling					4						4
FM: Cluster Tipping/Thinning					850						850
Berry Size: (GA) 2x/Disease: Mildew (SI)						148					148
CM: Hedging (Mechanical)						12					12
Weeds: Spot Spray						16					16
FM: Girdling						155					155
FM: Berry Color (Ethrel)						54					54
PCA/CCA									30		30
Mealybug Trapping Fee									11		11
Fertilizer: (Banded) K ₂ SO ₄										43	43
Irrigation: Acid Flush										45	45
Pickup Truck (1/2 Ton)	5	5	5	5	5	5	5	5	5	5	55
ATV-4WD	3	3	3	3	3	3	3	3	3	3	28
TOTAL CULTURAL COSTS	1,639	69	70	1,718	2,323	536	162	118	87	135	6,857
Harvest:											
Pick & Field Pack (Labor)								4,793			4,793
Spread/Swamp/Haul (Bags/Boxes/Labor)								3,682			3,682
Water Truck								48			48
Commission: 9% Sales and Marketing Fees								1,989			1,989
Assessment & Inspection Fees								313			313
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	10,825	0	0	10,825
Interest on Operating Capital @5.0%	7	7	7	15	24	26	27	73	-1	-1	185
TOTAL OPERATING COSTS/ACRE	1,646	76	78	1,733	2,347	563	189	11,015	86	134	17,867

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Table 4. CONTINUED Flame Seedless
Early Maturing San Joaquin Valley-south 2018

	JAN 18	FEB 18	MAR 18	APR 18	MAY 18	JUN 18	JUL 18	AUG 18	SEP 18	OCT 18	Total
CASH OVERHEAD											
Liability Insurance	0	0	0	0	0	0	0	0	2	0	2
Office Expense	8	8	8	8	8	8	8	8	8	8	80
Sanitation									4		4
Farm Management	50	50	50	50	50	50	50	50	50	50	500
Property Taxes		157					157				315
Property Insurance		13					13				27
Investment Repairs	4	4	4	4	4	4	4	4	4	4	40
TOTAL CASH OVERHEAD COSTS	62	233	62	62	62	62	233	62	69	62	969
TOTAL CASH COSTS/ACRE	1,708	309	140	1,795	2,409	625	422	11,077	154	196	18,836

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Table 5. RANGING ANALYSIS
Early Maturing San Joaquin Valley-south 2018

COSTS PER ACRE AND PER BOX AT VARYING YIELDS TO PRODUCE TABLE GRAPES

	YIELD (boxes/acre)						
	850.00	1,000.00	1,150.00	1,300.00	1,450.00	1,600.00	1,750.00
OPERATING COSTS/ACRE:							
Cultural	6,857	6,857	6,857	6,857	6,857	6,857	6,857
Harvest	7,113	8,350	9,587	10,825	12,062	13,299	14,537
Interest on Operating Capital @ 5.0%	170	175	180	185	190	195	201
TOTAL OPERATING COSTS/ACRE	14,139	15,382	16,624	17,867	19,110	20,351	21,594
TOTAL OPERATING COSTS/BOX	16.63	15.38	14.46	13.74	13.18	12.72	12.34
CASH OVERHEAD COSTS/ACRE	969	969	969	969	969	969	969
TOTAL CASH COSTS/ACRE	15,108	16,351	17,593	18,836	20,079	21,320	22,563
TOTAL CASH COSTS/BOX	17.77	16.35	15.30	14.49	13.85	13.32	12.89
NON-CASH OVERHEAD COSTS/ACRE	2,833	2,833	2,833	2,833	2,833	2,833	2,833
TOTAL COSTS/ACRE	17,941	19,184	20,425	21,668	22,911	24,153	25,396
TOTAL COSTS/BOX	21.00	19.00	18.00	17.00	16.00	15.00	15.00
Net Return per Acre above Operating Costs for Table Grapes							
PRICE (\$/box)	YIELD (boxes/acre)						
Table Grapes	850.00	1000.00	1150.00	1300.00	1450.00	1600.00	1750.00
12.50	-3,514	-2,882	-2,249	-1,617	-985	-351	281
14.00	-2,239	-1,382	-524	333	1,190	2,049	2,906
15.50	-964	118	1,201	2,283	3,365	4,449	5,531
17.00	311	1,618	2,926	4,233	5,540	6,849	8,156
18.50	1,586	3,118	4,651	6,183	7,715	9,249	10,781
20.00	2,861	4,618	6,376	8,133	9,890	11,649	13,406
21.50	4,136	6,118	8,101	10,083	12,065	14,049	16,031
Net Return per Acre above Cash Costs for Table Grapes							
PRICE (\$/box)	YIELD (boxes/acre)						
Table Grapes	850.00	1000.00	1150.00	1300.00	1450.00	1600.00	1750.00
12.50	-4,483	-3,851	-3,218	-2,586	-1,954	-1,320	-688
14.00	-3,208	-2,351	-1,493	-636	221	1,080	1,937
15.50	-1,933	-851	232	1,314	2,396	3,480	4,562
17.00	-658	649	1,957	3,264	4,571	5,880	7,187
18.50	617	2,149	3,682	5,214	6,746	8,280	9,812
20.00	1,892	3,649	5,407	7,164	8,921	10,680	12,437
21.50	3,167	5,149	7,132	9,114	11,096	13,080	15,062
Net Return per Acre above Total Costs for Table Grapes							
PRICE (\$/box)	YIELD (boxes/acre)						
Table Grapes	850.00	1000.00	1150.00	1300.00	1450.00	1600.00	1750.00
12.50	-7,316	-6,684	-6,050	-5,418	-4,786	-4,153	-3,521
14.00	-6,041	-5,184	-4,325	-3,468	-2,611	-1,753	-896
15.50	-4,766	-3,684	-2,600	-1,518	-436	647	1,729
17.00	-3,491	-2,184	-875	432	1,739	3,047	4,354
18.50	-2,216	-684	850	2,382	3,914	5,447	6,979
20.00	-941	816	2,575	4,332	6,089	7,847	9,604
21.50	334	2,316	4,300	6,282	8,264	10,247	12,229

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

Early Maturing San Joaquin Valley-south 2018

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
18	ATV-4WD	8,350	7	3,167	1,086	5	58	1,149
18	Mower-Flail 8'	11,700	15	1,123	1,115	5	64	1,185
18	Pickup Truck 1/2 Ton	32,000	7	12,139	4,163	19	221	4,402
18	65HP4WD Cab Narrow Tractor	62,228	15	12,115	5,659	31	372	6,062
18	Mower/Shredder 8'	22,199	15	2,131	2,116	10	122	2,248
18	34HP4WD Tractor	29,452	15	5,734	2,678	15	176	2,869
18	Weed Sprayer 200 Gal	9,700	10	1,715	1,154	5	57	1,216
18	Truck-Bobtail 12 Ton	70,000	15	13,628	6,366	35	418	6,819
18	Water Truck	120,000	15	23,362	10,913	61	717	11,690
18	Orchard/Vine Sprayer 500 Gal	26,000	10	4,598	3,092	13	153	3,258
18	Sulfur Duster 3Pt 12'	8,000	8	1,806	1,077	4	49	1,130
18	ATV Weed Sprayer 20 Gal	1,200	15	115	114	1	7	122
18	Fertilizer Spreader PTO 12'	15,000	10	2,653	1,784	7	88	1,880
18	Hedging Machine 12'	2,500	20	130	205	1	13	220
TOTAL		418,329	-	84,416	41,523	213	2,514	44,249
60% of New Cost*		250,997	-	50,650	24,914	128	1,508	26,550

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Building Pole Barn	60,000	30	0	4,128	25	300	1,200	5,654
Irrigation System: Single Line Drip	74,000	25	0	5,517	31	370	1,480	7,398
Fuel Storage and Delivery	10,978	25	768	803	5	59	220	1,087
Land: Table Grapes	900,000	25	900,000	49,500	761	9,000	0	59,261
Tools: Shop/Field	15,000	20	1,050	1,225	7	80	300	1,612
Bait Stations	850	8	0	134	0	4	17	156
Establishment: Flame Seedless	634,840	22	0	50,452	269	3,174	0	53,894
TOTAL INVESTMENT	1,695,668	-	901,818	111,759	1,099	12,987	3,217	129,062

ANNUAL BUSINESS OVERHEAD COSTS

Description	Farm	Units/ Unit	Price/ Unit	Total Cost
Liability Insurance	500	Acre	2.46	1,231
Office Expense	495	Acre	80.00	39,600
Sanitation	495	Acre	4.05	2,005
Farm Management	495	Acre	500.00	247,500

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Table 7. HOURLY EQUIPMENT COSTS
Early Maturing San Joaquin Valley-south 2018

Yr	Description	Table Grape	Cash Overhead			Operating		Total Oper.	Total Costs/Hr.
		Hours Used	Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel		
18	65HP4WD Cab Narrow Tractor	317	4.24	0.02	0.28	2.57	9.32	11.89	16.43
18	Orchard/Vine Sprayer 500 Gal	133	9.28	0.04	0.46	4.44	0.00	4.44	14.21
18	Sulfur Duster 3Pt 12'	94	2.59	0.01	0.12	1.41	0.00	1.41	4.12
18	ATV 4WD	60	2.33	0.01	0.12	0.77	1.07	1.84	4.30
18	Pickup Truck 1/2 Ton	53	8.76	0.04	0.46	4.56	14.67	19.22	28.49
18	Truck-Bobtail 12 Ton	50	28.72	0.16	1.89	8.53	13.14	21.67	52.43
18	Water Truck	40	49.23	0.27	3.23	13.21	13.14	26.35	79.09
18	Mower-Flail 8'	31	5.03	0.02	0.29	5.35	0.00	5.35	10.70
18	34HP4WD Tractor	26	2.01	0.01	0.13	1.28	4.88	6.16	8.31
18	Mower/Shredder 8'	17	9.55	0.05	0.55	10.15	0.00	10.15	20.29
18	Weed Sprayer 200 Gal	13	3.46	0.01	0.17	2.84	0.00	2.84	6.48
18	ATV Weed Sprayer 20 Gal	13	0.69	0.00	0.04	0.32	0.00	0.32	1.04
18	Hedging Machine 12'	13	1.23	0.01	0.08	0.97	0.00	0.97	2.28
18	Fertilizer Spreader PTO 12'	10	8.92	0.04	0.44	5.78	0.00	5.78	15.18

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Table 8. OPERATIONS WITH EQUIPMENT & MATERIALS

Early Maturing San Joaquin Valley-south 2018

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Well Test/Water Analysis Prune: (Spur Pruned)	Jan			Well Test/Water Analysis	1.00	Acre
	Jan			Pruning Labor	75.00	hours
				Tying Materials (Pruning)	1.00	Acre
Shred Prunings	Feb	65HP4WD Cab Tractor	Mower/Shredder 8'	Equipment Operator Labor	0.50	hour
Weeds: Strip Spray	Feb	34HP4WD Tractor	Weed Sprayer 200 Gal	Equipment Operator Labor	0.40	hour
				Surflan 4 AS	1.75	Pint
				Roundup WeatherMax	1.00	Pint
				Goal 2XL	1.00	Pint
Vine Re-Plant/Trellis Repair	Jan			Non-Machine Labor	3.00	hours
				Trellis Materials (Repairs)	1.00	Acre
				Vines: Dormant (Bench)	6.00	Each
				Tying Materials (Re-Plant)	6.00	Vine
Pests: Vertebrate 8x	Mar			Vertebrate Control	0.25	hour
	Apr			Vertebrate Poison Bait	1.00	Lb
	May			Vertebrate Control	0.25	hour
	June			Vertebrate Poison Bait	1.00	Lb
	July			Vertebrate Control	0.25	hour
	Aug			Vertebrate Poison Bait	1.00	Lb
	Sept			Vertebrate Control	0.25	hour
	Oct			Vertebrate Poison Bait	1.00	Lb
				Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
Disease: Phomopsis	Mar	65HP4WD Cab Tractor	Vine Sprayer 500Gal	Equipment Operator Labor	0.55	hour
				Abound	12.00	floz
				Microthiol Special	1.00	Lb
Weeds: Mow Middles 3x	Mar	65HP4WD Cab Tractor	Mower-Flail 8'	Equipment Operator Labor	0.31	hour
	May	65HP4WD Cab Tractor	Mower-Flail 8'	Equipment Operator Labor	0.31	hour
	July	65HP4WD Cab Tractor	Mower-Flail 8'	Equipment Operator Labor	0.31	hour
Disease: Sulfur 6x	May	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.94	hour
	June	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Dusting Sulfur	11.60	Lb
	July	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.94	hour
				Dusting Sulfur	11.80	Lb
				Equipment Operator Labor	0.94	hour
				Dusting Sulfur	11.60	Lb
Prune: Sucker	Apr			Pruning Labor	10.00	hours
Insects/Disease: (SI)	Apr	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.55	hour
				Microthiol Special	2.00	Lb
				Neutral Zinc 50%	5.00	Lb
				Rally 40W	4.00	Oz
				Movento	8.00	FIOz
Fertigate: UAN32	Apr			UAN32	50.00	Lb N
Irrigate	Apr			Irrigation Labor	1.50	hour
	May			Water-SJV south	4.00	AcIn
	June			Irrigation Labor	1.50	hour
	July			Water-SJV south	4.00	AcIn
	Aug			Irrigation Labor	0.50	hour
	Sept			Water-SJV south	8.00	AcIn
	Oct			Irrigation Labor	0.50	hour
				Water-SJV south	8.00	AcIn
				Irrigation Labor	0.50	hour
				Water-SJV south	2.00	AcIn
				Irrigation Labor	0.50	hour
				Water-SJV south	2.00	AcIn
Insects: Mealybugs	Apr			Admire Pro	14.00	FIOz
CM: Shoot Position	Apr			Canopy Mgmt. Labor	85.00	hours
Bloom: Insects: Thrips	May	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.55	hour
				Flint	2.00	Oz
				Microthiol Special	1.00	Lb
				Delegate WG	5.00	FIOz
FM: Bloom Size/Insects	May	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.60	hour
				Pro-Gibb LV-Plus	3.00	FIOz
				Microthiol Special	2.00	Lb
				Agri-Mek EC	16.00	FIOz

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TABLE 8. CONTINUED

Early Maturing San Joaquin Valley-south 2018

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
FM: Fruit Exposure	May			Fruit Management Labor	75.00	hours
Petiole Sampling	May			Petiole Sampling	1.30	Acre
FM: Cluster Tipping	May			Fruit Management	55.00	hours
FM: Berry Size: (GA) 2x	June	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.60	hour
				Pro-Gibb LV-Plus	24.00	FLOz
				Rally 40W	4.00	Oz
				Microthiol Special	2.00	Lb
	June	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.60	hour
				Pro-Gibb LV-Plus	24.00	FLOz
				Microthiol Special	2.00	Lb
				Flint	2.00	Oz
CM: Hedging	June	65HP4WD Cab Tractor	Hedging Machine 12'	Equipment Operator Labor	0.40	hour
Weeds: Spot Spray	June	ATV-4WD	ATV Weed Sprayer 20 Gal	Equipment Operator Labor	0.40	hour
				Roundup WeatherMax	1.50	Pint
FM: Girdling	June			Fruit Management	10.00	hour
FM: Berry Color (Ethrel)	June	65HP4WD Cab Tractor	Vine Sprayer 500 Gal	Equipment Operator Labor	0.55	hour
				Ethrel	64.00	FLOz
PCA/CCA	Sept			PCA/CCA	1.00	Acre
Mealybug Trapping Fee	Sept			Pheromone Trap Monitoring	1.00	Acre
Fertilizer: K ₂ SO ₄	Oct	34HP4WD Tractor	Fertilizer Spreader PTO 12'	Equipment Operator Labor	0.30	hour
				Potassium Sulfate K ₂ SO ₄	116.00	Units
Irrigate: Acid Flush	Oct			Irrigation Labor	2.50	hours
				N-pHuric Acid	0.12	Gal
		Pickup Truck 1/2 Ton		Water-SJV south	0.10	AcIn
Pickup Truck 1/2 Ton	Oct			Equipment Operator Labor	1.60	hours
ATV4WD	Oct	ATV-4WD		Equipment Operator Labor	1.40	hours
Pick & Field Pack	Aug			Harvest Labor	310.00	hours
Spread/Swamp/Haul	Aug	Pickup Truck 1/2 Ton		Equipment Operator Labor	1.50	hours
				Harvest (Bags/Boxes/Haul)	1,300.00	Each
	Aug			Harvest Labor	37.00	hours
Water Truck	Aug	Water Truck		Equipment Operator Labor	1.20	hours