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UNIVERSITY OF CALIFORNIA AGRICULTURE AND NATURAL RESOURCES  
COOPERATIVE EXTENSION  
AGRICULTURAL ISSUES CENTER  
UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS  
**2018**  
**SAMPLE COSTS TO ESTABLISH AND PRODUCE**  
**TABLE GRAPES**



**SAN JOAQUIN VALLEY SOUTH**  
**Autumn King, Late Maturing**

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**SAMPLE COST TO ESTABLISH AND PRODUCE TABLE GRAPES**  
 San Joaquin Valley south-2018  
 Autumn King-Late Maturing

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**INTRODUCTION**

Sample costs to establish a vineyard and produce late maturing varieties of Seedless 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](mailto:destewart@ucdavis.edu). You can contact the local UCCE Viticulture Advisor, through the county offices.

**Costs and Returns Study Program/Acknowledgements.** A costs and returns 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, the 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 the vineyard and produce late maturing Seedless table grapes in the San Joaquin Valley. The cultural practices described represent production operations and materials considered typical of a well-managed vineyard in the region. Costs, materials, and practices in this study 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.

**Farm.** The hypothetical farm consists of 500 contiguous acres. The vineyard establishment and table grape production is on 40 acres, Autumn King 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 4-5 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 two-inch by two-inch by twelve inch 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. In year three and continuing for the life of the vineyard 1 percent of the vines are replaced annually.

**Vines.** The vines are dormant, bench-grafted rootstock vines purchased at \$3.25 each from a commercial nursery, additional \$1 royalty fee is paid to the California Table Grape Commission. 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 in the ground 3 feet. 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 and with 10 inch helix anchor. (3) Eight wires, 12.5 gauge high tensile, are used for fruit and canopy support; 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 the following spring 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 desired head height. Most of the training costs occur during the second summer. The third summer is devoted to 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.

**Irrigation.** Water pumping costs plus labor constitute the irrigation cost. Water is calculated to cost \$12.00 per acre-inch (\$144 per acre-foot). 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 characteristic and other irrigation factors. 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.* Grape vines 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. No charge for this operation is included in this analysis.

*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 units of N per acre. In the second year, a single application of 40 units is made one month after bud-break, and in the third year 50 units of nitrogen 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. Starting in year two, potassium as  $K_2SO_4$  is applied at 40 units of K per acre and 50 units of K per acre, (50 units of K is approximately 116 lbs. of  $K_2SO_4$ ) in 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 two separate times. The first is a thinning spray, 1 ppm GA at 60 to 80 percent bloom, and the second is for sizing, 10 ppm at fruit set at 8-10 mm fruit size, (disease and insect materials are included with these

applications). Vines are girdled in June after berry set, two to three weeks after full bloom. Cluster tipping and hand thinning are done after berry set in early June to loosen clusters, and adjust cluster length and crop load.

**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](http://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 during 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, 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 beginning in May of the second year. 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 managed in this study. In April of the second and third years, 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 beginning in the third year, and 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; one Rubigan (SI) application in June. Dusting sulfur is applied eight times from May through September.

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. 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.

### **Mature Production Cultural Practices and Material Inputs**

**Prune/Sucker/Canopy Management (CM).** The vines are cane-pruned during the winter months (December to early February) in January and the prunings are placed in the row middles and shredded. In mid- February, the canes are tied by wrapping on the trellis wire and tying with twist-ties and twine. Suckers are removed from the vine trunks in early April. Shoot positioning and removal are done in late April. The canes are mechanically cut in June, (hedging) to improve canopy microclimate, allowing for sunlight penetration and proper coverage of pesticides.

**Fruit Management (FM).** Gibberellic acid (GA), a plant growth regulator, is applied two times: one time in May for thinning during bloom at one gram per acre and a second time for berry sizing three to four weeks after full bloom at eight grams per acre, (disease and insect materials are included with these applications). Vines are girdled to increase berry size two to three weeks after full bloom. Cluster tipping and hand thinning are done in late May to early June to loosen and adjust cluster length and crop load. Leaf removal for fruit exposure is done after fruit set. In September plastic is rolled out over each row canopy to protect fruit from fall moisture. The plastic is removed after harvest.

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

**Irrigation.** The vineyard is drip irrigated during the growing season from April through October. Water pumping costs plus labor constitute the irrigation cost. Water is calculated to cost \$ \$12.00 per acre-inch, (\$144 per acre-foot). A total of 44 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 (UAN32) is applied through the irrigation drip system in April or post-harvest at 50 units of N per acre. Potassium as K<sub>2</sub>SO<sub>4</sub> is applied at 50 units K per acre, (50 units of K is equal to approximately 116 lbs. K<sub>2</sub>SO<sub>4</sub>) the third year and possibly every year thereafter. Neutral zinc at 5 lbs. per acre 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, the costs of these operations, which can be significant are not included in this analysis.

**Table A.** Irrigation Water Applied

Year	AcIn/Year
1	8
2	18
3	36
4+	44

**Table B.** Applied Fertilizer\*

Year	N	K <sub>2</sub> SO <sub>4</sub>	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	11.4	1,200
5	15.2	1,600
6+	17.1	1,800

\*Applied units; N - Lbs. N/ac, K<sub>2</sub>SO<sub>4</sub> – 2.32lbs = 1lb K, Zn - 50%.

**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](http://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.

*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/berm 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 Applaud 70DF in late April, Admire Pro through the drip system in May, and a foliar application of Movento in mid-June. The Admire Pro and Movento also provide control of grape leafhopper (*Erythroneura elegantula*), glassy-winged sharpshooter (*Homalodisca vitripennis*) and grape mealybug (*Pseudococcus maritimus*), and may suppress nematodes. In vineyards with severe vine mealybug pressure it may also be necessary to apply Lorsban prior to bud-break and a foliar application of Assail or Belay in July (not included). 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).

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 are phomopsis cane and leafspot (*Phomopsis viticola*) and powdery mildew (*Erysiphe necator*). Phomopsis and powdery mildew are both treated in late March (shoot length averages 2-inches) with Abound and Microthiol (micronized sulfur). Mildew is controlled with various fungicide applications at 7 to 21 day intervals, depending on the fungicide used. Dusting Sulfur is applied four times – April, June and July. Microthiol and Rally, an SI, (with zinc) are applied in late April. Microthiol (with GA and Kryocide) is applied with the May bloom thin spray. Rally and Microthiol are applied in June. Microthiol and Rally (with GA and Movento) are applied with the berry size spray in June. Microthiol and Rally are applied in July. Dusting Sulfur is applied four more times, twice in September and twice in October to control powdery mildew on the stems. The mildew does not grow on the grapes at this stage of maturity. Vanguard fungicide is applied in October to protect grapes from Botrytis Bunch Rot.

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.* Gophers, rabbits, 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 shooting are utilized as necessary throughout the year. 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 October the grapes are hand-harvested for table grapes and packed in the field. The field is picked two to three times. Harvesting crews work in teams of three or four. Depending on fruit quality, the team can pick 3 to 6 boxes per hour per individual. The picker picks four shipping boxes per hour per individual. Two or three pickers field pick and trim the grapes, and put them in a reusable field box. After the fruit is picked and trimmed, the field boxes are loaded on a harvest wheelbarrow and delivered to the packer who places the fruit in bags and places them in shipping boxes. The box holds 8 bags and weighs 19 pounds when filled. The empty boxes are stacked along row ends and when filled, they are loaded on a truck and hauled to storage. The swap and haul cost 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 fees 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 1,800, 19-pound boxes over the productive 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 late harvested Autumn King 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 1,250 to 2,250 boxes per acre and crop prices ranged from \$13.25 to \$20.75 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 grower uses the pickup 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. This will help cover the expenses 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 producing acre or \$39,600 annually for the farm. These expenses include office supplies, telephones, 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 are 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 price 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 cost. The previous vineyard is assumed to have a pumping system that had 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 *Total Accumulated Net Cash Cost* on Table 1, in the third year represents the establishment cost which is; \$17,133 per acre or \$685,320 for the 40 producing acres. The establishment cost added to the bare land value is consistent with the value of an established mature vineyard ( $\$17,133 + \$22,500 = \$39,633$ ). The establishment cost is 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-Autumn King**  
 Late Maturing San Joaquin Valley-south 2018

	Year:	Cost Per Acre		
		1st	2nd	3rd
Operations:	\$17/Box, Boxes Per Acre:	0	0	600
<b>Pre-Planting Costs:</b>				
Vineyard Removal (50%)		443		
Chisel/Subsoil 2x, 5' Depth		400		
Laser Level		150		
Weeds-Applied/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	
<b>TOTAL PRE-PLANTING COSTS</b>		<b>1,622</b>	<b>6,272</b>	
<b>Planting Costs:</b>				
Dig, Plant, Wrap Vines		450	36	
Vines: 605 Per Acre, Replant; (Yr2-12)		2,571	51	
<b>TOTAL PLANTING COSTS</b>		<b>3,021</b>	<b>87</b>	
<b>Cultural Costs:</b>				
Well Test/Water Analysis		2	2	2
Trellis Repair/Vine Re-plant				115
Pests: Vertebrate		44	27	25
Fertigate: UAN32		3	23	29
Fertilizer: (Banded) K <sub>2</sub> SO <sub>4</sub>			35	42
Petiole Sampling				4
Irrigation: (Water & Labor)		173	301	517
Irrigation: Acid Flush		46	46	46
Weeds: Disc Middles: 2x/Yr 1		31		
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 (Cane Pruned)			268	876
Vine Training: (Select/Tie Vines)			876	829
Vines: Sucker				155
Disease: Mildew (SI) 3x				76
Shred Prunings: (All Middles)			15	19
Insects: Skeletonizer/Disease: Mildew/Fertilizer: Zinc			39	43
Insects: Mealybugs (Systemic)			24	24
Disease: Phomopsis (SI)				70
FM: Bloom Thin (GA), Disease: Mildew (SI)				33
FM: Berry Size (GA), Insects: (Leafhoppers/Mites: Yr 2 & Yr 3)			67	71
Disease: Mildew (Sulfur Dust) 8x				132
CM: Shoot Position/Remove Late Spurs				866
FM: Fruit Exposure/Leaf Removal				773
CM: Hedging (Mechanical)				12
FM: Cluster Tipping/Thinning				557
FM: Girdling				155
PCA/CCA				30
Pickup Truck (1/2 Ton)		41	41	41
ATV-4WD		18	18	18
<b>TOTAL CULTURAL COSTS</b>		<b>426</b>	<b>1,897</b>	<b>5,672</b>
<b>Harvest Costs:</b>				
Pick & Field Pack (Labor)				2,226
Spread/Swamp/Haul (Bags/Boxes/Labor)				1,706
Water Truck				24
Commission: 9% Sales & Marketing Fee				918
Assessment & Inspection Fees				225
<b>TOTAL HARVEST COSTS</b>				<b>5,099</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**Table 1. CONTINUED-Autumn King**  
Late Maturing San Joaquin Valley-south 2018

	Year:	Cost Per Acre		
		1st	2nd	3rd
Operations:	\$17/Box, Boxes Per Acre:	0	0	600
Interest On Operating Capital @ 5.0%		189	284	117
<b>TOTAL OPERATING COSTS/ACRE</b>		<b>5,259</b>	<b>8,539</b>	<b>10,888</b>
Cash Overhead Cost:				
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
<b>TOTAL CASH OVERHEAD COSTS</b>		<b>882</b>	<b>882</b>	<b>883</b>
<b>TOTAL CASH COSTS/ACRE</b>		<b>6,141</b>	<b>9,421</b>	<b>11,771</b>
<b>INCOME/ACRE FROM PRODUCTION</b>		<b>0</b>	<b>0</b>	<b>10,200</b>
<b>NET CASH COSTS/ACRE FOR THE YEAR</b>		<b>6,141</b>	<b>9,421</b>	<b>0</b>
<b>PROFIT/ACRE ABOVE CASH COSTS</b>		<b>0</b>	<b>0</b>	<b>1,571</b>
<b>ACCUMULATED NET CASH COSTS/ACRE</b>		<b>6,141</b>	<b>15,562</b>	<b>17,133</b>
Non-Cash Overhead Cost: (Capital Recovery)				
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		2	2	2
Bait Stations		0	0	0
Equipment		33	44	147
<b>TOTAL CAPITAL RECOVERY COST</b>		<b>1,421</b>	<b>1,432</b>	<b>1,535</b>
<b>TOTAL COST/ACRE FOR THE YEAR</b>		<b>7,562</b>	<b>10,854</b>	<b>13,305</b>
<b>INCOME/ACRE FROM PRODUCTION</b>		<b>0</b>	<b>0</b>	<b>10,200</b>
<b>NET COST/ACRE FOR THE YEAR</b>		<b>7,562</b>	<b>10,854</b>	<b>3,105</b>
<b>NET PROFIT/ACRE ABOVE TOTAL COST</b>		<b>0</b>	<b>0</b>	<b>0</b>
<b>TOTAL ACCUMULATED NET COST/ACRE</b>		<b>7,562</b>	<b>18,416</b>	<b>21,521</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**Table 2. COSTS PER ACRE TO PRODUCE TABLE GRAPES-Autumn King**  
 Late Maturing San Joaquin Valley-south 2018

Operation	Equipment		Cash and Labor Costs per Acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent			
Cultural:									
Well Test/Water Analysis	0.00	0	0	0	2	0	2		
Prune: Dormant (Cane Pruned)	0.00	1,314	0	0	0	0	1,314		
Shred Prunings (All Middles)	0.50	11	5	6	0	0	23		
Vine Re-Planting/Trellis Repair	0.00	46	0	0	69	0	115		
CM: Tie Canes	0.00	804	0	0	360	0	1,164		
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) 8x	3.14	69	32	13	18	0	132		
Vines: Sucker	0.00	155	0	0	0	0	155		
Disease: Mildew (SI) 4x, Fertilizer: (Zn)	0.46	10	5	3	97	0	111		
Fertigate: UAN32	0.00	0	0	0	29	0	29		
Irrigation: (Water & Labor)	0.00	93	0	0	528	0	621		
CM: Shoot Position/Remove Late Spurs	0.00	1,391	0	0	0	0	1,391		
FM: Bloom Thin (GA)/Disease/Insects	0.46	10	5	3	74	0	92		
Insects: Mealybugs (Systemic)	0.00	0	0	0	24	0	24		
Petiole Sampling	0.00	0	0	0	0	3	3		
Disease: Mildew (SI) 4x/Mites	0.46	10	5	3	71	0	89		
FM: Berry Size (GA)/Disease (SI) 4x	0.46	10	5	3	93	0	111		
CM: Hedging (Mechanical)	0.33	7	3	1	0	0	12		
FM: Cluster Tipping/Thinning	0.00	959	0	0	0	0	959		
FM: Girdling	0.00	186	0	0	0	0	186		
Weeds: Spot Spray	0.33	7	0	0	5	0	13		
FM: Fruit Exposure/Leaf Removal	0.00	1,237	0	0	0	0	1,237		
Disease: Mildew (SI) 4x	0.46	10	5	3	22	0	40		
Plastic Fruit Cover: Roll Out/Up	0.00	1,190	0	0	320	0	1,510		
Disease: Botrytis	0.58	13	6	4	50	0	73		
Irrigate: Acid Flush	0.00	39	0	0	7	0	46		
Fertilizer: (Banded) K <sub>2</sub> SO <sub>4</sub>	0.20	4	2	2	35	0	43		
PCA/CCA	0.00	0	0	0	0	30	30		
Mealy Bug Trapping Fee	0.00	0	0	0	0	11	11		
Pickup Truck (1/2 Ton)	1.33	29	20	6	0	0	55		
ATV-4WD	1.17	26	1	1	0	0	28		
<b>TOTAL CULTURAL COSTS</b>	<b>11.44</b>	<b>7,695</b>	<b>108</b>	<b>62</b>	<b>1,874</b>	<b>44</b>	<b>9,782</b>		
Harvest:									
Pick & Field Pack (Labor)	0.00	6,648	0	0	0	0	6,648		
Spread/Swamp/Haul (Bags/Boxes/Labor)	1.50	806	20	13	4,230	0	4,759		
Water Truck	1.33	29	18	18	0	0	64		
Commission: 9% Sales & Marketing Fee	0.00	0	0	0	0	2,754	2,754		
Assessment & Inspection Fees	0.00	0	0	0	378	0	378		
<b>TOTAL HARVEST COSTS</b>	<b>2.83</b>	<b>7,438</b>	<b>37</b>	<b>30</b>	<b>4,608</b>	<b>2,754</b>	<b>14,913</b>		
Interest on Operating Capital at 5.0%							311		
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>14</b>	<b>15,178</b>	<b>145</b>	<b>92</b>	<b>6,483</b>	<b>2,798</b>	<b>25,006</b>		



UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**Table 2. CONTINUED-Autumn King**  
Late Maturing San Joaquin Valley-south 2018

Operation	Equipment	Cash and Labor Costs per Acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent		
<b>CASH OVERHEAD:</b>								
Liability Insurance							2	
Office Expense							80	
Sanitation							4	
Farm Management							500	
Property Taxes							321	
Property Insurance							27	
Investment Repairs							41	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>							<b>976</b>	
<b>TOTAL CASH COSTS/ACRE</b>							<b>25,982</b>	
<b>NON-CASH OVERHEAD:</b>								
		Per Producing Acre		Annual Cost				
				Capital Recovery				
Building Pole Barn		121		8			8	
Irrigation System: Single Line Drip		1,850		138			138	
Fuel Storage and Delivery		22		2			2	
Land: Table Grapes		22,500		1,238			1,238	
Tools: Shop/Field		30		2			2	
Bait Stations		2		0			0	
Vineyard Establishment: AK		17,133		1,362			1,362	
Equipment		2,188		215			215	
<b>TOTAL NON-CASH OVERHEAD COSTS</b>							<b>2,964</b>	
<b>TOTAL COSTS/ACRE</b>							<b>28,946</b>	

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**Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE TABLE GRAPES-Autumn King**  
Late Maturing San Joaquin Valley-south 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS	1,800	Box	17.00	30,600	
TOTAL GROSS RETURNS				30,600	
<b>OPERATING COSTS</b>					
<b>Herbicide:</b>					<b>37</b>
Surflan 4 AS	1.75	Pint	5.00	14	
Roundup WeatherMax	2.00	Pint	5.21	10	
Goal 2XL	1.00	Pint	11.20	12	
<b>Insecticide:</b>					<b>273</b>
Applaud 70DF	1.50	Lb	44.46	62	
Delegate WG	5.00	FIOz	10.58	53	
Kryocide	6.00	Lb	3.00	18	
Admire Pro	14.00	FIOz	1.70	24	
Agri-Mek EC	16.00	FIOz	3.07	49	
Movento	8.00	FIOz	8.32	67	
<b>Fungicide:</b>					<b>190</b>
Abound	12.00	floz	2.20	26	
Microthiol Special	10.00	Lb	1.27	13	
Dusting Sulfur	40.00	Lb	0.45	18	
Rally 40W	17.00	Oz	4.89	83	
Vanguard WG	10.00	Oz	4.95	50	
<b>Growth Regulator:</b>					<b>5</b>
Pro-Gibb LV-Plus	4.50	FIOz	1.07	5	
<b>Fertilizer:</b>					<b>68</b>
Neutral Zinc 50%	5.00	Lb	0.92	5	
UAN32	50.00	Lb N	0.58	29	
Potassium Sulfate K <sub>2</sub> SO <sub>4</sub>	116.00	Units	0.30	35	
<b>Water:</b>					<b>537</b>
Well Test/Water Analysis	1.00	Acre	2.00	2	
Water: SJV south	44.10	AcIn	12.00	529	
N-pHuric Acid	0.12	Gal	47.54	6	
<b>Custom:</b>					<b>44</b>
Petiole Sampling	1.00	Acre	3.00	3	
PCA/CCA	1.00	Acre	30.00	30	
Pheromone Trap Monitoring	1.00	Acre	11.00	11	
<b>Vine:</b>					<b>26</b>
Vine Dormant-Bench Autumn King	6.00	Each	4.25	26	
<b>Vine Aids:</b>					<b>724</b>
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	
Plastic (Fruit Cover)	1.60	Roll	200.00	320	
<b>Harvest Aids:</b>					<b>4,230</b>
Harvest (Bags/Boxes/Haul)	1,800.00	Each	2.35	4,230	
<b>Assessment:</b>					<b>378</b>
Table Grape Commission	1,800.00	Box	0.12	207	
Table Grape Quality Inspection	600.00	Box	0.04	21	
Auditing & Compliance	1.00	Acre	150.00	150	
<b>Rodenticide:</b>					<b>15</b>
Vertebrate Poison Bait	8.00	Lb	1.92	15	
<b>Contract:</b>					<b>2,754</b>
Commission: 9% of \$17	1,800.00	Box	1.53	2,754	
<b>Labor:</b>					<b>15,178</b>
Equipment Operator Labor	17.13	hrs	18.27	313	
Pruning Labor	95.00	hrs	15.46	1,469	
Non-Machine Labor	3.00	hrs	15.46	46	
Canopy Management Labor	154.00	hrs	15.46	2,381	
Vertebrate Control Labor	2.00	hrs	15.46	31	
Irrigation Labor	8.00	hrs	15.46	131	
Fruit Management Labor	219.00	hrs	15.46	3,386	
Harvest Labor	480.00	hrs	15.46	7,421	
<b>Machinery:</b>					<b>237</b>
Fuel-Gas	6.61	gal	3.20	21	
Fuel-Diesel	42.42	gal	2.92	124	
Lube				22	
Machinery Repair				71	
Interest on Operating Capital @ 5.0%				311	
TOTAL OPERATING COSTS/ACRE				23,359	
TOTAL OPERATING COSTS/BOX				13	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**Table 3. CONTINUED-Autumn King**  
Late Maturing San Joaquin Valley-south 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
NET RETURNS ABOVE OPERATING COSTS				7,241	
CASH OVERHEAD COSTS					
Liability Insurance				2	
Office Expense				80	
Sanitation				4	
Farm Management				500	
Property Taxes				322	
Property Insurance				27	
Investment Repairs				41	
TOTAL CASH OVERHEAD COSTS/ACRE				976	
TOTAL CASH OVERHEAD COSTS/BOX				1	
TOTAL CASH COSTS/ACRE				25,982	
TOTAL CASH COSTS/BOX				14	
NET RETURNS ABOVE CASH COSTS				4,618	
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	
Vineyard Establishment: AK				1,362	
Equipment				215	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				2,964	
TOTAL NON-CASH OVERHEAD COSTS/BOX				2	
TOTAL COST/ACRE				28,946	
TOTAL COST/BOX				16	
NET RETURNS ABOVE TOTAL COST				1,654	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**Table 4. MONTHLY COSTS PER ACRE TO PRODUCE TABLE GRAPES-Autumn King**  
 Late 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
<b>Cultural:</b>											
Well Test/Water Analysis	2										2
Vines: Dormant (Cane Pruned)	1,314										1,314
Shred Prunings (All Middles)	23										23
Vine Re-Planting/Trellis Repair	115										115
CM: Tie Canes		1,164									1,164
Weeds: Strip Spray		42									42
Pests: Vertebrate 8x			6	6	6	6	6	6	6	6	46
Disease: Mildew Phomopsis			46								46
Weeds: Mow Middles 3x			10		10		10				31
Disease: Mildew (Sulfur Dust) 8x					33	33	33	17	17		132
Vines: Sucker				155							155
Disease: Mildew (SI) 4x, Fertilizer: (Zn)				111							111
Fertigate: UAN32				29							29
Irrigation: (Water & Labor)				71	71	111	104	104	80	80	621
CM: Shoot Position/Remove Late Spurs				1,391							1,391
FM: Bloom Thin (GA)/Disease/Insects					92						92
Insects: Mealybugs (Systemic)					24						24
Petiole Sampling					3						3
Disease: Mildew (SI) 4x/Mites						89					89
FM: Berry Size(GA)/Disease (SI) 4x						111					111
CM: Hedging (Mechanical)						12					12
FM: Cluster Tipping/Thinning						959					959
FM: Girdling						186					186
Weeds: Spot Spray						13					13
FM: Fruit Exposure/Leaf Removal					1,237						1,237
Disease: Mildew (SI) 4x							40				40
Plastic Fruit Cover: Roll Out/Up								1,510			1,510
Disease: Botrytis										73	73
Irrigate: Acid Flush										46	46
Fertilizer: (Banded) K <sub>2</sub> SO <sub>4</sub>										43	43
PCA/CCA										30	30
Mealy Bug Trapping Fee										11	11
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
<b>TOTAL CULTURAL COSTS</b>	<b>1,462</b>	<b>1,214</b>	<b>70</b>	<b>1,771</b>	<b>1,484</b>	<b>1,528</b>	<b>201</b>	<b>134</b>	<b>1,621</b>	<b>296</b>	<b>9,782</b>
<b>Harvest:</b>											
Pick & Field Pack (Labor)										6,648	6,648
Spread/Swamp/Haul (Bags/Boxes/Labor										5,068	5,068
Water Truck										64	64
Commission: 9% Sales & Marketing Fee										2,754	2,754
Assessment & Inspection Fees										378	378
<b>TOTAL HARVEST COSTS</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14,913</b>	<b>14,913</b>
Interest on Operating Capital @5.0%	6	11	11	19	25	31	32	33	40	103	311
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>1,469</b>	<b>1,225</b>	<b>82</b>	<b>1,790</b>	<b>1,509</b>	<b>1,560</b>	<b>234</b>	<b>167</b>	<b>1,660</b>	<b>15,311</b>	<b>25,006</b>

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**Table 4. CONTINUED-Autumn King**  
Late 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									2		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		161					161				322
Property Insurance		14					14				27
Investment Repairs	4	4	4	4	4	4	4	4	4	4	41
<b>TOTAL CASH OVERHEAD COSTS</b>	<b>62</b>	<b>237</b>	<b>62</b>	<b>62</b>	<b>62</b>	<b>62</b>	<b>237</b>	<b>62</b>	<b>65</b>	<b>66</b>	<b>976</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>1,531</b>	<b>1,462</b>	<b>144</b>	<b>1,852</b>	<b>1,571</b>	<b>1,622</b>	<b>470</b>	<b>229</b>	<b>1,725</b>	<b>15,377</b>	<b>25,982</b>

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**Table 5. RANGING ANALYSIS**

Late Maturing San Joaquin Valley-south 2018

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

	YIELD (boxes/acre)						
	1,350.00	1,500.00	1,650.00	1,800.00	1,950.00	2,100.00	2,250.00
OPERATING COSTS/ACRE:							
Cultural	9,782	9,782	9,782	9,782	9,782	9,782	9,782
Harvest	11,217	12,448	13,681	14,913	16,144	17,377	18,608
Interest on Operating Capital @ 5.0%	296	301	306	311	316	322	327
TOTAL OPERATING COSTS/ACRE	21,295	22,532	23,770	25,006	26,243	27,481	28,717
TOTAL OPERATING COSTS/BOX	15.77	15.02	14.41	13.89	13.46	13.09	12.76
CASH OVERHEAD COSTS/ACRE	976	976	976	976	976	976	976
TOTAL CASH COSTS/ACRE	22,271	23,508	24,746	25,982	27,219	28,457	29,693
TOTAL CASH COSTS/BOX	16.50	15.67	15.00	14.43	13.96	13.55	13.20
NON-CASH OVERHEAD COSTS/ACRE	2,964	2,964	2,964	2,964	2,964	2,964	2,964
TOTAL COSTS/ACRE	25,235	26,472	27,710	28,946	30,183	31,421	32,658
TOTAL COSTS/BOX	19.00	18.00	17.00	16.00	15.00	15.00	15.00

Net Return per Acre above Operating Costs for Table Grapes

PRICE (\$/box)	YIELD (boxes/acre)						
Autumn King	1350.00	1500.00	1650.00	1800.00	1950.00	2100.00	2250.00
13.25	-3,407	-2,657	-1,907	-1,156	-405	344	1,095
14.50	-1,720	-782	155	1,094	2,032	2,969	3,908
15.75	-32	1,093	2,218	3,344	4,470	5,594	6,720
17.00	1,655	2,968	4,280	5,594	6,907	8,219	9,533
18.25	3,343	4,843	6,343	7,844	9,345	10,844	12,345
19.50	5,030	6,718	8,405	10,094	11,782	13,469	15,158
20.75	6,718	8,593	10,468	12,344	14,220	16,094	17,970

Net Return per Acre above Cash Costs for Table Grapes

PRICE (\$/box)	YIELD (boxes/acre)						
Autumn King	1350.00	1500.00	1650.00	1800.00	1950.00	2100.00	2250.00
13.25	-4,384	-3,633	-2,883	-2,132	-1,381	-632	119
14.50	-2,696	-1,758	-821	118	1,056	1,993	2,932
15.75	-1,009	117	1,242	2,368	3,494	4,618	5,744
17.00	679	1,992	3,304	4,618	5,931	7,243	8,557
18.25	2,366	3,867	5,367	6,868	8,369	9,868	11,369
19.50	4,054	5,742	7,429	9,118	10,806	12,493	14,182
20.75	5,741	7,617	9,492	11,368	13,244	15,118	16,994

Net Return per Acre above Total Costs for Table Grapes

PRICE (\$/box)	YIELD (boxes/acre)						
Autumn King	1350.00	1500.00	1650.00	1800.00	1950.00	2100.00	2250.00
13.25	-7,348	-6,597	-5,847	-5,096	-4,345	-3,596	-2,845
14.50	-5,660	-4,722	-3,785	-2,846	-1,908	-971	-33
15.75	-3,973	-2,847	-1,722	-596	530	1,654	2,780
17.00	-2,285	-972	340	1,654	2,967	4,279	5,592
18.25	-598	903	2,403	3,904	5,405	6,904	8,405
19.50	1,090	2,778	4,465	6,154	7,842	9,529	11,217
20.75	2,777	4,653	6,528	8,404	10,280	12,154	14,030

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

Late Maturing San Joaquin Valley-south 2018

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
18	Cane Cutter 12'	2,500	20	130	205	1	13	220
18	Water Truck	120,000	15	23,362	10,913	61	717	11,690
18	Truck-Bobtail 12 Ton	70,000	15	13,628	6,366	35	418	6,819
18	65HP4WD Cab Narrow Tractor	62,228	15	12,115	5,659	31	372	6,062
18	34HP4WD Tractor	29,452	15	5,734	2,678	15	176	2,869
18	Mower/Shredder 8'	22,199	15	2,131	2,116	10	122	2,248
18	Mower-Flail 8'	11,700	15	1,123	1,115	5	64	1,185
18	ATV Weed Sprayer 20 Gal	1,200	15	115	114	1	7	122
18	Orchard/Vine Sprayer 500 Gal	26,000	10	4,598	3,092	13	153	3,258
18	Fertilizer Spreader PTO 12'	15,000	10	2,653	1,784	7	88	1,880
18	Weed Sprayer 200 Gal	9,700	10	1,715	1,154	5	57	1,216
18	Sulfur Duster 3Pt 12'	8,000	8	1,806	1,077	4	49	1,130
18	Pickup Truck 1/2 Ton	32,000	7	12,139	4,163	19	221	4,402
18	ATV 4WD	8,350	7	3,167	1,086	5	58	1,149
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: AK	685,320	22	0	54,463	290	3,427	0	58,180
TOTAL INVESTMENT	1,746,148	-	901,818	115,771	1,120	13,240	3,217	133,348

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	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**  
Late 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	364	4.24	0.02	0.28	2.56	9.32	11.89	16.43
18	Orchard/Vine Sprayer 500Gal	133	9.28	0.04	0.46	4.44	0.00	4.44	14.21
18	Sulfur Duster 3Pt 12'	125	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	Truck-Bobtail 12 Ton	60	28.72	0.16	1.89	8.53	13.14	21.67	52.43
18	Pickup Truck 1/2 Ton	53	8.76	0.04	0.46	4.56	14.67	19.22	28.49
18	Water Truck	53	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	Mower/Shredder 8'	20	9.55	0.05	0.55	10.15	0.00	10.15	20.29
18	34HP4WD Tractor	15	2.01	0.01	0.13	1.28	4.88	6.16	8.31
18	Cane Cutter 12'	13	1.23	0.01	0.08	0.97	0.00	0.97	2.28
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	Fertilizer Spreader PTO 12'	8	8.92	0.04	0.44	5.78	0.00	5.78	15.18



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**Table 8. OPERATIONS WITH EQUIPMENT & MATERIALS**

Late Maturing San Joaquin Valley-south 2018

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Well Test/Water Analysis	Jan			Well Test/Water Analysis	1.00	Acre
Vines: Prune, Dormant	Jan			Pruning Labor	85.00	hours
Shred Prunings	Jan	65HP4WD Cab Tractor	Mower/Shredder 8'	Equipment Operator Labor	0.60	hour
Vine Re-Planting/Trellis	Jan			Non-Machine Labor	3.00	hours
				Trellis Materials (Repairs)	1.00	Acre
				Vine Dormant-Bench AK	6.00	Each
				Tying Materials (Re-Planting)	6.00	Vine
CM: Tie Canes	Feb			Canopy Mgmt. Labor	52.00	hours
				Tying Materials (Pruning)	1.00	Acre
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
Pests: Vertebrate 8x	Mar			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	Apr			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	May			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	June			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	July			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	Aug			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	Sept			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
	Oct			Vertebrate Control	0.25	hour
				Vertebrate Poison Bait	1.00	Lb
Disease: Mildew	Mar	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500 Gal	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: Mildew Sulfur 8x	May	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.94	hour
				Dusting Sulfur	10.00	Lb
	June	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.94	hour
				Dusting Sulfur	10.00	Lb
	July	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.94	hour
				Dusting Sulfur	10.00	Lb
	Aug	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.47	hour
				Dusting Sulfur	5.00	Lb
	Sept	65HP4WD Cab Tractor	Sulfur Duster 3Pt 12'	Equipment Operator Labor	0.47	hour
				Dusting Sulfur	5.00	Lb
Vines: Sucker	Apr			Pruning Labor	10.00	hours
Disease: Mildew SI 4x	Apr	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500 Gal	Equipment Operator Labor	0.55	hour
				Microthiol Special	1.00	Lb
				Rally 40W	5.00	Oz
				Neutral Zinc 50%	5.00	Lb
				Applaud 70DF	1.50	Lb
Fertigate: UAN32	Apr			UAN32	50.00	Lb N
Irrigation	Apr			Irrigation Labor	1.50	hour
				Water-SJV south	4.00	AcIn
	May			Irrigation Labor	1.50	hour
				Water-SJV south	4.00	AcIn
	June			Irrigation Labor	1.00	hour
				Water-SJV south	8.00	AcIn
	July			Irrigation Labor	0.50	hour
				Water-SJV south	8.00	AcIn
	Aug			Irrigation Labor	0.50	hour
				Water-SJV south	8.00	AcIn
	Sept			Irrigation Labor	0.50	hour
				Water-SJV south	6.00	AcIn
	Oct			Irrigation Labor	0.50	hour
				Water-SJV south	6.00	AcIn

Table 8. CONTINUED

Late Maturing San Joaquin Valley-south 2018

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
CM: Shoot Position/R	Apr			Canopy Mgmt. Labor	90.00	hours
FM: Bloom Thin/Disease	May	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500Gal	Equipment Operator Labor	0.55	hour
				Pro-Gibb L.V-Plus	0.50	FlOz
				Microthiol Special	2.00	Lb
				Delegate WG	5.00	FlOz
				Kryocide	6.00	Lb
Insects: Mealybugs	May			Admire Pro	14.00	FlOz
Petiole Sampling	May			Petiole Sampling	1.00	Acre
Disease: Mildew SI 4x	June	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500Gal	Equipment Operator Labor	0.55	hour
				Rally 40W	4.00	Oz
				Microthiol Special	2.00	Lb
				Agri-Mek EC	16.00	FlOz
FM: Berry Size/Disease	June	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500Gal	Equipment Operator Labor	0.55	hour
				Pro-Gibb L.V-Plus	4.00	FlOz
				Microthiol Special	2.00	Lb
				Rally 40W	4.00	Oz
				Movento	8.00	FlOz
CM: Hedging	June	65HP4WD Cab Tractor	Cane Cutter 12'	Equipment Operator Labor	0.40	hour
FM: Cluster Tipping	June			Fruit Management	62.00	hours
FM: Girdling	June			Canopy Mgmt. Labor	12.00	hours
Weeds: Spot Spray	June	ATV-4WD	Weed Sprayer 20 Gal	Equipment Operator Labor	0.40	hour
				Roundup WeatherMax	1.00	Pint
FM: Fruit Exposure/Leaf	June			Fruit Management	80.00	hours
Disease: Mildew SI 4x	July	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500Gal	Equipment Operator Labor	0.55	hour
				Rally 40W	4.00	Oz
				Microthiol Special	2.00	Lb
Plastic Fruit Cover:	Sept			Fruit Management	77.00	hours
				Plastic (Fruit Cover)	1.60	Roll
Disease: Botrytis	Oct	65HP4WD Cab Tractor	Orchard/Vine Sprayer 500Gal	Equipment Operator Labor	0.70	hour
				Vanguard WG	10.00	Oz
Irrigate: Acid Flush	Oct			Irrigation Labor	2.50	hours
				N-pHuric Acid	0.12	Gal
				Water-SJV south	0.10	AcIn
Fertilizer: K <sub>2</sub> SO <sub>4</sub>	Oct	65HP4WD Cab Tractor	Fertilizer Spreader PTO 12'	Equipment Operator Labor	0.24	hour
				Potassium Sulfate K <sub>2</sub> SO <sub>4</sub>	116.00	Units
PCA/CCA	Oct			PCA/CCA	1.00	Acre
Mealy Bug Trapping Fee	Oct			Pheromone Trap Monitoring	1.00	Acre
Pickup Truck 1/2 Ton	Oct	Pickup Truck 1/2 Ton		Equipment Operator Labor	1.60	hours
ATV-4WD	Oct	ATV-4WD		Equipment Operator Labor	1.40	hours
Pick & Field Pack	Oct			Harvest Labor	430.00	hours
Spread/Swamp/Haul	Oct	Truck-Bobtail 12 Ton		Equipment Operator Labor	1.80	hours
				Harvest (Bags/Boxes/Haul)	1,800.00	Each
				Harvest Labor	50.00	hours
Water Truck	Oct	Water Truck		Equipment Operator Labor	1.60	hours