UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2015

SAMPLE COSTS TO ESTABLISH AN ORANGE ORCHARD AND PRODUCE

ORANGES

Navels & Valencias

SAN JOAQUIN VALLEY - South

Low Volume Irrigation

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SAMPLE COST TO ESTABLISH an ORANGE ORCHARD and PRODUCE ORANGES San Joaquin Valley South - 2015

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INTRODUCTION

Sample costs to establish an orange orchard and produce oranges under low volume irrigation in the Southern San Joaquin Valley are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the crop and area, but will not apply to every situation. Sample costs for labor, materials, equipment and custom services are based on current figures. A blank column titled "Your Costs", in Tables 3 and 4 is provided to enter your costs.

The hypothetical farm operation, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of the calculations used in the study call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-5489, or your local UC Cooperative Extension office.

Sample Cost of Production Studies for all current and many archived commodities are available at http://coststudies.ucdavis.edu or can be requested from the Department of Agricultural and Resource Economics, UC Davis, (530) 752-1515, or obtained from selected county UC Cooperative Extension offices.

ASSUMPTIONS

The assumptions refer to Tables 1 to 9 and pertain to sample costs to establish and produce oranges in the southern San Joaquin Valley. The cultural practices shown represent production operations and materials considered typical of a well-managed orchard in the region. Costs, materials, and practices in this study will not apply to all farms. Timing of and types of cultural practices will vary among growers within the region and from season to season due to variables such as variety, weather, soil, and insect and disease pressure. For more details on citrus production practices, see the 2014 University of California Cooperative Extension (UCCE) Citrus Production Manual. **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.**

Land. The hypothetical farm consists of 65 contiguous acres. Establishment and production costs are based on ten acres being planted to oranges. Mature orange trees are grown on 50 acres and the remaining five acres are roads, equipment and shop area, and homestead. The grower owns and farms the orchards.

Establishment Operating Costs
Tables 1 & 2

Land Preparation. The orchard is established on ground previously planted to another tree crop. Land preparation begins by removing the old orchard. Orchard removal costs include pushing, stacking, and burning or shredding the trees, and a hand cleanup of the area. After removal, deep ripping of the soil profile, 4 to 6 feet deep, is done to break up stratified layers that affect root and water penetration. The ground is disced two times to break up large clods and then leveled (triplaned). All land preparation operations are contracted and done in the year prior to planting. Contracted or custom operation costs will vary depending upon acreage size. Small acres (10 in this case) may have a minimum fee or additional equipment delivery charges. Some of these costs are included in this study.

Planting. Planting the orchard starts by marking tree sites (layout orchard). Holes are then dug and the trees planted in March. The trunks are wrapped with a foam wrap to shield them from sunburn and to reduce sucker development. Also, two percent of the trees, 2 trees per acre, are assumed to be replaced in the second year.

Trees. The two major orange varieties grown in the San Joaquin Valley are Navels and Valencias. Navels are grouped into three types by harvest timing – early, mid and late season. Tree costs are for the standard varieties. A royalty fee is added to the cost on patented varieties. Most cultural and management practices for the two varieties are the same except where noted in pruning, growth regulators, and harvest. The trees are planted on 18 X 22-foot spacing, at 110 trees per acre. Tree spacing and densities in orchards vary. Many new orchards are planted closer for earlier production, but historical data shows that the trees begin to crowd at 8 to 9 years with tree removal and additional pruning considerations warranted. Orange trees have a long production life if they are well maintained. The life of the orchard is assumed to be 40 years.

Pruning. Suckering is done during the first through the third year. Light pruning is done from the fourth year until mature. See Table A for estimated pruning/suckering times for the establishment years.

Table A. Sucker/Prune Operation Time Per Acre

Year	Operation	Hours
1	Sucker	2.71
2	Sucker	4.29
3	Sucker	5.00
4	Prune	3.14
5	Prune	6.00

Irrigation. District water is delivered via canal to the farm at a cost of $114 per acre-foot or $9.50 per acre-inch. Water costs are highly variable among districts, and in drought years water costs may increase to as high as $1,000 to $1,800 per acre-foot. This study assumes a year with normal water costs. Irrigation costs include the water and the labor for system operation and monitoring. No assumption is made about effective rainfall, runoff, and evaporation. Water applied by tree age is approximated and shown in Table B. Values are based on a micro irrigation sprinkler system delivering water with a distribution uniformity of 85%.

Table B. Water applied

Year	Acre-Inches
1	2.0
2	4.5
3	7.0
4	10.5
5	14.0
Maturity	30.0

Frost Protection. This study assumes that only weed/cover crop management and 2.2 acre-inches of water are used for frost protection during the first three years. Frost protection is in effect from November to February. Wind machines are installed in the third year and begin operation in the fourth year. Water use remains constant for frost protection in all years. Table C illustrates this study's frost protection methods.

In this region three methods are used to protect fruit and trees from frost or freeze during late winter and early spring. (1) Orchard floors are kept free of vegetation (or if a cover crop is used it is maintained as low as possible during freezing weather by planting late in the fall). The low vegetation allows the soil to act as a reservoir for heat from solar radiation during the day. This heat is released at night which raises the air temperature (vegetation tends to reflect solar radiation during the day and consequently less heat is stored in the soil to be released at night). (2) Water is applied to the orchard floor. Water stores heat that is released to the trees as air temperature falls. (3) Wind machines are used to pull the warm air above the trees into the orchard and mix it with colder resident air resulting in a temperature increase. Wind machine installation is often delayed until significant fruit is produced, sometimes as late as the seventh or eighth establishment year. A single machine will cover about 10 acres.

Table C. Frost Protection Procedures

Year	water	acin	floor management	wind machine
1	Yes	2.2	Discing & contact herbicide	No
2	Yes	2.2	Residual & contact herbicide	No
3	Yes	2.2	Residual & contact herbicide	No
4	Yes	2.2	Residual & contact herbicide	100 hours
5+	Yes	2.2	Residual & contact herbicide	100 hours

Protection from yield losses due to freeze damage will help maintain an orchard's economic viability. Several protection strategies have been outlined above, but other options are available (e.g. crop insurance). Methods for determining the best frost protection strategy for individual orchards are discussed in the publication *Reducing Citrus Revenue Losses for Frost Damage: Wind Machines and Crop Insurance*.

Fertilization. Nitrogen (N) is the major nutrient required for proper tree growth and optimum yields. Beginning in the first year, UN32 is injected through the drip line and low biuret urea plus micronutrients - zinc sulfate and manganese (Tecmangam) - are applied in March as a foliage spray. Beginning in the fourth year, the micronutrients are applied as a foliar fertilizer with the March cutworm spray. Additional urea is also applied with the May katydid/thrips spray. Nitrogen fertilizer rates from orchard establishment through maturity are shown in Table D. If groundwater is used for irrigation, water should be tested for nitrogen and the content taken into consideration in the fertilization program.

Table D. Applied N for Orange Orchards

Year	per tree	per acre	dripline	foliar
	Lbs. of N			
1	0.1	9.65	8.5	1.15
2	0.2	21.80	19.5	2.30
3	0.3	33.95	30.5	3.45
4	0.4	44.00	29.0	15.00
5	0.5	55.00	32.5	22.50
6	0.6	66.00	36.0	30.00
7+	0.8	110.00	80.0	30.00

Leaf/Tissue Sampling. Leaf samples are taken by the PCA sometime from August through October for nutrition analysis. For this study, one sample per 10 acres is taken.

Soil Amendments. Beginning in the fifth year, soluble gypsum is applied through the drip lines during each irrigation. A total of one-ton per acre per year is applied each season. Gypsum, calcium, or lime is applied for improving water infiltration and soil pH, and use should be based on soil and water tests. Although not included in this study, compost may be added to enhance soil organic matter.

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials available are listed in *UC Integrated Pest Management Guidelines, Citrus*. Pesticides mentioned in the study are commonly used, but are not presented as a recommendation.

Weeds. Chemical weed control begins the first year with three spot sprays (April, June, August) in the tree row during the spring and summer using Roundup herbicide. In the first year a custom operator discs the floor middles three times (April, May, June). From the second year on residual/pre-emergent herbicides, Karmex and Princep, are applied to the orchard floor in the fall (October) and in the spring (March) using half of the maximum rate for each application. These materials are regulated under the Groundwater Protection Regulations and under some conditions may require a pesticide permit from the agricultural commissioner's office.

Insects. Insects treated in this study are citrus thrips (*Scirtothrips citri*), katydids (*Scudderia furcata),* and larvae of Lepidoptera species (orangeworms) such as citrus cutworm (*Xylomyges curialis*). See UC IPM website http://ipm.ucdavis.edu/PMG/selectnewpest.citrus.html for full orangeworm list. Control for citrus thrips, citrus cutworms, and katydids begin in the fourth year. Citrus cutworms are controlled (generally required every other year) in March with one application of Dipel insecticide. Pesticides are applied at a lower volume per acre in the early years to account for the small tree size. In the fourth year 50% and in the fifth, 75% of the recommended spray volume is applied. Thrips and katydids are treated with Success insecticide plus oil in May at petal fall. Although a common industry practice is to apply multiple sprays on non-bearing trees for thrips, protection in this study begins in the fourth year for fruit protection rather than foliage protection. California red scale (*Aonidiella aurantii*) is not treated on young trees as it is only an economic problem when found on the fruit.

Fire ant (*Solenopsis xyloni*) control may be needed through the third year, especially if nests are still present. Clinch or Esteem ant bait is applied in late spring to early summer (May in this study) with the grower owned ATV and a bait applicator furnished by the chemical company. After careful monitoring, spot treatments with Lorsban may be needed, but are not included in this study.

Diseases. Beginning in October of the third year, brown rot (*Phytophthora spp*.) and septoria spot (*Septoria spp*.) are managed with a Kocide (copper) and hydrated lime application. A custom applicator applies the insect and disease materials by ground with an air blast sprayer. Various export markets require additional cooper spray applications, but this study does not include this.

Nematodes and phytophthora. Nematodes (*Tylenchulus semipenetrans),* phytophthora root rot (*Phytophthora citrophthora and P. parasitica)* and phytophthora gummosis (*Phytophthora ssp)* can be severe problems. If the field was previously planted to citrus, phytophthora and nematode samples should be taken to detect the presence and population levels of the organisms prior to planting. Management strategies include resistant rootstocks, irrigation management, and chemical applications. All pest management strategies need to be tailored to meet specific orchard requirements and should be discussed with a certified pest control adviser or local farm advisor.

Harvest and Yields. Commercial yields normally begin in the third or fourth establishment year. New plantings with close spacing may have commercial yields in the second or third year. A custom operator harvests the field. Packed cartons represent 80% of the fruit picked. The remaining 20% may go to juice, or a small percentage may be culled. Annual yields are shown in Table E.

Returns. See Returns in Production section.

Table E. Annual Orange Yields Per Acre

Year	Field Bins (900 lbs)	Field Boxes (55 lbs)	Total Ctns/bin (37.5 lbs)	Packed Cartons (37.5 lbs)
4	1.4	23	34	28
5	11.1	182	266	213
6	18.9	309	454	363
7	24.0	393	576	460
8	26.4	432	634	508
9	27.7	453	665	532
10+	28.6	468	686	550

Production Operating Costs

Table 3 to 9

Pruning. Pruning methods and frequencies vary widely on mature trees. In this study, pruning includes topping, hedging, hand pruning, and shredding. Pruning operations are done on a four-year cycle: (1) hedge alternate rows – each tree is hedged one side only, (2) top all trees, (3) hedge alternate rows - those not hedged previously, (4) hand prune. In this study, one-fourth of the costs are allocated to the orchard each year. Topping maintains tree height to augment adequate spray coverage and facilitate harvest operations. Hedging tree rows reduces fruit damage from orchard traffic and minimizes disruption of sprays applied to the orchard. Hand pruning of dead wood and suckering enhances spray deposition which is particularly important in the case of red scale. Hand pruning can also increase the amount of fruit inside the tree. Pruning is generally done after harvest. Because of increased risk from frost damage, pruning should be discontinued by mid-August to allow trees to enter the frost season in a reduced physiological state less susceptible to freezing. Pruning for Navels is normally done in the spring while Valencias are pruned in the summer. Pruning is done is April in this study. The prunings generally require shredding. The prunings from topping are stacked in alternate row middles by the custom shredder prior to shredding; the hand prunings are stacked by the pruners in alternate row middles and shredded by a custom shredder. The prunings from hedging fall in a manner that does not require hand stacking. Although, the custom operator shreds alternate rows, the charge is based on total acres.

Fertilization. Nitrogen (N) as UN-32 is applied through the irrigation system (not necessarily with an irrigation) in several applications during February, March, and April. Foliar applications of N as low biuret urea plus minor nutrients, zinc sulfate and manganese (Tecmangam), are mixed and sprayed with the March cutworm treatment. A second low biuret urea application is made with the May thrips and katydid spray. The nutritional program should be based on leaf analysis.

Leaf/Tissue Sampling. Leaf samples are taken in the fall from spring flush, non-fruiting, 5-7 month old leaves. In this study, one sample is taken per 10 acres (0.10 samples per acre) by the PCA sometime from August through October. The cost shown is for lab analysis.

Soil Amendments. Each year from April through October, gypsum is injected through the irrigation system with each irrigation; this results in a total application of one-ton per acre for the season. The cost includes the gypsum and the labor to operate and fill the gypsum machine. The machine is listed as an investment under the Non-Cash Overhead section of the tables.

Irrigation. In this study, water is applied April through October. Thirty acre-inches of district water, delivered via canal, is applied to the orchard at a cost of $114 per acre-foot or $9.50 per acre-inch. Water costs are highly

variable among districts and the cost used is approximately mid-range. From grower and district information, costs may be as low as $90 per acre-foot or as high as $250 per acre-foot in non-drought years. In drought years growers may pay between $1,000 and $1,800 per acre-foot. This study assumes a year with normal water costs. No assumption is made about effective rainfall, runoff, evaporation, winter water requirements or rainfall stored in the soil profile, tree size or tree health. The irrigation operation costs include the water and labor for irrigating, operating and monitoring the system.

Frost Protection. Protection is required from late winter to early spring (November through February) and is shown for November, December and January. In this study, chemical vegetation control on the orchard floor and 2.2 acre-inches of water are used for frost protection during the season. Also, wind machines are operated on nights with threatening minimum temperatures (see Table C). Each wind machine protects approximately 10 acres and uses 15 gallons of propane ($2.10 per gallon) per hour. The frost protection cost includes the fuel use and labor to operate the machines and to apply the water.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Citrus Pest Management Guidelines*. For more information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. For information and pesticide use permits, contact the local county agricultural commissioner's office. **Growers with fruit destined for the export market, must use registered products that meet maximum residue limits (MRL) for that country.** Check the MRLs at www.calcitrusquality.org .

Pest Control Adviser (PCA). Written recommendations are required for many pesticides and are made by licensed PCAs. In addition, the PCA can monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCAs or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study, a private PCA monitors the crops for pest, disease, and nutrition.

Weeds. Pre-emergent herbicides (Karmex, Princep) are applied to the orchard floor (tree row and middles) in split applications; one in the fall (October) and one in the spring (March), using one-half the maximum rate per application. Surviving weeds are controlled with three spot sprays – April, June, August – with Roundup. Karmex and Princep are regulated under the Groundwater Protection Regulations. Check with your farm advisor or PCA prior to applying.

Insects. Citrus cutworms are sprayed primarily in March with Dipel insecticide. Citrus thrips and katydids are treated in May and citrus thrips only in June. Success insecticide and oil are used in both applications. Urea and micronutrients are mixed with the cutworm spray, and urea only, with the thrips and katydid spray. A spray is applied in July for California red scale and citricola scale alternating each year with Esteem (insect growth regulator) and Lorsban. Esteem controls red scale only and Lorsban controls both scales. All insect and disease treatments are applied by a commercial applicator. The custom application costs vary by pest, material applied, volume of water used, and sprayer speed. The grower should alternate materials in order to reduce the potential for the development of insect resistance to pesticides used.

Disease. Brown rot is the primary preharvest disease of fruit that occurs in this study and is controlled by spraying a Kocide (copper) and hydrated lime mixture during October or November. The same fungicide mixture also controls Septoria spot. Brown rot develops in the fall initially on fruit that is close to the ground. The pathogen is normally found in the soil and is splashed onto the low hanging fruit by rain. Symptoms usually appear during cool, wet periods on mature or nearly mature fruit.

Snails. Brown garden snails (*Helix aspera*) cause fruit damage. Control options for brown garden snails include predaceous snails, skirt pruning, trunk banding, and chemical baits. However, in this study snails are assumed not to be a problem.

Insect and Disease Management Options. There are two fundamental approaches to using synthetic pesticides in citrus production. (1) Several applications of broad-spectrum pesticides are made to prevent pest damage. While these pesticides control a wide range of insect and mite pests and persist to provide control for long periods of time, these attributes can also create additional pest problems. Long-term use has increased pest resistance to many of these pesticides, resulting in increased pesticide applications. Since broad-spectrum pesticides affect many species of insects and mites, those sprays decrease the levels of beneficial populations that can assist in controlling many pests. Pest resurgence and secondary outbreaks can be the result of parasite and predator suppression by these pesticide applications. For example, treatment for citrus cutworms or citrus thrips can cause an increase of citrus red mite. (2) Use of selective pesticides and natural enemies (beneficial predators) as control measures. Selective pesticides are toxic to a narrow range of pests and are usually less harmful to the natural enemies. Their use requires careful monitoring of pests and more precise timing and application to be effective. Many selective pesticides do not persist for long-term control. Preserving beneficial predatory and parasitic populations can reduce the potential resurgence and secondary outbreaks of pests. However, some minor pests such as citricola scale may become economic pests once broad spectrum pesticides are not used. Pest management practices used in this study follow the first strategy described (currently this is the more typical pest management program used in this region).

Growth Regulators for Navels. Growth regulators are applied to mature Navel orange trees only. Gibberellic acid (Gib Gro) and 2, 4-D (Citrus Fix) treatments are made on mid-to-late harvested Navels. Gibberellic acid maintains a juvenile rind and 2,4-D applied in October/November minimizes pre-harvest fruit drop. In this study gibberellic acid (GA) is sprayed in October and 2,4-D in November. Growth regulators are applied to 70% of the orchard, because 30% of the orchard was picked earlier.

Harvest. Orange trees typically reach full production by the 10th or 11th year. In this cost study, the crop is hand picked and hauled by a contracted harvesting company.

Typically one-third of the orchard is picked in each of three harvests over the growing season. Navels are normally harvested from November to June while Valencias are harvested April through September. Oranges are hand picked and put into field bins that hold 900 pounds (24 carton equivalent) of fruit. The oranges are hauled from the field to a packinghouse where they are washed, graded, sized, and packed. Picking, hauling, packing, and marketing costs from the field to the packinghouse are paid by the grower. Current rates for these services vary; picking and hauling costs are $1.35 per carton and the packinghouse cost is $4.85 per carton. Delivering outside the local area will increase hauling costs. The packing house cost includes costs for the carton, packing, marketing and miscellaneous fees charged by the packer. The costs are based on typical costs as received from packinghouses and growers in the region.

Yields. Typical annual yields for the Navel and Valencia varieties are measured in 900-pound field bins per acre, but are typically sold by packed cartons weighing 37.5 pounds, although the industry often refers to them as 40-pound cartons. A 900-pound bin is calculated as either 23 or 24 cartons. Packed cartons represent 80% of the fruit picked. The remaining 20% may go to juice or a small percentage may be culled.

Returns. An estimated price based on past returns of $12 per carton, fob packinghouse, is used in this study. There is basically no income for juice products in Navels, but there may be a small amount in Valencias. Returns over a range of yields are shown in Table 6.

Assessments. Commercial orange producers pay three assessments.

Citrus Pest and Disease Prevention Program (CPDPP). The CPDPP was created to advise the Agricultural Secretary of California and the agricultural industry about efforts to combat serious pests and diseases that threaten California's citrus crop. Growers must pay a mandatory fee of $0.08 per 40-pound carton, to support the disease prevention program.

State Marketing Order. Under a state marketing order, mandatory assessment fees are collected and administered by the grower-directed Citrus Research Board. This assessment, currently $0.04 per 40 lb. carton, is used to fund industry research programs.

Central California Tristeza Eradication Agency. Tristeza disease can result in damage ranging from lower fruit quality to the death of the tree. The Central California Tristeza Eradication Agency (CCTEA) manages an eradication program to keep the Central Valley tristeza-free. The assessment varies by pest control district and not all districts participate. Although not all growers participate in this program and pay assessments, an average of $10.09 per acre is charged in this study. The charges are paid in the property assessment bill, but are shown as an assessment line item cost in this study.

Pickup/ATV. The grower uses a pickup for business and personal use. It is assumed that 5,000 miles are for business use. An all terrain vehicle (ATV) is used for checking and monitoring the field, irrigating, and checking the irrigation system. The cost is estimated and not based on any specific data. The grower also uses the ATV for weed control and the operation cost is included in that cost.

Labor, Equipment and Interest

Labor. Labor rates of $16.92 per hour for machine operators and $13.75 for general labor includes payroll overhead of 41%. The basic hourly wages are $12.00 for machine operators and $9.75 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for orchard/fruit crops (code 0016), and a percentage for other possible benefits. Workers' compensation costs will vary among growers, but for this study the cost is based upon the average industry final rate as of March 1, 2014 (personal e-mail from California Department of Insurance, March 2015, unreferenced). Labor for operations involving machinery are 20% higher than the operation time given in Table 3 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

Wages for management are not included as a cash cost. Any return above total costs is considered a return to management and risk. However, growers wanting to account for management may wish to add a fee. The manager makes all production decisions including cultural practices, action to be taken on pest management recommendations, and labor.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by American Society of Agricultural Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum Power Take Off (PTO) horsepower, and fuel type. Prices for on-farm delivery of red dye diesel and gasoline are $3.88 (excludes excise tax) and $3.79 per gallon, respectively. Fuel costs are derived from the Energy Information Administration, averaging January to December 2014 fuel prices. The cost includes a 2% local sales tax on diesel fuel and 8% sales tax on gasoline. Gasoline also includes federal and state excise tax, which are refundable for on-farm use when filing your income taxes. The fuel, lube, and repair cost per acre for each operation in Table 3 is determined by multiplying the total hourly operating cost in Table 7 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 5.75% per year. A nominal interest rate is the typical market cost of borrowed funds. The interest cost of post harvest operations is discounted back to the last harvest month using a negative interest charge. The interest rate will vary depending upon various factors. The rate is this study is considered a typical lending rate by a farm lending agency as of January, 2015.

Risk. The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability. Crop insurance is a risk management tool available to growers.

Cash Overhead Costs

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.

Property Taxes. Counties charge a base property tax rate of 1% on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.843% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $638 for the entire farm.

Crop Insurance. Crop insurance is available to growers, but is not included as a cost in this study.

Office Expense. Office and business expenses are estimated at $75 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, and miscellaneous administrative charges.

Management/Supervisor Salaries. The grower farms the orchard, so no cash cost is allocated to management. Returns above costs are considered a return to management.

Compliance Costs. Compliance costs are estimated by a study conducted for California Citrus Mutual examining compliance costs for citrus production across California. The study estimates total compliance cost per acre at $356.20, which includes education and training, air quality compliance, water quality compliance, pesticide regulation, labor regulation, and capital expenditures.

Investment Repairs. Annual maintenance is calculated as 2% of the purchase price, except orchard establishment is calculated at 0.50% to account for tree replacement and orchard repairs.

Non-Cash Overhead Costs

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

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

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

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 4.75% is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions, but is the basic suggested rate by a farm lending agency as of January, 2015.

Establishment Cost. Costs to establish the orchard are used to determine capital recovery expenses, depreciation, and interest on investment for the production years. Establishment cost is the sum of the costs for land preparation, planting, trees, cash overhead and production expenses for growing the trees through the first year that oranges are harvested minus any returns from production. The "Total Accumulated Net Cash Cost" on Table 1, in the fourth year represents the establishment cost. For this study the cost is $8,337 per acre or $83,370 for the 10-acre orchard. The establishment cost is spread over the remaining 36 years of the 40 years the orchard is in production. Establishment costs in this study are based on typical basic operations, but can vary considerably, depending upon terrain, soil type, local regulations, and other factors. For example, development on marginal soils will require additional land preparation and soil amendments. Management/Development companies will have additional labor costs.

Irrigation System. Water is delivered under pressure to the orchard through a low-volume irrigation system. Low-volume emitters discharge 10 gallons per hour and are spaced at one per tree. The cost for the low-volume irrigation system includes the cost of a pump, filtration system, hoses, emitters, and installation. The life of the irrigation system is estimated at 40 years. The above ground portion of the irrigation system will probably have to be replaced once per ten years, but is not separated out in this study.

Land. 2014 land values for bare or row crop land in Kern and Tulare Counties range between $8,000 to $18,000 per acre (Trends & Leases), depending on available water. Land with citrus orchards ranges from $14,000 to $24,000 per acre. Current real estate listings for bare land values range from $15,000 to $20,000 per acre. The land on which the orchard is planted in this study is valued at $15,000 per acre.

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Building. The shop building is a 1,800 square foot metal building or buildings on a cement slab.

Tools. This includes shop tools, hand tools, and miscellaneous field tools such as pruning tools. The value is estimated and not taken from any specific data.

Fuel Tanks. Two 250-gallon fuel tanks using gravity feed are on metal stands. The tanks are setup in a cement containment pad that meets federal, state, and county regulations.

Wind Machines. Each machine will cover approximately 10-acres. The cost includes six machines on the farm with one being in the new planting and five on the remaining acres. Cost includes installation of the propane-powered machines. The machines are assumed to use 15 gallons of propane per hour.

Gypsum Machine. The machine is used to inject the soluble gypsum into the irrigation system. The machine costs are allocated to the 10-acres of newly established oranges.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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

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UC COOPERATIVE EXTENSION

Table 1. COSTS PER ACRE TO ESTABLISH AN ORANGE ORCHARD

SAN JOAQUIN VALLEY – SOUTH 2015

	Costs per Acre				
YEAR:	1st	2nd	3rd	4th	5th
PACKOUT YIELD (37.5 lb Cartons/Acre):				28	213
Planting Costs					
Land Preparation: Remove Old Orchard (Dig, Stack, Chip)	375				
Land Preparation: Ripping	300				
Land Preparation: Disc 2X	100				
Land Preparation: Level (Triplane)	175				
Trees @ 110 per acre (Replant 2% of trees in 2nd Year)	1,265	23			
Plant: Layout, Plant , Stake & Wrap Trees ($2.09/Tree)	230	4			
TOTAL PLANTING COSTS	2,445	27	0	0	0
Cultural Costs:					
Sucker (Yr 1-3) Prune (Yr 4+)	35	59	55	43	58
Irrigate (Water & Labor)*	74	98	122	175	208
Frost Protection (Yr 1-3, water. Yr 4+, water & wind machines)	26	40	42	344	352
Fertilizer: Foliar Spray N, Mn, Zn	37	38	38		
Fertilizer: N w/irrigation, (UN32)	6	14	22	21	23
Insect/Fertilizer: Thrips, Katydids (Success, Oil) /Foliar (N)				61	73
Insect/Fertilizer: Citrus Cutworm (Dipel) / Foliar (N, Mn, Zn)				54	64
Insect: Ants (Clinch)	5	5	5		
Weed: Pre-emergent – orchard floor (Karmex, Princep)		56	56	56	56
Weed: Spot Spray (Roundup) 3X	19	19	19	19	19
Weed: Disc 3X (Custom)	150				
Disease: Brown Rot (Lime, Kocide)			58	70	81
Soil Amendments: Soluble Gypsum					170
Pickup Truck Use	112	112	112	112	112
ATV Use	73	73	73	73	73
Leaf Analysis (1 sample/10 acres)				7	7
PCA/Consultant Services	36	36	36	36	36
TOTAL CULTURAL COSTS	572	549	637	1,071	1,332
Harvesting Costs:					
Pick and Haul				46	359
Pack				136	1,033
Assessments				13	36
TOTAL HARVEST COSTS	0	0	0	195	1,428
Interest on operating capital @ 5.75%	179	19	19	22	33
TOTAL OPERATING COSTS PER ACRE	3,196	594	656	1,288	2,793
Cash Overhead Costs:					
Compliance Cost	356	356	356	356	356
Office Expense	75	75	75	75	75
Liability Insurance	11	11	11	11	11
Property Taxes	179	179	194	194	194
Property Insurance	15	15	16	16	16
Investment Repairs	64	64	118	118	120
TOTAL CASH OVERHEAD COSTS	700	700	769	769	773
TOTAL CASH COSTS	3,896	1,294	1,425	2,057	3,566
INCOME FROM PRODUCTION	0	0	0	336	2,556
NET CASH COSTS FOR THE YEAR	3,896	1,294	1,425	1,721	1,010
PROFIT ABOVE CASH COSTS					
TOTAL ACCUMULATED NET CASH COSTS	3,896	5,190	6,616	**8,337**	9,347

UC COOPERATIVE EXTENSION

Table 1. continued

SAN JOAQUIN VALLEY – SOUTH 2015

	Costs per Acre				
YEAR:	1st	2nd	3rd	4th	5th
Non-Cash Overhead Costs:					
Buildings	66	66	66	66	66
Drip Irrigation System	104	104	104	104	104
Shop Tools	24	24	24	24	24
Land	772	772	772	772	772
Fuel Tanks & Pumps	3	3	3	3	3
Gypsum Machine					31
Wind Machine			202	202	202
Equipment	46	46	46	46	46
TOTAL NON-CASH OVERHEAD COSTS	1,015	1,015	1,217	1,217	1,248
TOTAL COST FOR THE YEAR	4,911	2,309	2,642	3,274	4,814
INCOME FROM PRODUCTION				336	2,556
NET TOTAL COST FOR THE YEAR	4,911	2,309	2,642	2,938	2,258
NET PROFIT FOR THE YEAR					
ACCUMULATED NET TOTAL COST	4,911	7,220	9,863	12,801	15,059

* Assumes a year with normal water costs. In drought years, water costs can increase to between $1,000 and $1,800 per acre-foot.

UC COOPERATIVE EXTENSION

Table 2. MATERIALS AND CUSTOM WORK COSTS PER ACRE - ESTABLISHMENT YEARS

SAN JOAQUIN VALLEY – SOUTH 2015

			Year 1		Year 2		Year 3		Year 4		Year 5	
							Total Per Acre					
	Unit	$/Unit	units	$	units	$	units	$	units	$	units	$
OPERATING COSTS												
Custom:												
Orchard Removal & Chip	acre	375.00	1.00	375								
Ripping	acre	300.00	1.00	300								
Disc	acre	50.00	5.00	250								
Level - Triplane	acre	175.00	1.00	175								
Layout, Plant, Wrap	tree	1.50	110.00	165	2.00	3						
Ground Spray – Copper / Fertilizer	acre	35.00	1.00	35	1.00	35	2.00	70	1.00	35	1.00	35
Ground Spray – Citrus Cutworm	acre	35.00							1.00	35	1.00	35
Ground Spray – Thrips	acre	35.00							1.00	35	1.00	35
Harvest: Pick & Haul	ctn	1.35							34.00	46	266.00	359
Harvest: Pack	ctn	4.85							28.00	136	213.00	1,033
Leaf Analysis (1 per 10 acres)	each	68.00							0.10	7	0.10	7
PCA	acre	36.00	1.00	36	1.00	36	1.00	36	1.00	36	1.00	36
Assessments:												
Citrus Pest & Disease (40 lb ctn)	ctn	0.08							28.00	2	213.00	17
Citrus Research (40 lb ctn)	ctn	0.04							28.00	1	213.00	9
Tristeza Eradication	acre	10.09							1.00	10	1.00	10
Tree/Tree Aids:												
Orange Tree	tree	11.50	110.00	1,265	2.00	23						
Tree Wraps (foam type)	each	0.59	110.00	65	2.00	1						
Irrigation/Frost Protection:												
Wind Machine Operation	hr/ac	3.15							100.00	315	100.00	315
Water Frost Protection*	acin	9.50	1.46	14	2.20	21	2.20	21	2.20	21	2.20	21
Water (growing season)*	acin	9.50	2.00	19	4.50	43	7.00	67	10.50	100	14.00	133

UC COOPERATIVE EXTENSION

Table 2. continued

SAN JOAQUIN VALLEY – SOUTH 2015

			Year 1		Year 2		Year 3		Year 4		Year 5	
							Total Per Acre					
	Unit	$/Unit	units	$	units	$	units	$	units	$	units	$
Fertilizer:												
UN32 (32-0-0)	lb N	0.72	8.50	6	19.50	14	30.50	22	29.00	21	32.50	23
Urea Low Biuret (46-0-0)	lb N	0.74	1.15	1	2.30	2	3.45	3	15.00	11	22.50	17
Zinc Sulfate 36%	lb	0.86	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Tecmangam (31% Mn)	lb	0.73	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Soluble Gypsum (Soil Amendment)	ton	160									1.00	160
Herbicide:												
Roundup Original Max	pint	3.57	0.60	2	0.60	2	0.60	2	0.60	2	0.60	2
Princep 90S	gal	23.56			1.00	24	1.00	24	1.00	24	1.00	24
Karmex DF	lb	5.29			4.00	21	4.00	21	4.00	21	4.00	21
Insecticide:												
Clinch Ant Bait	lb	12.93	0.33	4	0.33	4	0.33	4				
Dipel ES	pint	13.08							1.00	13	1.50	20
Success	oz	5.97							3.00	18	4.50	27
Spray Oil 415	gal	5.68							0.50	3	0.50	3
Fungicide:												
Hydrated Lime	lb	0.29					5.00	1	7.50	2	10.00	3
Kocide 20/20	lb	4.32					5.00	22	7.50	32	10.00	43
Labor (machine)	hrs	16.92	8.93	151	9.53	161	9.53	161	9.50	161	9.50	161
Labor (irrigation)	hrs	13.75	4.00	55	4.00	55	5.50	76			6.67	92
Labor (non-machine)	hrs	13.75	3.70	48	5.80	67	5.00	55	9.26	127	7.10	68
Fuel - Gas	gal	3.78	9.08	34	9.26	35	9.26	35	9.25	35	9.25	35
Fuel - Diesel	gal	3.88										
Lube			5.16		5.21		5.21		5.21		5.21	
Machinery repair			11.09		11.87		11.87		11.86		11.86	
Operating Interest @ 5.75%			179.00		18.79		19.45		21.92		33.15	
Total Operating Costs/Acre				3,196		594		656		1,288		2,793

* Assumes a year with normal water costs. In drought years, water costs can increase to between $1,000 and $1,800 per acre-foot.

UC COOPERATIVE EXTENSION

Table 3. COSTS PER ACRE TO PRODUCE ORANGES

SAN JOAQUIN VALLEY - SOUTH 2015

Operation	Equipment Operation Time (Hrs/A)	Cash and Labor Costs per acre						
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:								
Frost Protection (water & wind machine)*	0.00	30	0	0	336	0	366	
Fertilize: N (UN32 through drip line)	0.00	4	0	0	58	0	62	
Weed: Pre-emergent (Princep, Karmex) 2X	0.50	10	0	1	45	0	56	
Insect/Fertilizer: Citrus Cutworm (Dipel)/N Mn Zn	0.00	0	0	0	40	35	75	
Prune: Top Trees, Stack & Shred Prunings (1X/4 Yr)	0.00	0	0	0	0	33	33	
Prune: Hedge Alt. Rows, Shred Prunings (2X/4Yr)	0.00	0	0	0	0	20	20	
Prune: Hand Prune & Stack, Shred Prunings (1X/4 Yr)	0.00	0	0	0	0	93	93	
Irrigate: (water & labor)*	0.00	76	0	0	285	0	361	
Soil Amendment: (Soluble Gypsum) w/irrigation	0.00	120	0	0	160	0	280	
Weed: Spot Spray (Roundup) 3X	0.75	15	1	1	2	0	19	
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /N	0.00	0	0	0	50	35	85	
Insect: Thrips (Success, Oil)	0.00	0	0	0	39	35	74	
Insect: Scale (Esteem)	0.00	0	0	0	80	90	170	
Leaf Analysis (1 sample/10 acres)	0.00	1	0	0	0	7	7	
Disease: Brown Rot (Lime, Kocide)	0.00	0	0	0	46	35	81	
Growth Regulator: (Fruit Fix) [Navel Only]	0.00	0	0	0	12	53	65	
Growth Regulator: (GibGro or GA) [Navel Only]	0.00	0	0	0	19	53	72	
Pickup Truck Use	3.33	68	32	13	0	0	112	
ATV Use	3.33	68	2	3	0	0	73	
PCA/Consultant Services	0.00	0	0	0	0	36	36	
TOTAL CULTURAL COSTS	7.92	392	35	17	1,172	524	2,140	
Harvest:								
Pick & Haul Fruit	0.00	0	0	0	0	926	926	
Pack Fruit	0.00	0	0	0	0	2,668	2,668	
Assessments	0.00	0	0	0	76	0	76	
TOTAL HARVEST COSTS	0.00	0	0	0	76	3,594	3,670	
Interest on operating capital @ 5.75%							163	
TOTAL OPERATING COSTS/ACRE	7.92	392	35	17	1,248	4,118	5,973	
Cash Overhead:								
Liability Insurance							10	
Office Expense							75	
Compliance Cost							356	
Property Taxes							236	
Property Insurance							20	
Investment Repairs							120	
TOTAL CASH OVERHEAD COSTS							818	
TOTAL CASH COSTS/ACRE							6,791	
Non-Cash Overhead:		Per producing Acre			Annual Cost Capital Recovery			
Buildings 1,800 sqft		1,050			66		66	
Drip Irrigation		1,850			104		104	
Orchard Establishment		8,337			488		488	
Fuel Tanks 2-250g		58			3		3	
Gypsum Machine (1)		133			31		31	
Land		16,250			772		772	
Shop Tools		250			24		24	
Wind Machine (6)		2,680			202		202	
Equipment		416			45		45	
TOTAL NON-CASH OVERHEAD COSTS		31,024			1,735		1,735	
TOTAL COSTS/ACRE							8,525	

* Assumes a year with normal water costs. In drought years, water costs can increase to between $1,000 and $1,800 per acre-foot.

UC COOPERATIVE EXTENSION

Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE ORANGES

SAN JOAQUIN VALLEY - SOUTH 2015

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Oranges	550	*cartons	12.00	6,600	
OPERATING COSTS					
Herbicide:				**47**	
Princep 90S	1.00	gal	23.56	24	
Karmex	4.00	lb	5.29	21	
Roundup Original Max	0.60	pint	3.57	2	
Insecticide:				**183**	
Dipel ES	2.00	pint	13.08	26	
Success	12.00	oz	5.97	72	
Spray Oil 415	1.00	gal	5.68	6	
Esteem	17.00	floz	4.70	80	
Fungicide:				**46**	
Hydrated Lime	10.00	lb	0.29	3	
Kocide 20/20	10.00	lb	4.32	43	
Growth Regulator:				**32**	
Fruit Fix (2, 4-D) [Navel Only]	2.50	floz	4.97	12	
Gib Gro 4LS (gibberalic acid) [Navel Only]	40.00	gram	0.48	19	
Fertilizer:				**83**	
UN 32 (32-0-0)	80.00	lb N	0.72	58	
Urea Low Biuret (46-0-0)	30.00	lb N	0.74	22	
Zinc Sulfate 36%	2.00	lb	0.86	2	
Tecmangam (31% Mn)	2.00	lb	0.73	1	
Soil Amendment:				**160**	
Gypsum Soluble	1.00	ton	160.00	160	
Contract/Custom:				**488**	
Spray Ground - Cutworm	1.00	acre	35.00	35	
Prune, Stack, Shred - Top (1X/4 Yr)	0.25	acre	132.00	33	
Prune & Shred - Hedge Alt. Rows (1X/4 Yr)	0.25	acre	80.00	20	
Prune - Hand (1X/4 Yr)	0.25	acre	320.00	80	
Stack & Shred - Hand (1X/4 Yr)	0.25	acre	53.00	13	
Spray Ground -Thrips	2.00	acre	35.00	70	
Spray Ground - Scale	1.00	acre	90.00	90	
Leaf Analysis (1 per 10 acres)	0.10	each	68.00	7	
Spray Ground - Copper or Fertilizer	1.00	acre	35.00	35	
Spray Ground - Growth Regulator	2.00	acre	52.50	105	
Harvest - Pick & Haul	686.00	ctn	1.35	926	
Harvest - Sort & Pack	550.00	ctn	4.85	2,668	
PCA Fees	1.00	acre	36.00	36	
Irrigation:				**285**	
Water**	30.00	acin	9.50	285	
Frost Protection:				**336**	
Water**	2.20	acin	9.50	21	
Wind Machine Operation (propane @ $2.10/gal)	100.00	hour	3.15	315	
Assessment:				**76**	
Citrus Research/40 lb ctn	550.00	ctn	0.04	22	
Tristeza Eradication	1.00	acre	10.09	10	
CPDPP/40 lb ctn	550.00	ctn	0.08	44	

UC COOPERATIVE EXTENSION

Table 4. continued

SAN JOAQUIN VALLEY - SOUTH 2015

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
Labor (machine)	9.50	hrs	16.92	161	
Labor (irrigation)	7.74	hrs	13.75	106	
Labor (non-machine)	9.10	hrs	13.75	125	
Fuel - Gas	9.17	gal	3.79	35	
Lube				5	
Machinery repair				12	
Interest on operating capital @ 5.75%				163	
TOTAL OPERATING COSTS/ACRE				5,973	
NET RETURNS ABOVE OPERATING COSTS				627	
CASH OVERHEAD COSTS:					
Liability Insurance				10	
Office Expense				75	
Compliance Cost				356	
Property Taxes				236	
Property Insurance				20	
Investment Repairs				120	
TOTAL CASH OVERHEAD COSTS/ACRE				818	
TOTAL CASH COSTS/ACRE				6,791	
NON-CASH OVERHEAD COSTS					
Buildings 1800 sqft				66	
Drip Irrigation				104	
Orchard Establishment				488	
Fuel Tanks 2-250g				3	
Gypsum Machine (1)				31	
Land				772	
Shop Tools				24	
Wind Machine (6)				202	
Equipment				45	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				1,735	
TOTAL COSTS/ACRE				8,52	
NET RETURNS ABOVE TOTAL COSTS				-1,925	

*carton = 37.5 lbs

** Assumes a year with normal water costs. In drought years, water costs can increase to between $1,000 and $1,800 per acre-foot.

UC COOPERATIVE EXTENSION

Table 5. MONTHLY PER ACRE CASH COSTS - ORANGES

SAN JOAQUIN VALLEY - SOUTH 2015

Beginning JAN 15 Ending DEC 15	JAN 15	FEB 15	MAR 15	APR 15	MAY 15	JUN 15	JUL 15	AUG 15	SEP 15	OCT 15	NOV 15	DEC 15	TOTAL
Cultural:													
Frost Protection (water & wind machine)*	121										124	121	366
Fertilize: N (UN32 through drip line)		21	21	21									62
Weed: Pre-emergent (Princep, Karmex) 2X			28							28			56
Insect/Fertilizer: Citrus Cutworm (Dipel)/N Mn Zn			75										75
Prune: Top Trees, Stack & Shred Prunings (1X/4 Yr)				33									33
Prune: Hedge Alt. Rows, Shred Prunings (2X/4Yr)				20									20
Prune: Hand Prune & Stack, Shred Prunings (1X/4 Yr)				93									93
Irrigate: (water & labor)*				40	49	61	77	61	49	24			361
Soil Amendment: (Soluble Gypsum) w/irrigation				35	40	44	51	44	40	27			280
Weed: Spot Spray (Roundup) 3X				6		6		6					19
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /N					85								85
Insect: Thrips (Success, Oil)						74							74
Insect: Scale (Esteem)							170						170
Leaf Analysis (1 sample/10 acres)									7				7
Disease: Brown Rot (Lime, Kocide)										81			81
Growth Regulator: (Fruit Fix) [Navel Only]										65			65
Growth Regulator: (GibGro or GA) [Navel Only]											72		72
Pickup Truck Use	9	9	9	9	9	9	9	9	9	9	9	9	112
ATV Use	6	6	6	6	6	6	6	6	6	6	6	6	73
PCA/Consultant Services	3	3	3	3	3	3	3	3	3	3	3	3	36
TOTAL CULTURAL COSTS	139	39	142	266	192	204	316	130	114	243	214	139	2,140
Harvest:													
Pick & Haul Fruit		309		308							309		926
Pack Fruit		888		888							892		2,668
Assessments		25		25							26		76
TOTAL HARVEST COSTS	0	1,222	0	1,221	0	0	0	0	0	0	1,227	0	3,670
Interest on operating capital @ 5.75%	1	7	7	15	15	16	18	19	19	20	27	-1	163
TOTAL OPERATING COSTS/ACRE	140	1,268	150	1,502	207	220	334	149	134	263	1,468	139	5,973
OVERHEAD:													
Liability Insurance													10
Office Expense													75
Compliance Cost													356
Property Taxes													236
Property Insurance	10						10						20
Investment Repairs	10	10	10	10	10	10	10	10	10	10	10	10	120
TOTAL CASH OVERHEAD COSTS	20	10	10	10	10	10	20	10	10	10	10	10	818
TOTAL CASH COSTS/ACRE	160	1,278	160	1,512	217	230	354	159	144	273	1,478	149	6,791

* Assumes a year with normal water costs. In drought years, water costs can increase to between $1,000 and $1,800 per acre-foot.

UC COOPERATIVE EXTENSION

Table 6. RANGING ANALYSIS

SAN JOAQUIN VALLEY - SOUTH 2015

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ORANGES

	*YIELD (cartons/acre)						
	400	450	500	550	600	650	700
OPERATING COSTS/ACRE:							
Cultural Cost	2,140	2,140	2,140	2,140	2,140	2,140	2,140
Harvest Cost	2,669	3,003	3,336	3,670	4,003	4,337	4,670
Interest on operating capital	133	143	153	163	174	184	194
TOTAL OPERATING COSTS/ACRE	4,942	5,286	5,629	5,973	6,317	6,661	7,004
TOTAL OPERATING COSTS/CTN	12.36	11.75	11.26	10.86	10.53	10.25	10.01
CASH OVERHEAD COSTS/ACRE	818	818	818	818	818	818	818
TOTAL CASH COSTS/ACRE	5,760	6,103	6,447	6,791	7,135	7,478	7,822
TOTAL CASH COSTS/CTN	14.4	13.56	12.89	12.35	11.89	11.5	11.17
NON-CASH OVERHEAD COSTS/ACRE	1,734	1,734	1,734	1,734	1,734	1,734	1,734
TOTAL COSTS/ACRE	7,493	7,837	8,181	8,525	8,868	9,212	9,556
TOTAL COSTS/CTN	18.73	17.42	16.36	15.5	14.78	14.17	13.65

*carton = 37.5 pounds

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE	YIELD (cartons/acre)						
$/carton	400	450	500	550	600	650	700
9.00	-1,342	-1,236	-1,129	-1,023	-917	-811	-704
10.00	-942	-786	-629	-473	-317	-161	-4
11.00	-542	-336	-129	77	283	490	696
12.00	-142	114	371	627	883	1,140	1,396
13.00	258	564	871	1,177	1,483	1,790	2,096
14.00	658	1,014	1,371	1,727	2,083	2,440	2,796
15.00	1,058	1,464	1,871	2,277	2,683	3,090	3,496

NET RETURNS PER ACRE ABOVE CASH COSTS

PRICE	YIELD (cartons/acre)						
$/carton	400	450	500	550	600	650	700
9.00	-2,160	-2,053	-1,947	-1,841	-1,735	-1,628	-1,522
10.00	-1,760	-1,603	-1,447	-1,291	-1,135	-978	-822
11.00	-1,360	-1,153	-947	-741	-535	-328	-122
12.00	-960	-703	-447	-191	65	322	578
13.00	-560	-253	53	359	665	972	1,278
14.00	-160	197	553	909	1,265	1,622	1,978
15.00	240	647	1,053	1,459	1,865	2,272	2,678

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE	YIELD (cartons/acre)						
$/carton	400	450	500	550	600	650	700
9.00	-3,893	-3,787	-3,681	-3,575	-3,468	-3,362	-3,256
10.00	-3,493	-3,337	-3,181	-3,025	-2,868	-2,712	-2,556
11.00	-3,093	-2,887	-2,681	-2,475	-2,268	-2,062	-1,856
12.00	-2,693	-2,437	-2,181	-1,925	-1,668	-1,412	-1,156
13.00	-2,293	-1,987	-1,681	-1,375	-1,068	-762	-456
14.00	-1,893	-1,537	-1,181	-825	-468	-112	244
15.00	-1,493	-1,087	-681	-275	132	538	944

UC COOOPERATIVE EXTENSION

Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY - SOUTH 2015

ANNUAL EQUIPMENT COSTS

						Cash Overhead		
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
15	ATV 4WD	7,100	15	1,382	607	4	42	653
15	Pickup Truck 1/2 Ton	32,000	7	12,139	3,978	18	221	4,217
15	Weed Sprayer-Pull, ATV 55 gal	2,750	20	143	212	1	14	227
TOTAL		41,850		13,664	4,797	23	278	5,097
	*60% of new cost	25,110		8,199	2,878	14	167	3,058

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

					Cash Overhead			
Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Repairs	Total
Buildings 1,800 sqft	63,000	30	0	3,982	26	315	1,260	5,583
Drip Irrigation (10 acres)	18,500	40	0	1041.49	8	93	370	1,512
Orchard Establishment (10 acres)	83,370	36	0	4,878	35	417	0	5,329
Fuel Tanks 2-250g	3,500	40	350	193.96	2	19	70	285
Gypsum Machine (1)	8,000	5	0	1,835	3	40	160	2,038
Land (65 acres)	975,000	40	975,000	46,313	808	9,750	0	56,871
Shop Tools	15,000	15	0	1,421	6	75	300	1,802
Wind Machine (6)	160,800	20	16,080	12,132	73	884	3,216	16,305
TOTAL INVESTMENT	1,327,170		991,430	71,795	961	11,593	5,376	89,725

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	60	acre	10.35	621
Office Expense	60	acre	75.00	4,500
Compliance Cost	60	acre	356.20	21,372

UC COOPERATIVE EXTENSION

Table 8. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY - SOUTH 2015

				COSTS PER HOUR						
		Oranges	Total		Cash Overhead		Operating			
Yr	Description	Hours Used	Hours Used	Capital Recovery	Insur-ance	Taxes	Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
15	ATV 4WD	46.00	133.00	2.74	0.02	0.19	0.77	0.69	1.46	4.41
15	Pickup Truck 1/2 Ton	33.00	265.00	9.00	0.04	0.50	3.96	9.48	13.44	22.97
15	Weed Sprayer-Pull, ATV 55 gal	13.00	75.00	1.69	0.01	0.12	0.72	0.00	0.72	2.53

UC COOPERATIVE EXTENSION

Table 9. OPERATIONS WITH EQUIPMENT & MATERIALS

SAN JOAQUIN VALLEY - South 2015

Operation	Operation Month	Implement	Labor Type/ Material	Rate/ Acre	Unit
Frost Protection (water & wind machine)	Jan		Irrigation Labor	0.73	hour
			Water- Frost	0.73	acin
			Wind Machine Operation	33.00	hour
	Nov		Irrigation Labor	0.73	hour
			Water- Frost	0.73	acin
			Wind Machine Operation	34.00	hour
	Dec		Irrigation Labor	0.73	hour
			Water- Frost	0.74	acin
			Wind Machine Operation	33.00	hour
Fertilize: N (UN32 through drip line)	Feb		Non-Machine Labor	0.10	hour
			UN 32	26.60	lb N
	Mar		Non-Machine Labor	0.10	hour
			UN 32	26.70	lb N
	Apr		Non-Machine Labor	0.10	hour
			UN 32	26.70	lb N
Weed: Pre-emergent (Princep, Karmex) 2X	Mar	ATV 4WD	Equipment Operator Labor	0.30	hour
			Princep	0.50	gal
		SprayerPull55GaATV	Karmex	2.00	lb
	Oct	ATV 4WD	Equipment Operator Labor	0.30	hour
			Princep	0.50	gal
		SprayerPull55GaATV	Karmex	2.00	lb
Insect/Fertilizer: Citrus Cutworm (Dipel)/N Mn Zn	Mar		Dipel ES	2.00	pint
			Spray Ground Worm	1.00	acre
			Urea Low Biuret	15.00	lb N
			Zinc Sulfate 36%	2.00	lb
			Tecmangam (31%Mn)	2.00	lb
Prune: Top Trees, Stack & Shred Prunings (1X/4 Yr)	Apr		Non-Machine Labor		
			Prune, Stack, Shred (top)	0.25	acre
Prune: Hedge Alt. Rows, Shred Prunings (2X/4Yr)	Apr		Non-Machine Labor		
			Prune & Shred (hedge)	0.25	acre
Prune: Hand Prune & Stack, Shred Prunings (1X/4 Yr)	Apr				
			Prune (hand) 1X/4Yr	0.25	acre
			Stack & Shred (hand)	0.25	acre
Irrigate: (water & labor)	Apr		Irrigation Labor	0.50	hour
			Water	3.50	acin
	May		Irrigation Labor	0.80	hour
			Water	4.00	acin
	June		Irrigation Labor	1.00	hour
			Water	5.00	acin
	July		Irrigation Labor	1.10	hours
			Water	6.50	acin
	Aug		Irrigation Labor	1.00	hour
			Water	5.00	acin
	Sept		Irrigation Labor	0.80	hour
			Water	4.00	acin
	Oct		Irrigation Labor	0.35	hour
			Water	2.00	acin
Soil Amendment: (Soluble Gypsum)	Apr		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.11	ton
	May		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.14	ton
	June		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.17	ton
	July		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.21	ton
	Aug		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.17	ton
	Sept		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.14	ton
	Oct		Non-Machine Labor	1.25	hours
			Gypsum Soluble	0.06	ton

UC COOPERATIVE EXTENSION
Table 9. continued
SAN JOAQUIN VALLEY - South 2015

Operation	Operation Month	Implement	Labor Type/ Material	Rate/ Acre	Unit
Weed: Spot Spray (Roundup) 3X	Apr	ATV 4WD	Non-Machine Labor		
		SprayerPull55GaATV	RoundupOriginalMax	0.20	pint
	June	ATV 4WD	Non-Machine Labor		
		SprayerPull55GaATV	RoundupOriginalMax	0.20	pint
	Aug	ATV 4WD	Non-Machine Labor		
		SprayerPull55GaATV	RoundupOriginalMax	0.20	pint
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /N	May		Success	6.00	oz
			Spray Ground Thrip	1.00	acre
			Urea Low Biuret	15.00	lb N
			Spray Oil 415	0.50	gal
Insect: Thrips (Success, Oil)	June		Success	6.00	oz
			Spray Ground Thrip	1.00	acre
			Spray Oil 415	0.50	gal
Insect: Scale (Esteem)	July		Esteem	17.00	floz
			Spray Ground Scale	1.00	acre
Leaf Analysis (1 sample/10 acres)	Sept		Non-Machine Labor	0.05	hour
			Leaf Analysis	0.10	each
Disease: Brown Rot (Lime, Kocide)	Oct		Spray Ground Copper	1.00	acre
			Hydrated Lime	10.00	lb
			Kocide 20/20	10.00	lb
Growth Regulator: (Fruit Fix) [Navel Only]	Oct				
			Spray Ground	1.00	acre
			Citrus Fix	2.50	floz
Growth Regulator: (GibGro or GA) [Navel Only]	Nov		Spray Grnd	1.00	acre
			Gib Gro 4LS	40.00	gram
Pickup Truck Use	Nov	Pickup Truck 1/2 T	Equipment Operator Labor	4.00	hours
ATV Use	Nov	ATV 4WD	Equipment Operator Labor	4.00	hours
PCA/Consultant Services	Nov		PCA Fees	1.00	acre
Pick & Haul Fruit	Feb		Harvest, Pick & Haul	229.00	ctn
	Apr		Harvest, Pick & Haul	228.00	ctn
	Nov		Harvest, Pick & Haul	229.00	ctn
Pack	Feb		Harvest:Sort & Pack	183.00	ctn
	Apr		Harvest:Sort & Pack	183.00	ctn
	Nov		Harvest:Sort & Pack	184.00	ctn
Assessments	Feb		CitrusReserch /40 lb	152.00	ctn
			Tristeza Eradication	0.33	acre
			CPDPP	183.00	ctn
	Apr		CitrusReserch / 40lb	156.00	ctn
			Tristeza Eradication	0.33	acre
			CPDPP	183.00	ctn
	Nov		CitrusReserch / 40lb	159.00	ctn
			Tristeza Eradication	0.34	acre
			CPDPP	184.00	ctn