

**UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION**

**2009**

**SAMPLE COSTS TO ESTABLISH AN  
ORANGE ORCHARD AND PRODUCE**

**ORANGES**

Navels & Valencias



**SAN JOAQUIN VALLEY - South**  
Low Volume Irrigation

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San Joaquin Valley South - 2009

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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, “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) 752-3589 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.

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## ASSUMPTIONS

The assumptions refer to Tables 1 to 9 and pertain to sample costs to establish an orange orchard 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. **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 the ten acres being planted to oranges. Mature orange trees are 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 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.

**Planting.** Planting the orchard starts by marking tree sites (layout orchard). Holes are then dug and the trees planted in February. The trunks are wrapped with a foam wrap to shield them from sunburn and to reduce sucker development. Also, 2% of the trees or 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, 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 consideration 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.

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

**Irrigation.** Irrigation water is applied from April through October. District water is delivered via canal to the farm at a cost of \$129 per acre-foot or \$10.75 per acre-inch. Water costs are variable among districts with the cost shown being approximately mid-range between the high and low. Irrigation costs include the water and the labor for system operation and monitoring. No assumption is made about effective rainfall, runoff, and evaporation. The water applied for different aged trees is approximated and shown in Table B. Values are based on an irrigation system delivering water with a distribution uniformity of 85%.

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. This also provides 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 orangeworm 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	Lbs. of N	
			dripline	foliar
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 at 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*) and fruittree leafroller (*Archips argyrosphilus*). See UC IPM website <http://ipm.ucdavis.edu/PMG/selectnewpest.citrus.html> for full orangeworm list. Control for citrus thrips, orangeworms, and katydids begin in the fourth year. Orangeworms are controlled (control is 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 regulated with a Kocide (copper) and hydrated lime application. A custom applicator applies the insect and disease materials by ground with an air blast sprayer.

**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. Annual yields are shown in Table E.

**Returns.** See Returns in Production section.

Year	Field Bins (900 lbs)	Field Boxes (55 lbs)	Total Crtns/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 in 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 (Tecomangam), are mixed and sprayed with the March orangeworm 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 \$129 per acre-foot or \$10.75 per acre-inch. Water costs are highly variable among districts and the cost shown is approximately mid-range. 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 (\$1.97 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 and Reducing Insecticide Use and Energy Costs in Citrus Pest Management*. For more 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. **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](http://www.calcitrusquality.org).

*Pest Control Adviser (PCA).* Written recommendations are required for many pesticides and are made by licensed pest control advisers. 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.* Orangetworms (Lepidoptera) are sprayed primarily in March with Dipel insecticide. Citrus thrips and katydid 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 orangetworm 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 orangeworms 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 are \$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 some 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 juices or a small percentage may be culls.

*Returns.* An estimated price based on past returns of \$10 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 two assessments.

*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 \$0.07 per 55-pound field box, 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 \$9.20 per acre is charged in this study. The charges are paid in the property assessment bill, but are shown as a line item cost in this study

**Pickup/ATV.** The grower uses the pickup for business and personal use. It is assumed that 5,000 miles are for business use. The all terrain vehicle (ATV) cost is 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 \$14.49 per hour for machine operators and \$11.04 for general labor includes payroll overhead of 38%. The basic hourly wages are \$10.50 for machine operators and \$8.00 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 January 1, 2009 (personal email from California Department of Insurance, March 2009, 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 \$3.70 (excludes excise tax) and \$3.56 per gallon, respectively. Fuel costs are derived from American Automobile Association (AAA) and Energy Information Administration 2008 July to December monthly data. The cost includes a 2% local sales tax on diesel fuel and 8% sales tax on gasoline. Gasoline also includes federal and state excise tax, which are refundable for on-farm use when filing your income tax. The fuel, lube, and repair 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 in this study is considered a typical lending rate by a farm lending agency as of January 2009.

**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 0.714% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$539 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 \$125 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, miscellaneous administrative charges, and complying with environmental regulations.

**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.

**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  $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$ .

*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.

*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 2009.

**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 \$6,509 per acre or \$65,088 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.** Land values for bare or row crop land range from \$5,000 to \$12,000 per acre (Trends & Leases), depending on available water. Land with citrus orchards ranges from \$8,000 to \$15,000 per acre. Current real estate listings for bare land values range from \$5,500 to \$9,500. The land on which the orchard is planted in this study is valued at \$7,500 per acre.

**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 over 10 acres.

**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 2009

	Costs per Acre					
	YEAR:	1st	2nd	3rd	4th	5th
PACKOUT YIELD (37.5 lb Cartons/Acre):					28	213
<b>Planting Costs</b>						
Land Preparation: Remove Old Orchard (Dig, Stack, Chip)		350				
Land Preparation: Subsoil		390				
Land Preparation: Disc 2X		110				
Land Preparation: Level (Triplane)		175				
Trees @ 110 per acre (Replant 2% of trees in 2nd Year)		1,155	21			
Plant: Layout, Plant , Stake & Wrap Trees (includes wrap costs)		149	3			
<b>TOTAL PLANTING COSTS</b>		<b>2,329</b>	<b>24</b>			
<b>Cultural Costs:</b>						
Sucker (Yr 1-3) Prune (Yr 4+)		30	47	55	35	66
Irrigate		66	93	119	173	211
Frost Protection (Yr 1-3, water. Yr 4+, water & wind machines)		27	40	40	330	337
Fertilizer: Foliar Spray N, Mn, Zn		37	38	39		
Fertilizer: N w/irrigation, (UN32)		4	9	14	13	15
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /Foliar (N)					61	73
Insect/Fertilizer: Orangeworms (Dipel) / Foliar (N, Mn, Zn)					48	54
Insect: Ants (Clinch)		4	4	4		
Weed: Pre-emergent – orchard floor (Karmex, Princep)			59	59	59	59
Weed: Spot Spray (Roundup) 3X		18	18	18	18	18
Weed: Disc 3X (Custom)		165				
Disease: Brown Rot (Lime, Kocide)				54	63	73
Soil Amendments: Soluble Gypsum						145
Pickup Truck Use		98	98	98	98	98
ATV Use		63	63	63	63	63
Leaf Analysis (1 sample/10 acres)					7	7
PCA/Consultant Services		35	35	35	35	35
<b>TOTAL CULTURAL COSTS</b>		<b>546</b>	<b>504</b>	<b>598</b>	<b>1,003</b>	<b>1,252</b>
<b>Harvesting Costs:</b>						
Pick and Haul					46	359
Pack					136	1,033
Assessments					11	22
<b>TOTAL HARVEST COSTS</b>					<b>193</b>	<b>1,414</b>
Interest on operating capital @ 5.75%		173	17	18	20	32
<b>TOTAL OPERATING COSTS PER ACRE</b>		<b>3,047</b>	<b>545</b>	<b>616</b>	<b>1,216</b>	<b>2,698</b>
<b>Cash Overhead Costs:</b>						
Office Expense		125	125	125	125	125
Liability Insurance		10	10	10	10	10
Property Taxes		99	98	111	111	114
Property Insurance		14	14	25	25	27
Investment Repairs		58	58	105	105	117
<b>TOTAL CASH OVERHEAD COSTS</b>		<b>307</b>	<b>306</b>	<b>376</b>	<b>376</b>	<b>394</b>
<b>TOTAL CASH COSTS</b>		<b>3,354</b>	<b>851</b>	<b>992</b>	<b>1,592</b>	<b>3,092</b>
<b>INCOME FROM PRODUCTION</b>					<b>280</b>	<b>2,130</b>
<b>NET CASH COSTS FOR THE YEAR</b>		<b>3,354</b>	<b>851</b>	<b>992</b>	<b>1,312</b>	<b>962</b>
<b>PROFIT ABOVE CASH COSTS</b>						
<b>TOTAL ACCUMULATED NET CASH COSTS</b>		<b>3,354</b>	<b>4,204</b>	<b>5,197</b>	<b>6,509</b>	<b>7,470</b>

UC COOPERATIVE EXTENSION  
**Table 1. continued**  
 SAN JOAQUIN VALLEY – SOUTH 2009

	Costs per Acre				
	YEAR:	1st	2nd	3rd	4th
Non-Cash Overhead Costs:					
Buildings	66	66	66	66	66
Drip Irrigation System	87	87	87	87	87
Shop Tools	24	24	24	24	24
Land	386	386	386	386	386
Fuel Tanks & Pumps	3	3	3	3	3
Gypsum Machine					138
Wind Machine			177	177	177
Equipment	45	42	42	42	42
<b>TOTAL NON-CASH OVERHEAD COSTS</b>	<b>612</b>	<b>608</b>	<b>785</b>	<b>785</b>	<b>922</b>
<b>TOTAL COST FOR THE YEAR</b>	<b>3,966</b>	<b>1,459</b>	<b>1,778</b>	<b>2,377</b>	<b>4,014</b>
<b>INCOME FROM PRODUCTION</b>				<b>280</b>	<b>2,130</b>
<b>NET TOTAL COST FOR THE YEAR</b>	<b>3,966</b>	<b>1,459</b>	<b>1,778</b>	<b>2,097</b>	<b>1,884</b>
<b>NET PROFIT FOR THE YEAR</b>					
<b>ACCUMULATED NET TOTAL COST</b>	<b>3,966</b>	<b>5,424</b>	<b>7,202</b>	<b>9,298</b>	<b>11,182</b>

UC COOPERATIVE EXTENSION  
**Table 2. MATERIALS AND CUSTOM WORK COSTS PER ACRE - ESTABLISHMENT YEARS**  
 SAN JOAQUIN VALLEY – SOUTH 2009

	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5	
			Total Per Acre						units	\$	units	\$
			units	\$	units	\$	units	\$				
<b>OPERATING COSTS</b>												
<b>Custom:</b>												
Orchard Removal & Chip	acre	350.00	1.00	350								
Slip Plow	acre	390.00	1.00	390								
Disc	acre	55.00	5.00	275								
Level - Triplane	acre	175.00	1.00	175								
Layout, Plant, Wrap	tree	0.77	110.00	85	2.00	2						
Ground Spray – Copper / Fertilizer	acre	35.00	1.00	35	1.00	35	2.00	70	1.00	35	1.00	35
Ground Spray – Orangetworm	acre	35.00							1.00	35	1.00	35
Ground Spray – Thrips	acre	35.00							1.00	35	1.00	35
Harvest: Pick & Haul	crtn	1.35							34.00	46	266.00	359
Harvest: Pack	crtn	4.85							28.00	136	213.00	1033
Leaf Analysis (Nutrients)	each	68.00							0.10	7	0.10	7
PCA	acre	35.00	1.00	35	1.00	35	1.00	35	1.00	35	1.00	35
<b>Assessments:</b>												
Citrus Research (55 lb lug)	lug	0.07							23.00	2	182.00	13
Tristeza Eradication	acre	9.20							1.00	9	1.00	9
<b>Tree/Tree Aids:</b>												
Orange Tree	tree	10.50	110.00	1,155	2.00	21						
Tree Wraps (foam type)	each	0.58	110.00	64	2.00	1						
<b>Irrigation/Frost Protection:</b>												
Wind Machine Operation	hr/ac	3.00							100.00	300	100.00	300
Water Frost Protection	acin	10.75	1.46	16	2.20	24	2.20	24	2.20	24	2.20	24
Water (growing season)	acin	10.75	2.00	22	4.50	48	7.00	75	10.50	113	14.00	151



UC COOPERATIVE EXTENSION  
**Table 2. continued**  
 SAN JOAQUIN VALLEY – SOUTH 2009

	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5	
			Total Per Acre						units	\$	units	\$
			units	\$	units	\$	units	\$				
<b>Fertilizer:</b>												
UN32 (32-0-0)	lb N	0.46	8.50	4	19.50	9	30.50	14	29.00	13	32.50	15
Urea Low Biuret (46-0-0)	lb N	0.91	1.15	1	2.30	2	3.45	3	15.00	14	22.50	20
Zinc Sulfate 36%	lb	0.64	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Tecmangam (31% Mn)	lb	0.74	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Soluble Gypsum (Soil Amendment)	ton	133.00									1.00	133
<b>Herbicide:</b>												
Roundup Original Max	pint	5.15	0.60	3	0.60	3	0.60	3	0.60	3	0.60	3
Princep 90S	lb	6.07			4.00	24	4.00	24	4.00	24	4.00	24
Karmex DF	lb	6.17			4.00	25	4.00	25	4.00	25	4.00	25
<b>Insecticide:</b>												
Clinch Ant Bait	lb	12.15	0.33	4	0.33	4	0.33	4				
Dipel ES	pint	5.10							1.00	5	1.50	8
Success	oz	5.66							3.00	17	4.50	25
Spray Oil 415	gal	4.43							0.50	2	0.50	2
<b>Fungicide:</b>												
Hydrated Lime	lb	0.25					5.00	1	7.50	2	10.00	3
Kocide 20/20	lb	3.53					5.00	18	7.50	26	10.00	35
<b>Labor (machine)</b>	hrs	14.49	8.93	129	9.53	138	9.53	138	9.50	138	9.50	138
<b>Labor (non-machine)</b>	hrs	11.04	7.71	85	9.80	108	10.50	116	9.26	102	13.77	152
<b>Fuel - Gas</b>	gal	3.36	9.17	31	9.26	31	9.26	31	9.25	31	9.25	31
Lube				5		5		5		5		5
Machinery repair				11		12		12		12		12
Operating Interest @ 5.75%				173		17		18		20		32
<b>Total Operating Costs/Acre</b>				<b>3,048</b>		<b>545</b>		<b>616</b>		<b>1,216</b>		<b>2,698</b>

UC COOPERATIVE EXTENSION  
**Table 3. COSTS PER ACRE TO PRODUCE ORANGES**  
 SAN JOAQUIN VALLEY - SOUTH 2009

Operation	Operation	Cash and Labor Costs per acre					Your Cost
	Time (Hrs/A)	Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	
Cultural:							
Frost Protection (water & wind machine)	2.19	24	0	324	0	348	
Fertilize: N (UN32 through drip line)	0.30	3	0	37	0	40	
Weed: Pre-emergent (Princep, Karmex) 2X	0.50	9	1	49	0	59	
Insect/Fertilizer: Orangeworm (Dipel)/N Mn Zn	0.00	0	0	27	35	62	
Prune: Top Trees, Stack & Shred Prunings 1X/4 Yr	0.00	0	0	0	25	25	
Prune: Hedge Alt. Rows, Shred Prunings 2X/4Yr	0.00	0	0	0	24	24	
Prune: Hand Prune & Stack, Shred Prunings 1X/4 Yr	0.00	0	0	0	75	75	
Irrigate: (water & labor)	5.55	61	0	323	0	384	
Soil Amendment: (Soluble Gypsum) w/irrigation	8.75	97	0	133	0	230	
Weed: Spot Spray (Roundup) 3X	0.75	13	2	3	0	18	
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /N	0.00	0	0	50	35	85	
Insect: Thrips (Success, Oil)	0.00	0	0	36	35	71	
Insect: Scale (Esteem)	0.00	0	0	145	85	230	
Leaf Analysis (1 sample/10 acres)	0.05	1	0	0	7	7	
Disease: Brown Rot (Lime, Kocide)	0.00	0	0	38	35	73	
Growth Regulator: (Fruit Fix) [Navel Only]	0.00	0	0	11	53	64	
Growth Regulator: (GibGro or GA) [Navel Only]	0.00	0	0	24	53	77	
Pickup Truck Use	3.33	58	40	0	0	98	
ATV Use	3.33	58	5	0	0	63	
PCA/Consultant Services	0.00	0	0	0	35	35	
<b>TOTAL CULTURAL COSTS</b>	<b>24.75</b>	<b>324</b>	<b>47</b>	<b>1,199</b>	<b>496</b>	<b>2,065</b>	
Harvest:							
Pick & Haul Fruit	0.00	0	0	0	926	926	
Pack Fruit	0.00	0	0	0	2,668	2,668	
Assessments	0.00	0	0	42	0	42	
<b>TOTAL HARVEST COSTS</b>	<b>0.00</b>	<b>0</b>	<b>0</b>	<b>42</b>	<b>3,594</b>	<b>3,635</b>	
Interest on operating capital @ 5.75%						160	
<b>TOTAL OPERATING COSTS/ACRE</b>		<b>324</b>	<b>47</b>	<b>1,240</b>	<b>4,089</b>	<b>5,860</b>	
Cash Overhead:							
Office Expense						125	
Liability Insurance						10	
Property Taxes						147	
Property Insurance						54	
Investment Repairs						149	
<b>TOTAL CASH OVERHEAD COSTS</b>						<b>485</b>	
<b>TOTAL CASH COSTS/ACRE</b>						<b>6,346</b>	
Non-Cash Overhead:							
		Per producing Acre		Annual Cost		Capital Recovery	
Buildings 1800 sqft		1,050		66		66	
Fuel Tanks 2-250g		58		3		3	
Shop Tools		250		24		24	
Land		8,125		386		386	
Gypsum Machine (1)		600		138		138	
Orchard Establishment		6,509		381		381	
Drip Irrigation		1,550		87		87	
Wind Machine (6)		2,340		177		177	
Equipment		405		44		44	
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>20,887</b>		<b>1,305</b>		<b>1,305</b>	
<b>TOTAL COSTS/ACRE</b>						<b>7,651</b>	

UC COOPERATIVE EXTENSION  
**Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE ORANGES**  
 SAN JOAQUIN VALLEY - SOUTH 2009

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>GROSS RETURNS</b>					
Oranges	550.00	*crtm	10.00	5,500	
<b>OPERATING COSTS</b>					
<b>Frost Protection:</b>					
Water	2.20	acin	10.75	24	
Wind Machine Operation (propane @ \$1.97/gal)	100.00	hr/ac	3.00	300	
<b>Fertilizer:</b>					
UN 32 (32-0-0)	80.00	lb N	0.46	37	
Urea Low Biuret (46-0-0)	30.00	lb N	0.91	27	
Zinc Sulfate 36%	2.00	lb	0.64	1	
Tecmangam (31% Mn)	2.00	lb	0.74	1	
<b>Soil Amendment:</b>					
Gypsum Soluble	1.00	ton	133.00	133	
<b>Herbicide:</b>					
Princep 90S	4.00	lb	6.07	24	
Karmex	4.00	lb	6.17	25	
Roundup Original Max	0.60	pint	5.15	3	
<b>Insecticide:</b>					
Dipel ES	2.00	pint	5.10	10	
Success	12.00	oz	5.66	68	
Spray Oil 415	1.00	gal	4.43	4	
Esteem	17.00	floz	8.52	145	
<b>Contract/Custom:</b>					
Harvest - Pick & Haul	686.00	crtm	1.35	926	
Harvest - Pack	550.00	crtm	4.85	2,668	
Prune - by Hand & Stack (1X/4 Yr)	0.25	acre	270.00	68	
PCA Fees	1.00	acre	35.00	35	
Prune-Top (1X/4 Yr)	0.25	acre	35.00	35	
Prune-Hedge (2X/4 Yr, Alt. Rows = 1/2 field each time)	0.25	acre	35.00	9	
Shred Prunings (hand prunings 1X/4 Yr & hedge prunings 2X/4 Yr)	0.75	acre	30.00	23	
Stack & Shred Prunings (top prunings) 1X/4 Yr	0.25	acre	65.00	16	
Spray Ground -Thrips	2.00	acre	35.00	70	
Spray Ground - Scale	1.00	acre	85.00	85	
Spray Ground - Orangeworm	1.00	acre	35.00	35	
Spray Ground - Copper or Fertilizer	1.00	acre	35.00	35	
Spray Ground - Growth Regulator	2.00	acre	52.50	105	
Leaf Analysis (1 per 10 acres)	0.10	each	68.00	7	
<b>Irrigation:</b>					
Water	30.00	acin	10.75	323	
<b>Fungicide:</b>					
Hydrated Lime	10.00	lb	0.25	3	
Kocide 20/20	10.00	lb	3.53	35	
<b>Growth Regulator:</b>					
Fruit Fix (2, 4-D) [Navel Only]	2.50	floz	4.56	11	
Gib Gro 4LS (gibberalic acid) [Navel Only]	40.00	gram	0.60	24	
<b>Assessment:</b>					
Citrus Research/55lb box	464.00	box	0.07	32	
Tristeza Eradication	1.00	acre	9.20	9	

UC COOPERATIVE EXTENSION  
**Table 4. continued**  
 SAN JOAQUIN VALLEY - SOUTH 2009

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>Labor (machine)</b>	9.50	hrs	14.49	138	
<b>Labor (non-machine)</b>	16.84	hrs	11.04	186	
<b>Fuel - Gas</b>	9.26	gal	3.36	31	
Lube				5	
Machinery repair				12	
Interest on operating capital @ 5.75%				160	
<b>TOTAL OPERATING COSTS/ACRE</b>				5,860	
<b>NET RETURNS ABOVE OPERATING COSTS</b>				-360	
<b>CASH OVERHEAD COSTS:</b>					
Office Expense				125	
Liability Insurance				10	
Property Taxes				147	
Property Insurance				54	
Investment Repairs				149	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>				485	
<b>TOTAL CASH COSTS/ACRE</b>				6,346	
<b>NON-CASH OVERHEAD COSTS</b>					
Buildings 1800 sqft				66	
Fuel Tanks 2-250g				3	
Shop Tools				24	
Land				386	
Gypsum Machine				138	
Orchard Establishment				381	
Drip Irrigation				87	
Wind Machine (6)				177	
Equipment				44	
<b>TOTAL NON-CASH OVERHEAD COSTS/ACRE</b>				1,305	
<b>TOTAL COSTS/ACRE</b>				7,651	
<b>NET RETURNS ABOVE TOTAL COSTS</b>				-2,151	

\*carton = 37.5 lbs

UC COOPERATIVE EXTENSION  
**Table 5. MONTHLY PER ACRE CASH COSTS - ORANGES**  
 SAN JOAQUIN VALLEY - SOUTH 2009

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Beginning JAN 09													
Ending DEC 09	09	09	09	09	09	09	09	09	09	09	09	09	
<b>Cultural:</b>													
Frost Protection (water & wind machine)	115										118	115	348
Fertilize: N (through drip line)		13	13	13									40
Weed: Pre-emergent Orchard Floor (Princep, Karmex) 2X			29							29			59
Insect/Fertilizer: Orangeworm (Dipel)/N Mn Zn			62										62
Prune: Top Trees, Stack & Shred Prunings 1X/4 Yr				25									25
Prune: Hedge Alt. Rows, Shred Prunings 2X/4Yr				24									24
Prune: Hand Prune & Stack, Shred Prunings 1X/4 Yr				75									75
Irrigate: (water & labor)				43	52	65	82	65	52	25			384
Soil Amendment: (Soluble Gypsum) w/irrigation				28	32	36	42	36	32	22			230
Weed: Spot Spray (Roundup) 3X				6		6		6					18
Insect/Fertilizer: Thrips Katydid (Success, Oil) /N					85								85
Insect: Thrips (Success, Oil)						71							71
Insect: Scale (Esteem)							230						230
Leaf Analysis (1 sample/10 acres)									7				7
Disease: Brown Rot (Lime, Kocide)										73			73
Growth Regulator: (Fruit Fix) [Navel Only]										64			64
Growth Regulators (GibGro or GA) [Navel Only]											77		77
Pickup Truck Use	8	8	8	8	8	8	8	8	8	8	8	8	98
ATV Use	5	5	5	5	5	5	5	5	5	5	5	5	63
PCA/Consultant Services	3	3	3	3	3	3	3	3	3	3	3	3	35
<b>TOTAL CULTURAL COSTS</b>	<b>131</b>	<b>30</b>	<b>121</b>	<b>231</b>	<b>185</b>	<b>195</b>	<b>370</b>	<b>123</b>	<b>108</b>	<b>229</b>	<b>211</b>	<b>131</b>	<b>2,065</b>
<b>Harvest:</b>													
Pick & Haul Fruit		309		308							309		926
Pack Fruit		888		888							892		2,668
Assessments		14		14							14		42
<b>TOTAL HARVEST COSTS</b>		<b>1,210</b>		<b>1,209</b>							<b>1,216</b>		<b>3,635</b>
Interest on operating capital @ 5.75%	1	7	7	14	15	16	18	18	19	20	27	-1	160
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>132</b>	<b>1,247</b>	<b>128</b>	<b>1,454</b>	<b>200</b>	<b>210</b>	<b>388</b>	<b>142</b>	<b>127</b>	<b>249</b>	<b>1,453</b>	<b>131</b>	<b>5,860</b>
<b>OVERHEAD:</b>													
Office Expense	10	10	10	10	10	10	10	10	10	10	10	10	125
Liability Insurance	10												10
Property Taxes	73						73						147
Property Insurance	27						27						54
Investment Repairs	12	12	12	12	12	12	12	12	12	12	12	12	150
<b>TOTAL CASH OVERHEAD COSTS</b>	<b>134</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>123</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>23</b>	<b>486</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>265</b>	<b>1,269</b>	<b>151</b>	<b>1,477</b>	<b>223</b>	<b>233</b>	<b>511</b>	<b>165</b>	<b>150</b>	<b>272</b>	<b>1,476</b>	<b>154</b>	<b>6,346</b>

UC COOPERATIVE EXTENSION  
**Table 6. RANGING ANALYSIS**  
 SAN JOAQUIN VALLEY - SOUTH 2009

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ORANGES

	*YIELD (cartons/acre)						
	400	450	500	550	600	650	700
<b>OPERATING COSTS/ACRE:</b>							
Cultural Cost	2,065	2,065	2,065	2,065	2,065	2,065	2,065
Harvest Cost	2,646	2,976	3,306	3,635	3,965	4,295	4,624
Interest on operating capital	130	140	150	160	170	180	190
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>4,841</b>	<b>5,181</b>	<b>5,521</b>	<b>5,860</b>	<b>6,200</b>	<b>6,540</b>	<b>6,879</b>
<b>TOTAL OPERATING COSTS/CRTN</b>	<b>12.10</b>	<b>11.51</b>	<b>11.04</b>	<b>10.65</b>	<b>10.33</b>	<b>10.06</b>	<b>9.83</b>
<b>CASH OVERHEAD COSTS/ACRE</b>	<b>485</b>	<b>485</b>	<b>485</b>	<b>485</b>	<b>485</b>	<b>485</b>	<b>485</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>5,326</b>	<b>5,666</b>	<b>6,006</b>	<b>6,345</b>	<b>6,685</b>	<b>7,025</b>	<b>7,364</b>
<b>TOTAL CASH COSTS/CRTN</b>	<b>13.32</b>	<b>12.59</b>	<b>12.01</b>	<b>11.54</b>	<b>11.14</b>	<b>10.81</b>	<b>10.52</b>
<b>NON-CASH OVERHEAD COSTS/ACRE</b>	<b>1,305</b>	<b>1,305</b>	<b>1,305</b>	<b>1,305</b>	<b>1,305</b>	<b>1,305</b>	<b>1,305</b>
<b>TOTAL COSTS/ACRE</b>	<b>6,631</b>	<b>6,971</b>	<b>7,311</b>	<b>7,650</b>	<b>7,990</b>	<b>8,330</b>	<b>8,669</b>
<b>TOTAL COSTS/CRTN</b>	<b>16.58</b>	<b>15.49</b>	<b>14.62</b>	<b>13.91</b>	<b>13.32</b>	<b>12.82</b>	<b>12.38</b>

\*cartons = 37.5 pounds

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	400	450	500	550	600	650	700
7.00	-2,041	-2,031	-2,021	-2,010	-2,000	-1,990	-1,979
8.00	-1,641	-1,581	-1,521	-1,460	-1,400	-1,340	-1,279
9.00	-1,241	-1,131	-1,021	-910	-800	-690	-579
10.00	-841	-681	-521	-360	-200	-40	121
11.00	-441	-231	-21	190	400	610	821
12.00	-41	219	479	740	1,000	1,260	1,521
13.00	359	669	979	1,290	1,600	1,910	2,221

NET RETURNS PER ACRE ABOVE CASH COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	400	450	500	550	600	650	700
7.00	-2,526	-2,516	-2,506	-2,495	-2,485	-2,475	-2,464
8.00	-2,126	-2,066	-2,006	-1,945	-1,885	-1,825	-1,764
9.00	-1,726	-1,616	-1,506	-1,395	-1,285	-1,175	-1,064
10.00	-1,326	-1,166	-1,006	-845	-685	-525	-364
11.00	-926	-716	-506	-295	-85	125	336
12.00	-526	-266	-6	255	515	775	1,036
13.00	-126	184	494	805	1,115	1,425	1,736

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	400	450	500	550	600	650	700
7.00	-3,831	-3,821	-3,811	-3,800	-3,790	-3,780	-3,769
8.00	-3,431	-3,371	-3,311	-3,250	-3,190	-3,130	-3,069
9.00	-3,031	-2,921	-2,811	-2,700	-2,590	-2,480	-2,369
10.00	-2,631	-2,471	-2,311	-2,150	-1,990	-1,830	-1,669
11.00	-2,231	-2,021	-1,811	-1,600	-1,390	-1,180	-969
12.00	-1,831	-1,571	-1,311	-1,050	-790	-530	-269
13.00	-637	-1,121	-811	-500	-190	120	431

UC COOPERATIVE EXTENSION  
**Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS**  
 SAN JOAQUIN VALLEY - SOUTH 2009

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
09	ATV 4WD	6,700	15	1,304	573	33	40	646
09	Pickup Truck 1/2 Ton	32,000	7	12,139	3,978	181	221	4,380
09	Weed Sprayer-Pull, ATV 55 gal	2,500	20	130	192	11	13	216
<b>TOTAL</b>		<b>41,200</b>		<b>13,573</b>	<b>4,743</b>	<b>225</b>	<b>274</b>	<b>5,242</b>
*60% of new cost		24,720		8,144	2,846	135	164	3,145

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

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes	Repairs	
Buildings 1800 sqft	63,000	30		3,982	258	315	1,260	5,816
Drip Irrigation (10 acres)	15,500	40		873	64	78	310	1,324
Orchard Establishment (10 acres)	65,088	36		3,808	267	325	325	4,725
Fuel Tanks 2-250g	3,500	40	350	194	16	19	70	299
Gypsum Machine (1)	6,000	5		1,376	25	30	120	1,551
Land (65 acres)	487,500	40	487,500	23,156	0	4,875	0	28,031
Shop Tools	15,000	15		1,421	62	75	300	1,857
Wind Machine (6)	140,400	20	14,040	10,593	633	772	2,808	14,806
<b>TOTAL INVESTMENT</b>	<b>795,988</b>		<b>501,890</b>	<b>45,403</b>	<b>1,324</b>	<b>6,489</b>	<b>5,193</b>	<b>58,409</b>

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	60	acre	10.35	621
Office Expense	60	acre	125.00	7,500

UC COOPERATIVE EXTENSION  
**Table 8. HOURLY EQUIPMENT COSTS**  
 SAN JOAQUIN VALLEY - SOUTH 2009

Yr	Description	COSTS PER HOUR							Total Costs/Hr.
		Actual Hours Used	Cash Overhead			Operating			
			Capital Recovery	Insur- ance	Taxes	Repairs	Fuel & Lube	Total Oper.	
09	ATV 4WD	133	2.59	0.15	0.18	0.64	0.77	1.41	4.33
09	Pickup Truck 1/2 Ton	265	9.00	0.41	0.50	2.36	9.66	12.02	21.93
09	Weed Sprayer-Pull, ATV 55 gal	75	1.55	0.09	0.11	0.65	0.00	0.65	2.40

UC COOPERATIVE EXTENSION  
**Table 9. OPERATIONS WITH EQUIPMENT & MATERIALS**  
 SAN JOAQUIN VALLEY - South 2009

Operation	Operation		Field Labor Hr/Acre	Material	Broadcast Rate/Acre	Unit	
	Month	Tractor					Implement
Frost Protection (water & wind machine)	Jan		0.70	Water	0.73	acin	
				Wind Machine	33.00	hr	
	Nov		0.70	Water	0.73	acin	
				Wind Machine	33.00	hr	
Fertilize: N (through drip line)	Dec			Water	0.74	acin	
				Wind Machine	33.00	hr	
	Feb		0.10	UN32	26.60	lb N	
	Mar		0.10	UN32	26.70	lb N	
Weed: Pre-emergent (Princep, Karmex) 2X	Apr		0.10	UN32	26.70	lb N	
	Mar	ATV	Weed Sprayer	Princep	2.00	lb	
				Karmex	2.00	lb	
Insect/Fertilizer: Orangeworm (Dipel)/ Foliar (N, Mn, Zn)	Oct	ATV	Weed Sprayer	Princep	2.00	lb	
				Karmex	2.00	lb	
	Mar	Custom		Dipel	2.00	pt	
				Urea LB	15.00	lb N	
Irrigate				Zinc Sulfate	2.00	lb	
				Tecmangam (Mn)	2.00	lb	
	Apr		0.50	Water	3.50	acin	
	May		0.80	Water	4.00	acin	
	June		1.00	Water	5.00	acin	
	July		1.10	Water	6.50	acin	
	Aug		1.00	Water	5.00	acin	
	Sept		0.80	Water	4.00	acin	
	Oct		0.30	Water	2.00	acin	
	Prune: Top Trees, Stack & Shred Prunings 1X/4 Yr	Apr	Custom				
Prune: Hedge Alt. Rows, Shred Prunings 2X/4Yr	Apr	Custom					
Prune: Hand Prune & Stack, Shred Prunings 1X/4 Yr	Apr	Custom					
Soil Amendment:(Soluble Gypsum) w/irrigation	Apr		1.30	Gypsum	0.11	ton	
	May		1.30	Gypsum	0.14	ton	
	June		1.30	Gypsum	0.17	ton	
	July		1.30	Gypsum	0.21	ton	
	Aug		1.30	Gypsum	0.17	ton	
	Sept		1.30	Gypsum	0.14	ton	
	Oct		1.30	Gypsum	0.06	ton	
	Weed: Spot Spray (Roundup) 3X	Apr	ATV	Weed Sprayer	Roundup	0.20	pt
		June	ATV	Weed Sprayer	Roundup	0.20	pt
		Aug	ATV	Weed Sprayer	Roundup	0.20	pt



UC COOPERATIVE EXTENSION  
**Table 9. continued**  
SAN JOAQUIN VALLEY - South 2009

Operation	Operation		Implement	Field Labor	Material	Broadcast	
	Month	Tractor		Hr/Acre		Rate/acre	Unit
Insect/Fertilizer: Thrips, Katydid (Success, Oil) /N	May	Custom			Success	6.00	oz
					415 Oil	0.50	gal
					Urea LB	15.00	lb N
Insect: Thrips (Success, Oil)	June	Custom			Success	6.40	oz
					415 Oil	0.50	gal
Insect: Scale (Esteem)	July	Custom			Esteem	17.00	floz
Leaf Analysis (1 sample/10 acres)	July	Custom		0.10	Analysis	31.00	ea
Disease: Brown Rot (Lime, Kocide)	Oct	Custom			Lime	10.00	lb
					Kocide	10.00	lb
Growth Regulator: (Fruit Fix) [Navel Only]	Oct	Custom			Fruit Fix	2.50	floz
Growth Regulators: (GibGro or GA) [Navel Only]	Nov	Custom			Gib Gro	40.00	gram
Harvest: Pick & Haul	Feb	Custom				229.00	crtn
	Apr	Custom				228.00	crtn
	Nov	Custom				229.00	crtn
Harvest: Pack	Feb	Custom				183.00	crtn
	Apr	Custom				183.00	crtn
	Nov	Custom				184.00	crtn