

**UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION**

**2005**

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

**LEMONS**



**SAN JOAQUIN VALLEY - South**

Low Volume Irrigation

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## SAMPLE COST TO ESTABLISH A LEMON ORCHARD and PRODUCE LEMONS

San Joaquin Valley South - 2005

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### INTRODUCTION

Sample costs to establish a lemon orchard and produce lemons 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 many commodities are available and can be requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-3589. Current studies can be obtained from selected county UC Cooperative Extension offices or downloaded from the department website at <http://coststudies.ucdavis.edu>.

## ASSUMPTIONS

The assumptions refer to Tables 1 to 9 and pertain to sample costs to establish a lemon orchard and produce lemons 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 10 acres being planted to lemons. 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 (slip plowing) 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 acreage (10 in this case) may have a minimum fee or additional equipment delivery charges.

**Planting.** Planting the orchard starts by marking tree sites (layout orchard). Holes are then dug and the trees planted. 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 major lemon variety grown in the San Joaquin Valley is Lisbon. Tree costs are for the standard varieties. The trees are planted on 20 X 20-foot spacing, 109 trees per acre. Tree spacing and densities in orchards vary. Lemon trees have a long production life if they are well maintained. The life of the orchard is assumed to be 40 years.

Table A. Sucker/Prune  
Operation Time

Year	Operation	Hours
1	Sucker	3.00
2	Sucker	3.00
3	Sucker/Prune	5.00
4	Prune	7.00
5	Prune	12.00

**Pruning.** Suckering is done twice a year, April and July, during the first and second year. Light pruning is done in April after harvest from the third year until the trees are mature. Also in the third year some suckering may be done during the pruning. See Table A for estimated pruning/suckering times for the establishment years.

**Irrigation.** District water is delivered via canal to the farm at a cost of \$90.00 per acre-foot or \$7.50 per acre-inch. Water costs are highly variable among districts. Irrigation costs include the water and the labor for system operation and monitoring. No assumption is made about effective rainfall, runoff, evaporation, winter water requirements or rainfall stored in the soil profile, tree size or tree health. In the first year, an irrigation is applied in March shortly after planting. Irrigation water is generally applied from April through October. The amount of

Table B. Water applied

Year	Acre-Inches
1	3.0
2	7.0
3	13.0
4	22.0
5	27.0
6+	33.0

water applied to different aged trees is shown in Table B. Values are based on an irrigation system delivering water with a distribution uniformity of 85%.

**Frost Protection.** Lemons are highly susceptible to freezing. Damage begins at a higher temperature than oranges; therefore, the wind machines are started in some instances at temperatures that are two to three degrees Fahrenheit higher than when started for oranges. This study assumes that weed/cover crop management and 2.2 acre-inches of water are used for frost protection during November, December and January except for the first year. Wind machines are installed in the first year and begin operation in the winter (November & December) of the first year to which the costs are allocated, while the January costs are allocated to the second year. The costs are based on a calendar year. Water use remains constant for frost protection in all years except the first year for the same reason as the wind machines. 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

Table C. Frost Protection Procedures

Year	water	acin	floor management	wind machine
1	Yes	1.5	Discing & contact herbicide	66 hours
2	Yes	2.2	Residual & contact herbicide	100 hours
3	Yes	2.2	Residual & contact herbicide	100 hours
4	Yes	2.2	Residual & contact herbicide	100 hours
5+	Yes	2.2	Residual & contact herbicide	100 hours

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. A single machine will cover about 10 acres, effectively.

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 is the major nutrient required for proper tree growth and optimum yields. Beginning in the first year, UN32 is applied through the low volume or drip system and low biuret urea plus micronutrients - zinc sulfate and manganese (Tecmangam) - are applied in March as a foliage spray. Beginning in the third year, low biuret urea (46-0-0) is applied twice as a foliar spray, once with the micronutrients in March and applied alone in May. 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 (nitrogen)

Year	per tree	per acre	dripline	foliar
Lbs of N				
1	0.09	10.00	8.5	1.15
2	0.20	22.00	19.7	2.30
3	0.31	34.00	30.50	3.45
4	0.48	52.00	37.00	15.00
5	0.69	75.00	52.50	22.50
6	0.92	100.00	70.00	30.00
7+	1.20	130.00	100.00	30.00

**Soil Amendments.** In this study, beginning in the third 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, manures or 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 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. In the second and subsequent years, residual/pre-emergent herbicides, Karmex and Princep, are applied to the orchard floor in the fall and in the spring 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 katydids ants, and scale. Beginning in the fourth year, katydids (*Scudderia furcata*) are treated with Success insecticide plus oil in May at petal fall. A spray may be needed every other year for katydid or soft scale; katydid is treated every year in this study. Thrips and worms normally do not damage lemon fruit and are not treated in this study. Pesticides are sprayed at full rates in the fourth and fifth years, but are applied at a lower volume per acre to account for the small tree size. In the fourth year 50% and in the fifth, 75% of the recommended spray volume is applied. California red scale (*Aonidiella aurantii*) is not treated on young trees as it is only an economic problem when found on the fruit. Therefore treatment begins in the fourth year in July alternating each year with Esteem and Lorsban.

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

*Diseases.* Beginning in the third year, brown rot (*Phytophthora spp.*) and septoria spot (*Septoria spp.*), which can be a problem 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.

*Vertebrates.* Voles and gophers can damage and kill young trees and should be monitored and controlled. No costs are included in this study for control.

*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. A contracted operator harvests the field. Annual yields are shown in Table E.

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

Table E. Annual Lemon Yields Per Acre

Year	Field Bins (900 lbs)	Field Boxes (56 lbs)	Total Crtns/bin (37.5 lbs)	Packed Cartons (37.5 lbs)
3	10.2	164	244	195
4	17.0	273	407	326
5	27.0	436	651	521
6	37.3	600	895	716
7	42.4	681	1,017	814
8+	47.5	763	1,139	912

## 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 every year: (1) top all trees, stack, shred, (2) hedge every row, stack, shred, (3) hand prune, stack, shred. 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 started in April after harvest.

**Fertilization.** Nitrogen as UN-32 is applied through the irrigation system (not necessarily with a scheduled irrigation) in several applications during February, March, and April. A foliar application of N as low biuret urea plus minor nutrients, zinc sulfate and manganese (Tecmangam), are applied in March. A second low biuret urea application is made in May with the katydid spray. The nutritional program should be based on leaf analysis. 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 or 0.10 samples per acre.

**Soil Amendments.** Each year beginning with the first irrigation, 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 under the Non-Cash Overhead section of the tables.

**Irrigation.** Typically, water is applied each year from April through October. Thirty-three acre-inches of district water, delivered via canal, is applied to the orchard at a cost of \$90.00 per acre-foot or \$7.50 per acre-inch. Water costs are highly variable among districts. From grower and district information, costs may go as high as \$160 per acre-foot. The irrigation operation costs include the water and labor. Irrigation labor includes operating and monitoring the system. No assumption is made about effective rainfall, runoff, and evaporation.

**Frost Protection.** Protection is required from late winter to early spring (November through January in this study). In this study, chemical vegetation control on the orchard floor and 2.2 acre-inches of water are used for frost protection. 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 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.

*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 and one in the spring, 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.* On the average, katydids or soft scales are concerns every other year. In this study katydids are treated each year in May with Success insecticide and oil. Low biuret urea is mixed with the katydid spray. A spray is applied in July for California red scale alternating each year with Esteem (insect growth regulator) and Lorsban. 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.

*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.

*Vertebrate.* Roof rats may affect mature trees. They can girdle trees and cause fruit damage. Contact your local agricultural commissioner or farm advisor for controls available.

*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, the pesticides 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.** Gibberellic acid (Gib Gro) and 2,4-D (Hivol 44) treatments are made on mid-to-late harvested lemons. Gibberellic acid would not be applied to early ripening lemons, those picked in October and November. Gibberellic acid maintains a juvenile rind and 2,4-D applied in October/November minimizes pre-harvest fruit drop. In this study gibberellic acid is sprayed in October and 2,4-D in November to affect fruit harvested in January and later.

**Harvest.** Lemon trees typically reach full production by the eighth 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. Lemons are picked and graded by size and normally harvested from mid October through March. Lemons are hand picked and put into field bins that hold 900 pounds (24 carton equivalent) of fruit. The lemons 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 \$2.00 per carton and the packinghouse cost are \$4.50 per carton. Delivering outside the local area will increase hauling costs. The packing house costs 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 lemons 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. Yields from the third year to full production for field bins, boxes, and cartons are shown in Table E.

Table E. Annual Lemon Yields Per Acre

Year	Field Bins (900 lbs)	Field Boxes (56 lbs)	Total Crtns/bin (37.5 lbs)	Packed Cartons (37.5 lbs)
3	10.2	164	244	195
4	17.0	273	407	326
5	27.0	436	651	521
6	37.3	600	895	716
7	42.4	681	1,017	814
8+	47.5	763	1,139	912

*Returns.* An estimated price based on current returns of \$14.00 per carton, fob packinghouse, is used in this study. Returns over a range of yields are shown in Table 6.

**Assessments.** Commercial lemon 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 \$0.028 per 55-pound field box equivalent, 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 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.** Labor rates of \$14.30 per hour for machine operators and \$9.65 for general labor includes payroll overhead of 43%. The basic hourly wages are \$10.00 for machine operators and \$6.75 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. For this study the cost is based upon the average industry final rate as of January 5, 2005 (California Department of Insurance). 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 diesel and gasoline are \$2.00 and \$2.25 per gallon, respectively. 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 8 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. Fuel prices have fluctuated considerably in 2005 and may be higher or lower on any given day. The price used is based upon grower deliveries in May.

**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 7.65% 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.

**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. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

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

**Insurance.** Insurance for farm investments varies depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.690% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$529 for the entire farm.

**Crop Insurance.** Crop insurance is available and is desirable due to the freezes in the San Joaquin Valley, but is not included as a cost in this study.

**Office Expense.** Office and business expenses are estimated at \$120 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 for orchard establishment 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.* The interest rate of 6.01% used to calculate capital recovery cost is the USDA-ERSs ten-year average of California's agricultural sector long-run rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can be used effectively in the agricultural sector.

*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 lemons 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 \$4,157 per acre or \$41,570 for the 10-acre orchard. The establishment cost is spread over the remaining 37 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 \$1,300 to \$5,500 per acre, depending on available water. Citrus orchards range from \$5,000 to \$10,000. Being that the orchard is established on land previously planted to tree crops, the land in this study is valued at \$6,000 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.

**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 6 machines – 1 in the new planting, 5 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 lemons.

**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. SAMPLE COSTS PER ACRE TO ESTABLISH A LEMON ORCHARD**  
 SAN JOAQUIN VALLEY – SOUTH 2005

	YEAR	Costs per Acre				
		1st	2nd	3rd	4th	5th
PACKOUT YIELD (37.5 lb Cartons/Acre):				195	326	521
<b>Planting Costs</b>						
Land Preparation: Remove Old Orchard		240				
Land Preparation: Subsoil		390				
Land Preparation: Disc 2X		90				
Land Preparation: Level (Triplane)		125				
Trees @ \$9/tree (Replant 2% of Trees in 2nd Year)		981	18			
Plant: Layout, Plant, Stake & Wrap Trees		120	2			
<b>TOTAL PLANTING COSTS</b>		<b>1,946</b>	<b>20</b>			
<b>Cultural Costs:</b>						
Sucker (Yr 1-2) Prune (Yr 3+)		29	29	48	68	116
Irrigate (water & labor)		61	86	131	213	250
Frost Protection (Water & Wind Machines)		218	329	329	329	329
Fertilize: Foliar Spray (N, Mn, Zn)		31	32	32	29	31
Fertilize: N (through drip)		9	13	24	27	34
Fertilize: Foliar (N) Yrs 1-5. Insect: Katydid (Success, oil) Yr 5					29	59
Insect: Scale (Esteem)						148
Insect: Ants (Clinch)		5	5	5		
Weed: Orchard Floor (Karmex, Princep)			45	45	45	45
Weed: Spot Spray (Roundup)		17	17	17	17	17
Weed: Disc 3X (Custom)		135				
Disease: Brown Rot (Lime, Kocide) rates increase each yr				41	46	51
Soil Amendments: Soluble Gypsum						130
Pickup Truck Use		86	86	86	86	86
ATV Use		61	61	61	61	61
Fertilize: Leaf Analysis (1/10 acre)					4	4
PCA/Consultant Services		35	35	35	35	35
<b>TOTAL CULTURAL COSTS</b>		<b>686</b>	<b>737</b>	<b>854</b>	<b>987</b>	<b>1,395</b>
<b>Harvesting Costs:</b>						
Pick and Haul				488	814	1,302
Sort & Pack				877	1,467	2,345
Assessments				14	16	20
<b>TOTAL HARVEST COSTS</b>				<b>1,379</b>	<b>2,297</b>	<b>3,666</b>
Interest on operating capital @ 7.65%		198	30	46	54	91
<b>TOTAL OPERATING COSTS PER ACRE</b>		<b>2,830</b>	<b>788</b>	<b>2,279</b>	<b>3,338</b>	<b>5,153</b>
<b>Cash Overhead Costs:</b>						
Office Expense		120	120	120	120	120
Liability Insurance		9	9	9	9	9
Property Taxes		92	91	91	91	94
Property Insurance		18	18	18	18	20
Investment Repairs		92	92	92	92	103
<b>TOTAL CASH OVERHEAD COSTS</b>		<b>331</b>	<b>330</b>	<b>330</b>	<b>330</b>	<b>346</b>
<b>TOTAL CASH COSTS</b>		<b>3,160</b>	<b>1,118</b>	<b>2,609</b>	<b>3,668</b>	<b>5,498</b>
<b>INCOME FROM PRODUCTION</b>				<b>2,730</b>	<b>4,564</b>	<b>7,294</b>
<b>NET CASH COSTS FOR THE YEAR</b>		<b>3,160</b>	<b>1,118</b>			
<b>PROFIT ABOVE CASH COSTS</b>					<b>238</b>	<b>243</b>
<b>TOTAL ACCUMULATED NET CASH COSTS</b>		<b>3,160</b>	<b>4,278</b>	<b>4,157</b>	<b>3,261</b>	<b>1,466</b>

## UC COOPERATIVE EXTENSION

Table 1. CONTINUED

	YEAR	Costs per Acre				
		1st	2nd	3rd	4th	5th
Non-Cash Overhead Costs:						
Buildings		73	73	73	73	73
Drip Irrigation System		83	83	83	83	83
Shop Tools		21	21	21	21	21
Land		391	391	391	391	391
Fuel Tanks & Pumps		4	4	4	4	4
Gypsum Machine						131
Wind Machine		175	175	175	175	175
Equipment		43	39	40	39	39
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>789</b>	<b>786</b>	<b>787</b>	<b>786</b>	<b>916</b>
<b>TOTAL COST FOR THE YEAR</b>		<b>3,950</b>	<b>1,904</b>	<b>3,396</b>	<b>4,454</b>	<b>6,415</b>
<b>INCOME FROM PRODUCTION</b>				<b>2,730</b>	<b>4,564</b>	<b>7,294</b>
<b>NET TOTAL COST FOR THE YEAR</b>		<b>3,950</b>	<b>1,904</b>	<b>666</b>		
<b>NET PROFIT FOR THE YEAR</b>					<b>110</b>	<b>879</b>
<b>ACCUMULATED NET TOTAL COST</b>		<b>3,950</b>	<b>5,853</b>	<b>6,519</b>	<b>6,409</b>	<b>5,530</b>

UC COOPERATIVE EXTENSION  
**Table 2. MATERIALS AND CUSTOM WORK COSTS PER ACRE - ESTABLISHMENT YEARS**  
 SAN JOAQUIN VALLEY – SOUTH 2005

	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/Contract:</b>												
Orchard Removal	acre	240.00	1.00	240								
Slip Plow	acre	390.00	1.00	390								
Disc	acre	45.00	5.00	225								
Level - Triplane	acre	125.00	1.00	125								
Layout, Plant, Wrap	tree	0.70	109.00	76	2.00	1						
Ground Spray - Copper	acre	30.00	1.00	30	1.00	30	2.00	60	1.00	30	1.00	30
Ground Spray - Katydid	acre	25.00							1.00	25	1.00	25
Ground Spray - Nutrients	acre	25.00							1.00	25	1.00	25
Ground Spray - Scale	acre	75.00									1.00	75
Harvest: Pick & Haul	crtn	2.00					244.00	488	407.00	814	651.00	1,302
Harvest: Sort & Pack	crtn	4.50					195.00	878	326.00	1467	521.00	2,345
Leaf Analysis (Nutrients)	each	31.00							0.10	3	0.10	3
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	0.03					133.00	4	222.00	6	355.00	10
Tristeza Eradication	acre	10.00					1.00	10	1.00	10	1.00	10
<b>Tree/Tree Aids:</b>												
Orange Tree	tree	9.00	109.00	981	2.00	18						
Tree Wraps	each	0.40	109.00	44	2.00	1						
<b>Irrigation/Frost Protection:</b>												
Wind Machine Operation	hour	2.93	66.00	193	100.00	292.5	100.00	293	100.00	293	100.00	293
Water Frost Protection	acin	7.50	1.50	11	2.20	16.5	2.20	17	2.20	17	2.20	17
Water (growing season)	acin	7.50	3.00	23	7.00	53	13.00	98	22.00	165	27.00	203
<b>Fertilizer:</b>												
UN32	lb N	0.44	8.50	4	19.70	9	30.50	13	37.00	16	52.50	23
Urea Low Biuret (46-0-0)	lb N	0.48	1.15	1	2.30	1	3.45	2	15.00	7	22.50	11
Zinc Sulfate 36%	lb	0.56	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Tecmangam (Mn)	lb	0.63	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Soluble Gypsum (Soil Amendment)	ton	120.00									1.00	120
<b>Herbicide:</b>												
Roundup Original Max	pint	4.38	0.60	3	0.60	3	0.60	3	0.60	3	0.60	3
Princep 90S	lb	3.27			4.00	13	4.00	13	4.00	13	4.00	13
Karmex DF	lb	5.62			4.00	22	4.00	22	4.00	22	4.00	22

UC COOPERATIVE EXTENSION  
**Table 2. CONTINUED**  
 SAN JOAQUIN VALLEY -SOUTH 2005

	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5	
			Total Per Acre						units	\$	units	\$
			units	\$	units	\$	units	\$				
<b>Insecticide:</b>												0
Clinch Ant Bait	lb	13.94	0.33	5	0.33	5	0.33	5				
Esteem	floz	5.76									12.75	73
Success	oz	5.86									4.50	26
Spray Oil 415	gal	3.87									0.50	2
<b>Fungicide:</b>												
Hydrated Lime	lb	0.20					5.00	1	7.50	2	10.00	2
Kocide 20/20	lb	1.90		0		0	5.00	10	7.50	14	10.00	19
<b>Labor (machine)</b>	hrs	14.30	8.93	128	9.53	136	9.53	136	9.50	136	9.50	136
<b>Labor (non-machine)</b>	hrs	9.65	8.90	86	9.10	88	11.70	113	15.22	147	21.27	205
<b>Fuel - Gas</b>	gal	2.25	9.16	21	9.26	21	9.26	21	9.26	21	9.26	21
<b>Lube</b>				3		3		3		3		3.12
<b>Machinery repair</b>				9		10		10		10		9.93
<b>Interest @ 7.65%</b>				198		30		46		54		90.91
<b>Total Operating Costs/Acre</b>				2,830		788		2,279		3,338		5,152



UC COOPERATIVE EXTENSION  
**Table 3. COSTS PER ACRE TO PRODUCE LEMONS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

Operation	Operation	Cash and Labor Costs per acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/Rent			
Cultural:								
Frost Protection (water & wind machine)	2.10	21	0	309	0	330		
Fertilize: N (through drip line)	1.10	11	0	44	0	55		
Weed: Orchard Floor (Princep, Karmex) 2X	0.50	9	1	36	0	45		
Fertilize: Foliar (N Mn Zn)	0.00	0	0	10	25	35		
Prune: Top Trees, Stack & Shred Prunings	0.00	0	0	0	68	68		
Prune: Hedge , Stack & Shred Prunings	0.00	0	0	0	35	35		
Prune: Hand Prune & Stack, Shred Prunings	0.00	0	0	0	210	210		
Irrigate: (water & labor)	5.65	55	0	248	0	302		
Soil Amendment:(Soluble Gypsum) w/irrigation	1.75	17	0	120	0	137		
Weed: Spot Spray (Roundup) 3X	0.75	13	1	3	0	17		
Fertilizer: Foliar N. Insect: Katydid (Success, Oil)	0.00	0	0	44	25	69		
Insect: Scale (Esteem)	0.00	0	0	98	75	173		
Fertilize: Leaf Analysis (1 sample/10 acres)	0.05	0	0	0	3	4		
Disease: Brown Rot (Lime, Kocide)	0.00	0	0	21	30	51		
Growth Regulator: (GibGro or GA)	0.00	0	0	22	45	67		
Growth Regulator: (Hivol)	0.00	0	0	6	45	51		
Pickup Truck Use	3.33	57	28	0	0	86		
ATV Use	3.33	57	3	0	0	61		
PCA/Consultant Services	0.00	0	0	0	35	35		
<b>TOTAL CULTURAL COSTS</b>	<b>18.57</b>	<b>239</b>	<b>34</b>	<b>959</b>	<b>596</b>	<b>1,829</b>		
Harvest:								
Pick & Haul Fruit	0.00	0	0	0	2,278	2,278		
Pack Fruit	0.00	0	0	0	4,104	4,104		
Assessments	0.00	0	0	28	0	28		
<b>TOTAL HARVEST COSTS</b>	<b>0.00</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>6,382</b>	<b>6,410</b>		
<b>Interest on operating capital</b>						<b>265</b>		
<b>TOTAL OPERATING COSTS/ACRE</b>		<b>239</b>	<b>34</b>	<b>987</b>	<b>6,978</b>	<b>8,504</b>		
Cash Overhead:								
Office Expense						120		
Liability Insurance						9		
Property Taxes						115		
Property Insurance						34		
Investment Repairs						124		
<b>TOTAL CASH OVERHEAD COSTS</b>						<b>402</b>		
<b>TOTAL CASH COSTS/ACRE</b>						<b>8,905</b>		
Non-Cash Overhead:								
		Per producing Acre		Annual Cost	Capital Recovery			
Buildings 1800 sqft		1,000		73		73		
Fuel Tanks 2-250g		58		4		4		
Shop Tools		215		21		21		
Land		6,500		391		391		
Gypsum Machine (1)		550		131		131		
Orchard Establishment		4,157		282		282		
Drip Irrigation		1,250		83		83		
Wind Machine (6)		2,070		175		175		
Equipment		350		41		41		
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>16,150</b>		<b>1,201</b>		<b>1,201</b>		
<b>TOTAL COSTS/ACRE</b>						<b>10,106</b>		

UC COOPERATIVE EXTENSION  
**Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE LEMONS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>GROSS RETURNS</b>					
Lemons	912.00	crtn	14.00	12,768	
<b>OPERATING COSTS</b>					
<b>Frost Protection:</b>					
Water	2.20	acin	7.50	17	
Wind Machine Operation	100.00	hour	2.93	293	
<b>Fertilizer:</b>					
UN 32	100.00	lb N	0.44	44	
Urea Low Biuret	30.00	lb N	0.48	14	
Zinc Sulfate 36%	2.00	lb	0.56	1	
Tecmangam (31% Mn)	2.00	lb	0.63	1	
<b>Assessment:</b>					
Citrus Research/55lb box	622.00	box	0.03	17	
Tristeza Eradication	1.00	acre	10.00	10	
<b>Herbicide:</b>					
Princep 90S	4.00	lb	3.27	13	
Karmex	4.00	lb	5.62	22	
Roundup Original Max	0.60	pint	4.38	3	
<b>Insecticide:</b>					
Success	6.00	oz	5.86	35	
Spray Oil 415	0.50	gal	3.87	2	
Esteem	17.00	floz	5.76	98	
<b>Custom/Contract:</b>					
Prune-Top	1.00	acre	28.00	28	
Prune-Hedge	1.00	acre	15.00	15	
Prune - Hand & Stack	1.00	acre	200.00	200	
Prune - Stack Toppings	1.00	acre	20.00	20	
Prune - Stack Hedgings	1.00	acre	10.00	10	
Prune - Shred Toppings	1.00	acre	20.00	20	
Prune - Shred Hedgings	1.00	acre	10.00	10	
Prune - Shred Hand Prunings	1.00	acre	10.00	10	
Spray Ground -N/Katydid	1.00	acre	25.00	25	
Spray Ground -N & minor nutrients	1.00	acre	25.00	25	
Spray Ground - Scale	1.00	acre	75.00	75	
Spray Ground - Copper or Fertilizer	1.00	acre	30.00	30	
Spray Ground - Growth Regulator	2.00	acre	45.00	90	
Leaf Analysis	0.10	acre	31.00	3	
Harvest Pick & Haul	1,139.00	crtn	2.00	2,278	
Harvest Pack	912.00	crtn	4.50	4,104	
PCA Fees	1.00	acre	35.00	35	
<b>Irrigation:</b>					
Water	33.00	acin	7.50	248	
<b>Soil Amendment:</b>					
Gypsum Soluble	1.00	ton	120.00	120	
<b>Fungicide:</b>					
Hydrated Lime	10.00	lb	0.20	2	
Kocide 20/20	10.00	lb	1.90	19	
<b>Growth Regulator:</b>					
Hivol 44	1.25	floz	4.46	6	
Gib Gro 4LS	32.00	gram	0.70	22	

UC COOPERATIVE EXTENSION  
**Table 4. CONTINUED**  
 SAN JOAQUIN VALLEY - SOUTH 2005

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
Labor (machine)	9.50	hrs	14.30	136	
Labor (non-machine)	10.65	hrs	9.65	103	
Fuel - Gas	9.26	gal	2.25	21	
Lube				3	
Machinery repair				10	
Interest on operating capital @ 7.65%				265	
<b>TOTAL OPERATING COSTS/ACRE</b>				<b>8,503</b>	
<b>NET RETURNS ABOVE OPERATING COSTS</b>				<b>4,265</b>	
<b>CASH OVERHEAD COSTS:</b>					
Office Expense				120	
Liability Insurance				9	
Property Taxes				115	
Property Insurance				34	
Investment Repairs				124	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>				<b>402</b>	
<b>TOTAL CASH COSTS/ACRE</b>				<b>8,905</b>	
<b>NON-CASH OVERHEAD COSTS</b>					
Buildings 30'X60'				73	
Fuel Tanks 2-250g				4	
Shop Tools				21	
Land				391	
Gypsum Machine				131	
Establishment				282	
Drip Irrigation				83	
Wind Machine (6)				175	
Equipment				41	
<b>TOTAL NON-CASH OVERHEAD COSTS/ACRE</b>				<b>1,201</b>	
<b>TOTAL COSTS/ACRE</b>				<b>10,105</b>	
<b>NET RETURNS ABOVE TOTAL COSTS</b>				<b>2,663</b>	

UC COOPERATIVE EXTENSION  
**Table 5. MONTHLY CASH COSTS - LEMONS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

Beginning JAN 05	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Ending DEC 05	05	05	05	05	05	05	05	05	05	05	05	05	
Cultural:													
Frost Protection (water & wind machine)	109										112	109	329
Fertilize: N (through drip line)		19	19	16									55
Weed: Orchard Floor (Princep, Karmex) 2X			22						22				45
Fertilize: Foliar (N Mn Zn)			35										35
Prune: Top Trees, Stack & Shred Prunings				68									68
Prune: Hedge , Stack & Shred Prunings				35									35
Prune: Hand Prune & Stack, Shred Prunings				210									210
Irrigate: (water & labor)				30	40	52	60	60	40	21			302
Soil Amendment:(Soluble Gypsum) w/irrigation				16	19	23	28	23	19	10			137
Weed: Spot Spray (Roundup) 3X				6		6		6					17
Fertilizer: Foliar N. Insect: Katydid (Success, Oil)					69								69
Insect: Scale (Esteem)							173						173
Fertilize: Leaf Analysis (1 sample/10 acres)									4				4
Disease: Brown Rot (Lime, Kocide)										51			51
Growth Regulator: (GibGro or GA)										67			67
Growth Regulator: (Hivol)											51		51
Pickup Truck Use	7	7	7	7	7	7	7	7	7	7	7	7	86
ATV Use	5	5	5	5	5	5	5	5	5	5	5	5	61
PCA/Consultant Services	3	3	3	3	3	3	3	3	3	3	3	3	35
<b>TOTAL CULTURAL COSTS</b>	<b>124</b>	<b>35</b>	<b>92</b>	<b>395</b>	<b>144</b>	<b>95</b>	<b>276</b>	<b>104</b>	<b>100</b>	<b>164</b>	<b>177</b>	<b>124</b>	<b>1,828</b>
Harvest:													
Pick & Haul Fruit			758							760		760	2,278
Pack			1,368							1,368		1,368	4,104
Assessments			9							9		9	28
<b>TOTAL HARVEST COSTS</b>			<b>2,135</b>							<b>2,137</b>		<b>2,137</b>	<b>6,410</b>
Interest on operating capital @ 7.65%	1	1	15	18	19	19	21	22	22	37	38	53	265
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>125</b>	<b>36</b>	<b>2,242</b>	<b>412</b>	<b>162</b>	<b>114</b>	<b>297</b>	<b>125</b>	<b>123</b>	<b>2,338</b>	<b>215</b>	<b>2,314</b>	<b>8,503</b>
OVERHEAD:													
Office Expense	10	10	10	10	10	10	10	10	10	10	10	10	120
Liability Insurance	9												9
Property Taxes	57						57						115
Property Insurance	17						17						34
Investment Repairs	10	10	10	10	10	10	10	10	10	10	10	10	124
<b>TOTAL CASH OVERHEAD COSTS</b>	<b>104</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>95</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>402</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>228</b>	<b>56</b>	<b>2,262</b>	<b>433</b>	<b>182</b>	<b>135</b>	<b>392</b>	<b>146</b>	<b>143</b>	<b>2,358</b>	<b>236</b>	<b>2,334</b>	<b>8,905</b>

UC COOPERATIVE EXTENSION  
**Table 6. RANGING ANALYSIS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE LEMONS

	*YIELD (cartons/acre)						
	612	712	812	912	1,012	1,112	1,212
<b>OPERATING COSTS/ACRE:</b>							
Cultural Cost	1,828	1,828	1,828	1,828	1,828	1,828	1,828
Harvest Cost	4,283	4,982	5,682	6,382	7,082	7,782	8,481
Assessment Cost	22	24	26	28	29	31	33
Interest on operating capital	203	223	244	265	286	307	328
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>6,336</b>	<b>7,057</b>	<b>7,780</b>	<b>8,503</b>	<b>9,225</b>	<b>9,948</b>	<b>10,670</b>
<b>TOTAL OPERATING COSTS/CRTN</b>	<b>10.35</b>	<b>9.91</b>	<b>9.58</b>	<b>9.32</b>	<b>9.12</b>	<b>8.95</b>	<b>8.80</b>
<b>CASH OVERHEAD COSTS/ACRE</b>	<b>402</b>	<b>402</b>	<b>402</b>	<b>402</b>	<b>402</b>	<b>402</b>	<b>402</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>6,738</b>	<b>7,459</b>	<b>8,182</b>	<b>8,905</b>	<b>9,627</b>	<b>10,350</b>	<b>11,072</b>
<b>TOTAL CASH COSTS/CRTN</b>	<b>11.01</b>	<b>10.48</b>	<b>10.08</b>	<b>9.76</b>	<b>9.51</b>	<b>9.31</b>	<b>9.14</b>
<b>NON-CASH OVERHEAD COSTS/ACRE</b>	<b>1,201</b>	<b>1,201</b>	<b>1,201</b>	<b>1,201</b>	<b>1,201</b>	<b>1,201</b>	<b>1,201</b>
<b>TOTAL COSTS/ACRE</b>	<b>7,939</b>	<b>8,660</b>	<b>9,383</b>	<b>10,106</b>	<b>10,828</b>	<b>11,551</b>	<b>12,273</b>
<b>TOTAL COSTS/CRTN</b>	<b>12.97</b>	<b>12.16</b>	<b>11.56</b>	<b>11.08</b>	<b>10.70</b>	<b>10.39</b>	<b>10.13</b>

\*cartons = 37.5 pounds

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	612	712	812	912	1,012	1,112	1,212
11.00	396	775	1,152	1,529	1,907	2,284	2,662
12.00	1,008	1,487	1,964	2,441	2,919	3,396	3,874
13.00	1,620	2,199	2,776	3,353	3,931	4,508	5,086
14.00	2,232	2,911	3,588	4,265	4,943	5,620	6,298
15.00	2,844	3,623	4,400	5,177	5,955	6,732	7,510
16.00	3,456	4,335	5,212	6,089	6,967	7,844	8,722
17.00	4,068	5,047	6,024	7,001	7,979	8,956	9,934

NET RETURN PER ACRE ABOVE CASH COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	612	712	812	912	1,012	1,112	1,212
11.00	-6	373	750	1,127	1,505	1,882	2,260
12.00	606	1,085	1,562	2,039	2,517	2,994	3,472
13.00	1,218	1,797	2,374	2,951	3,529	4,106	4,684
14.00	1,830	2,509	3,186	3,863	4,541	5,218	5,896
15.00	2,442	3,221	3,998	4,775	5,553	6,330	7,108
16.00	3,054	3,933	4,810	5,687	6,565	7,442	8,320
17.00	3,666	4,645	5,622	6,599	7,577	8,554	9,532

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE \$/carton	*YIELD (cartons/acre)						
	612	712	812	912	1,012	1,112	1,212
11.00	-1,207	-828	-451	-74	304	681	1,059
12.00	-595	-116	361	838	1,316	1,793	2,271
13.00	17	596	1,173	1,750	2,328	2,905	3,483
14.00	629	1,308	1,985	2,662	3,340	4,017	4,695
15.00	1,241	2,020	2,797	3,574	4,352	5,129	5,907
16.00	1,853	2,732	3,609	4,486	5,364	6,241	7,119
17.00	-637	3,444	4,421	5,398	6,376	7,353	8,331

UC COOPERATIVE EXTENSION  
**Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
05	ATV 4WD	5,700	15	1,110	540	23	34	597
05	Pickup Truck 1/2 Ton	28,000	7	10,621	3,753	133	193	4,079
05	Weed Sprayer-Pull, ATV 55 gal	2,100	20	109	180	8	11	199
<b>TOTAL</b>		<b>35,800</b>		<b>11,840</b>	<b>4,473</b>	<b>164</b>	<b>238</b>	<b>4,875</b>
60% of new cost*		21,480		7,104	2,684	99	143	2,925

\*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	60,000	30		4,364	207	300	1,200	6,071
Drip Irrigation (10 acres)	12,500	40		832	43	63	250	1,187
Orchard Establishment (10 acres)	41,570	37		2,824	143	208	208	3,384
Fuel Tanks 2-250g	3,500	40	350	231	13	19	70	333
Gypsum Machine (1)	5,500	5		1,306	19	28	110	1,463
Land (65 acres)	390,000	40	390,000	23,439	0	3,900	0	27,339
Shop Tools	12,879	15	1,288	1,272	49	71	258	1,649
Wind Machine (6)	124,170	20	12,417	10,497	471	683	2,483	14,134
<b>TOTAL INVESTMENT</b>	<b>650,119</b>		<b>404,055</b>	<b>44,764</b>	<b>946</b>	<b>5,271</b>	<b>4,579</b>	<b>55,560</b>

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/		Price/ Unit	Total Cost
	Farm	Unit		
Liability Insurance	60	acre	8.82	529
Office Expense	60	acre	120.00	7,200

UC COOPERATIVE EXTENSION  
**Table 8. HOURLY EQUIPMENT COSTS**  
 SAN JOAQUIN VALLEY - SOUTH 2005

Yr	Description	COSTS PER HOUR							Total Costs/Hr.
		Actual Hours Used	Cash Overhead			Operating			
			Capital Recovery	Insur- ance	Taxes	Repairs	Fuel & Lube	Total Oper.	
05	ATV 4WD	133	2.44	0.11	0.15	0.53	0.52	1.05	3.75
05	Pickup Truck 1/2 Ton	265	8.49	0.30	0.44	2.05	6.47	8.52	17.75
05	Weed Sprayer-Pull, ATV 55 gal	75	1.45	0.06	0.09	0.54	0.00	0.54	2.14

## UC COOPERATIVE EXTENSION

**Table 9. OPERATIONS WITH EQUIPMENT & MATERIALS - LEMONS**  
SAN JOAQUIN VALLEY - SOUTH 2005

Operation	Operation		Field Labor Hr/Acre	Material	Broadcast Rate/Acre	Unit
	Month	Tractor				
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		0.50	UN32	33.30	lb N
	Mar		0.50	UN32	33.30	lb N
Weed: Pre-emergent (Princep, Karmex) 2X	Apr		0.10	UN32	33.40	lb N
	Mar	ATV		Princep	2.00	lb
				Karmex	2.00	lb
Weed: Pre-emergent (Princep, Karmex) 2X	Sept	ATV		Princep	2.00	lb
				Karmex	2.00	lb
Fertilize: foliar (N, Mn, Zn)	Mar	Custom		Urea LB	15.00	lb N
				Zinc Sulfate	2.00	lb
				Tecmangam (Mn)	2.00	lb
Irrigate	Apr		0.50	Water	3.30	acin
	May		0.80	Water	4.29	acin
	June		1.00	Water	5.61	acin
	July		1.10	Water	6.60	acin
	Aug		1.10	Water	6.60	acin
	Sept		0.80	Water	4.29	acin
	Oct		0.40	Water	2.31	acin
Prune: Top Trees, Stack & Shred Prunings	Apr	Custom				
Prune: Hedge All. Rows, Shred Prunings	Apr	Custom				
Prune: Hand Prune & Stack, Shred Prunings	Apr	Custom				
Soil Amendment:(Soluble Gypsum) w/irrigation	Apr		0.30	Gypsum	0.11	ton
	May		0.30	Gypsum	0.14	ton
	June		0.30	Gypsum	0.17	ton
	July		0.30	Gypsum	0.21	ton
	Aug		0.30	Gypsum	0.17	ton
	Sept		0.30	Gypsum	0.14	ton
	Oct		0.30	Gypsum	0.06	ton
Weed: Spot Spray (Roundup) 3X	Apr	ATV		Roundup	0.20	pt
	June	ATV		Roundup	0.20	pt
	Aug	ATV		Roundup	0.20	pt

UC COOPERATIVE EXTENSION  
**Table 9. CONTINUED**  
 SAN JOAQUIN VALLEY - South 2005

Operation	Operation		Implement	Field Labor	Material	Broadcast	
	Month	Tractor		Hr/Acre		Rate/acre	Unit
Fertilizer: foliar (N). Insect: Katydid (Success, Oil)	May	Custom			Success	6.00	oz
					415 Oil	0.50	gal
					Urea LB	15.00	lb N
Insect: Scale (Esteem)	July	Custom			Esteem	17.00	floz
Leaf Analysis (1 sample/10 acres)	Sept	Custom		0.10	Analysis	31.00	ea
Disease: Brown Rot (Lime, Kocide)	Oct	Custom			Lime	10.00	lb
					Kocide	10.00	lb
					Gib Gro	32.00	gram
Growth Regulators: (GibGro or GA)	Oct	Custom			Hivol	1.25	floz
Growth Regulator: (Hivol)]	Nov	Custom					
Harvest: Pick & Haul	Apr	Custom				379.00	crtn
	Oct	Custom				380.00	crtn
	Dec	Custom				380.00	crtn
Harvest: Pack	Apr	Custom				304.00	crtn
	Oct	Custom				304.00	crtn
	Dec	Custom				304.00	crtn