
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2011

**SAMPLE COSTS TO ESTABLISH A
CITRUS ORCHARD AND PRODUCE**

MANDARINS

TANGO



SAN JOAQUIN VALLEY - South

Low-Volume Irrigation

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CONTENTS

INTRODUCTION	2
ASSUMPTIONS.....	3
Establishment Operating Costs.....	3
Production Operating Costs	6
Labor, Equipment and Interest.....	9
Cash Overhead.....	10
Non-Cash Overhead.....	10
REFERENCES	12
Table 1. COSTS PER ACRE TO ESTABLISH A MANDARIN ORCHARD (TANGO).....	13
Table 2. MATERIALS & CUSTOM WORK COSTS PER ACRE – ESTABLISHMENT YEARS	14
Table 3. COSTS PER ACRE TO PRODUCE MANDARINS (TANGO).....	16
Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE MANDARINS (TANGO).....	17
Table 5. MONTHLY CASH COSTS PER ACRE TO PRODUCE MANDARINS (TANGO)	19
Table 6. RANGING ANALYSIS	20
Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT & BUSINESS OVERHEAD COSTS....	21
Table 8. HOURLY EQUIPMENT COSTS	21
Table 9. OPERATIONS WITH EQUIPMENT & MATERIALS	22

INTRODUCTION

Sample costs to establish a mandarin orchard and produce Tango mandarins under low volume irrigation in the Southern San Joaquin Valley are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the crop and area, but will not apply to every situation. Sample costs for labor, materials, equipment, and custom services are based on current figures. A blank column titled “Your Costs” is available in Table 3 and Table 4 to enter your own 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 at (530) 752-3589, or contact your local UC Cooperative Extension office.

Sample Cost of Production Studies for current and archived commodities are available at <http://coststudies.ucdavis.edu> or can be requested from the Department of Agricultural and Resource Economics, UC Davis, (530) 752-4461 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 a Tango mandarin orchard and produce Tango mandarins in the southern San Joaquin Valley. **The production data is derived from the W. Murcott variety and used as a proxy for the Tango variety.** 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 and types of cultural practices will vary among growers within the region and from season to season due to variables such as weather, soil, and insect and disease pressure. **The use of trade names and cultural practices in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of other similar products or cultural practices.**

Land. The hypothetical farm consists of 65 contiguous acres. Establishment and production costs are based on ten acres being planted to Tango mandarins. Mature citrus trees are on 50 acres and the remaining five acres are roads, equipment and shop area, and homestead. The grower owns and operates 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 and 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 acreage (10 acres in this case) may have a minimum fee or additional equipment delivery charges. Some of these costs are included in the study.

Planting. Planting the orchard starts by marking tree sites (layout orchard). Holes are then dug and the trees are planted in February or March. The trunks are wrapped with a foam wrap to shield them from sunburn and to reduce sucker development. Also, about 2% of the trees or 4 trees per acre are assumed to be replaced in the second year.

Trees. Tree costs are for the citrus Tango variety. A royalty fee is added to the cost on patented varieties. The trees are planted on 12 X 20-foot spacing, 181 trees per acre. Tree spacing and densities in orchards vary. Many new orchards are planted closer for earlier production. Citrus 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	4.42
2	Sucker	5.50
3	Sucker	6.00
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	3.3
2	7.4
3	11.5
4	17.2
5	23.0
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. In some areas, wind machine installation is often delayed until significant fruit is produced, sometimes as late as the seventh or eighth establishment 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 lack of,

Table C. Frost Protection Procedures

Year	water	Ac-in	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

or 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.

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 third year, the micronutrients are applied as a foliar fertilizer with the March orange worm 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 Mandarin Orchards

Year	Lbs. of N			
	per tree	per acre	drip line	foliar
1	0.10	18.10	15.65	2.45
2	0.20	36.20	31.93	4.27
3	0.30	54.30	48.16	6.14
4	0.40	72.40	52.40	20.00
5	0.50	90.50	60.50	30.00
6	0.60	108.60	78.60	30.00
7+	0.70	126.70	96.70	30.00

Leaf/Tissue Sampling. An analytical lab or the PCA takes leaf samples sometime from mid-August through mid-October for nutrition analysis. For this study, one sample per 10 acres is taken.

Soil Amendments. Beginning in the third year of this study, soluble gypsum is applied through the drip lines with each irrigation. A total of one-ton per acre per year is applied each season. Citrus growers commonly apply gypsum, sulfur, calcium, lime and other materials for improving water infiltration and soil pH. Individual 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*, found at the UC IPM website <http://www.ipm.ucdavis.edu/PMG/selectnewpest.citrus.html>. 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 and August) in the tree row during the spring and summer using Roundup Power Max herbicide. In the first year a custom operator discs the floor middles three times (April, May and June). From the second year on residual/pre-emergent herbicides, Prowl H₂O and Matrix are applied to the orchard floor in the fall (October) and in the spring (March) using half of the maximum rate for each application.

Insects. Insects treated in this study are citrus thrips (*Scirtothrips citri*), katydids (*Scudderia furcata*), and larvae of Lepidoptera species (orange worms) such as citrus cutworm (*Xylomyges curialis*) and fruit tree leaf roller (*Archips argyrospilus*). See the UC IPM website for full orange worm list. Control for citrus thrips, orange worms, and katydids begin in the third year. Orange worms 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 third and fourth year, 50% and in the fifth year, 75% of the recommended spray volume is applied. Thrips and katydids are treated with Delegate 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 third year for fruit protection rather than foliage protection. In this study, California red scale (*Aonidiella aurantii*) is not treated on young trees, as it is primarily an economic problem when found on the fruit. However, heavy infestations of the California red scale may inflict serious damage on the tree, including leaf yellowing and drop, dieback of twigs and limbs, and potentially death of a tree. See the UC IPM website for more information about the California red scale.

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 second year, brown rot (*Phytophthora spp.*) and septoria spot (*Septoria spp.*) are regulated with a Kocide (copper) and a hydrated lime application. A custom applicator applies the insect and disease materials by ground using 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 these 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 estimated yields are shown in Table E.

Year	Field Bins (900 lbs.)	Total Crtns/Bin Equivalent (5 lbs.)	Packed Cartons (5 lbs.)
3	4.8	864	605
4	13.4	2,412	1,688
5	25.0	4,500	3,150
6	33.0	5,940	4,158
7	38.0	6,840	4,788
8+	38.0	6,840	4,788

Returns. See Returns in Production section.

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 annually. The activities are performed in the following order: (1) hedge each row – each tree is hedged on both sides, (2) top all trees and (3) hand prune. 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. In this study, pruning is done after harvest, usually in March or April. The prunings generally require shredding.

Fertilization. Nitrogen (N) as UN-32 is applied through the irrigation system (not necessarily with an irrigation) in several applications during January, February, March, and April. Foliar applications of N as low-biuret urea plus minor nutrients, zinc sulfate and manganese (Tecmangam), are mixed and sprayed with the March orange worm 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 an agricultural lab or 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 (\$2.60 per gallon) per hour. The frost protection cost includes the fuel use and labor to operate the machines and 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. For information and pesticide use permits, contact the local county agricultural commissioner's office. **Growers with fruit destined for the export market, must use registered products that meet maximum residue limits (MRL) for that country.** Check the MRLs at www.calcitrusquality.org.

Pest Control Adviser (PCA). Written recommendations for pesticide use are often 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 PCA monitors the crops for pest, disease, and nutrition.

Weeds. Pre-emergent herbicides (Prowl H₂O and Matrix) 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 and August – with Roundup Power Max. Check with your farm advisor or PCA prior to applying.

Insects. Orange worms (Lepidoptera) are sprayed primarily in March with Dipel insecticide. Citrus thrips and katydid are treated in May and citrus thrips only in June. Delegate insecticide and oil are used in both applications. Urea and micronutrients are mixed with the orange worm 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. In this study, brown rot is the primary pre-harvest fruit disease that occurs and is controlled by spraying a Kocide (copper) and hydrated lime mixture in October or November. The same fungicide mixture also controls Septoria spot. Brown rot develops in the fall initially on fruit that is close in proximity 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, *Cantareus asperses* (= *Helix aspersa*), 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 orange worms 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. Growth regulators are applied to Tango mandarin trees only. Citrus Fix (2, 4-D) treatments are applied in mid-to-late October to minimize pre-harvest fruit-drop. The growth regulator is applied to the whole orchard.

Harvest. Tango mandarin trees, at the specified density, typically reach full production by the 8th year. The crop is hand-picked and hauled by a contracted harvesting company.

Typically, one-third of the orchard is picked in three harvests over the growing season. Tango mandarins are hand-picked and put into field bins that hold 900 pounds of fruit. The mandarins are hauled from the field to a packinghouse where they are washed, graded, sized, and packed. Picking, forklift operation, hauling, packing, and marketing costs from the field to the packinghouse are paid by the grower. Current rates for these services vary; picking, forklift operation and hauling costs are \$62.70 per bin and the packinghouse costs are \$1.53 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 Tango mandarin annual yields are measured in 900-pound field bins per acre, but are typically sold by packed cartons that weigh 5 pounds. A 900-pound bin is calculated as 180 cartons. Packed cartons represent 70% of the fruit picked. The assumed average pack-out yield over the remaining orchard life is 4,788 cartons per acre.

Returns. An estimated price based on past returns of \$3.95 per carton, FOB packinghouse, is used in this study. Returns over a range of yields are shown in Table 6.

Assessments. Commercial citrus producers pay three assessments.

State Marketing Order. This assessment, currently \$0.03 per 40-pound field box, is used to fund industry research programs. This is equivalent to \$0.675 per 900-pound bin or \$0.005 per packed 5-pound carton.

California Citrus Improvement Program. This assessment charges citrus growers \$1.1475 per 900-pound field bin or \$0.009 per packed 5-pound carton.

Citrus Pest Disease Prevention. This assessment charges growers \$1.9125 per 900-pound field bin or \$0.015 per packed 5-pound carton.

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 \$14.28 per hour for machine operators and \$10.88 for general labor includes payroll overhead of 36%. 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, 2011 (personal email from California Department of Insurance, March 2011, 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 \$3.44 (excludes excise tax) and \$3.85 per gallon, respectively. Fuel costs are derived from the Energy Information Administration, 2011 January to June 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 2011.

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 0.775% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$587 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 2011.

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 mandarins are harvested minus any returns from production. The Total Accumulated Net Cash Cost on Table 1, in the fourth year represents the establishment cost. For this study the cost is \$8,011 per acre, or \$80,110 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. In this study, 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 every ten years, but is not separated out in this study.

Land. Land values for bare or row crop land range from \$6,500 to \$11,000 per acre (Trends & Leases 2011), depending on water availability. Land with citrus orchards range from \$15,000 to \$20,000 per acre. Current real estate listings for bare land values range from \$9,000 to \$10,000. The land on which the orchard is planted in this study is valued at \$9,500 per acre.

Building. The shop building is a 1,800 square foot metal building 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 one machine in the new planting. 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 mandarins.

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 A MANDARIN ORCHARD (TANGO)
 SAN JOAQUIN VALLEY - SOUTH 2011

	Cost/Acre					
	YEAR:	1 st	2 nd	3 rd	4 th	5 th
PACKOUT YIELD (5 lb. Cartons/Acre):				605	1,688	3,150
Planting Costs:						
Land Preparation – Remove Orchard & Chip		375				
Land Preparation - Rip		250				
Land Preparation - Disc 2X & Level (triplane)		125				
Trees: 181/Acre (2% replant in 2nd year)		2,226	49			
Plant: Layout, Plant & Wrap		190	4			
TOTAL PLANTING COSTS/ACRE		3,166	53			
Cultural:						
Prune And Sucker		48	60	65	49	65
Irrigate		79	124	161	245	307
Frost Protection (Yrs. 1-3, water. Year 4+, water & wind machine)		27	40	40	427	427
Fertilizer: Foliar Spray N, Mn & Zn (Year 3+, Dipel)		18	20	29	51	59
Fertilizer: Irrigation with N (UN32)		12	24	36	39	45
Insect/Fertilizer: Thrips, Katydid (Delegate & Oil)/Foliar (N)				53	76	94
Insect: Ants (Clinch)		4	4	4		
Weed: Pre-emergent orchard floor (Prowl H ₂ O & Matrix)			91	91	91	91
Weed: Spot Spray (Roundup Power Max)		16	16	16	16	16
Weed: Disc (Custom)		165				
Disease: Brown Rot (Lime & Kocide)			19	39	63	73
Soil Amendments: Soluble Gypsum				174	174	174
Pickup Truck Use		102	102	102	102	102
ATV Use		62	62	62	62	62
Leaf Analysis (1 sample/10 acres)				7	7	7
PCA/Consultant Services		35	35	35	35	35
TOTAL CULTURAL COSTS/ACRE		568	596	914	1,437	1,557
Harvesting Costs:						
Picking, Forklift & Hauling				301	840	1,568
Packing				926	2,583	4,820
Assessments				18	51	96
TOTAL HARVEST COSTS/ACRE				1,245	3,474	6,483
Interest on Operating Capital at 5.75%		210	23	41	69	84
TOTAL OPERATING COSTS/ACRE		3,945	673	2,200	4,980	8,124
Cash Overhead Costs:						
Office Expenses		125	125	125	125	125
Liability Insurance		10	10	10	10	10
Property Taxes		118	118	136	136	136
Property Insurance		12	12	26	26	26
Investment Repairs		58	58	120	120	125
TOTAL CASH OVERHEAD COSTS/ACRE		323	322	417	417	421
TOTAL CASH COSTS/ACRE		4,268	995	2,617	5,397	8,545
Non-Cash Overhead Costs:						
Buildings		66	66	66	66	66
Drip Irrigation System		87	87	87	87	87
Fuel Tanks and Pumps		3	3	3	3	3
Gypsum Machine				195	195	195
Land		489	489	489	489	489
Shop Tools		24	24	24	24	24
Equipment		45	42	42	41	41
Wind Machine				189	189	189
TOTAL NON-CASH OVERHEAD COSTS		715	711	1,095	1,094	1,095
TOTAL COSTS/ACRE		4,983	1,706	3,712	6,491	9,640
INCOME FROM PRODUCTION				2,390	6,668	12,443
NET TOTAL COST FOR THE YEAR		4,983	1,706	1,322	-177	-2,802
PROFIT ABOVE CASH COSTS					177	2,802
ACCUMULATED NET TOTAL CASH COSTS		4,983	6,689	8,011	8,233	5,431

UC COOPERATIVE EXTENSION
Table 2. MATERIAL AND CUSTOM WORK COSTS PER ACRE - ESTABLISHMENT YEARS
 SAN JOAQUIN VALLEY - SOUTH 2011

OPERATING COSTS	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5	
			Units	\$	Units	\$	Units	\$	Units	\$	Units	\$
Custom:												
Orchard Removal (Removal & Chip)	acre	375.00	1.00	375								
Deep Ripping	acre	250.00	1.00	250								
Disc and Level (Triplane)	acre	125.00	1.00	125								
Ground Spray - Copper/Fertilizer	acre	35.00	0.43	15	0.43	15	0.57	20	1.00	35	1.00	35
Ground Spray - Orange worm	acre	35.00					0.57	20	1.00	35	1.00	35
Ground Spray - Thrips	acre	35.00					0.57	20	1.00	35	1.00	35
Weed (Disc Middle)	acre	55.00	3.00	165								
Harvest: Picking, Forklift & Hauling	bin	62.70					4.80	301	13.40	840	25.00	1568
Packing & Material	crtn	1.53					864.00	1322	1688.00	2583	3150.00	4820
Leaf Analysis (Nutrients)	each	68.00					0.10	7	0.10	7	0.10	7
PCA Fees	acre	35.00	1.00	35	1.00	35	1.00	35	1.00	35	1.00	35
Assessment:												
Cal. Citrus Improvement Program (CCIP)	crtn	0.01					605.00	6	1688.00	17	3150.00	32
Citrus Pest Disease Prevention (CPDP)	crtn	0.01					605.00	9	1688.00	25	3150.00	47
State Marketing Order	crtn	0.01					605.00	3	1688.00	9	3150.00	17
Tree/Tree Aids:												
Mandarin (Tango) Tree	tree	12.30	181.00	2226	4.00	49						
Layout, Planting & Wrapping	tree	1.05	181.00	190	4.00	4						
Irrigation/Frost Protection:												
Wind Machine Operation	hr/ac	39.00							10.00	390	10.00	390
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	3.30	35	7.44	80	10.89	117	17.22	185	23.00	247
Fertilizer:												
Urea Low Biuret (46-0-0)	lb. N	1.06	2.45	3	4.27	5	6.14	7	20.00	21	30.00	32
Zinc Sulfate 36%	lb.	0.64	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
Tecmangan (31%Mn)	lb.	0.73	0.50	0	0.50	0	0.50	0	0.50	0	0.50	0
UN 32 (32-0-0)	lb. N	0.74	15.65	12	31.93	29	48.16	36	52.40	39	60.50	45
Soluble Gypsum (Soil Amendment)	ton	162.60					1.00	163	1.00	163	1.00	163
Herbicide:												
Roundup Power Max	pint	2.40	0.60	1	0.60	1	0.60	1	0.60	1	0.60	1
Prowl H ₂ O	pin	5.86			1.00	6	1.00	6	1.00	6	1.00	6
Matrix	oz	19.95			4.00	80	4.00	80	4.00	80	4.00	80
Insecticide:												
Clinch Ant Bait	lb.	12.16	0.33	4	0.33	4	0.33	4				
Dipel ES	pint	5.10					1.00	5	1.00	5	1.50	8
Delegate	oz	8.96					3.00	27	3.00	27	4.50	40
Spray Oil 415	gal	6.30					0.50	3	0.50	3	0.50	3

UC COOPERATIVE EXTENSION
Table 2. Continued
 SAN JOAQUIN VALLEY - SOUTH 2011

OPERATING COSTS	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5	
			Units	\$	Units	\$	Units	\$	Units	\$	Units	\$
Fungicide:												
Hydrated Lime	lb.	0.25			5.00	1	5.00	1	7.50	2	10.00	3
Kocide 20/20	lb.	3.53			5.00	18	5.00	18	7.50	26	10.00	35
Equipment Operator Labor	hrs	14.28	8.93	128	9.23	132	9.23	132	9.20	131	9.20	131
Non-Machine Labor	hrs	10.88	9.42	102	11.00	120	11.55	137	12.27	134	13.77	150
Fuel-Gas	gal	3.85	9.15	35	9.21	35	9.21	35	9.20	35		35
Lube				5		5		5		5		5
Machinery Repair				11		12		12		12		12
Interest on Operating Capital at 5.75%				210		22		42		69		84
TOTAL OPERATING COSTS/ACRE				3,945		673		2,598		4,979		8,124

UC COOPERATIVE EXTENSION
Table 3. COSTS PER ACRE TO PRODUCE MANDARINS (TANGO)
 SAN JOAQUIN VALLEY - SOUTH 2011

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre				Total Cost	Your Costs
		Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:							
Frost Protection (Water & Wind Machine)	2.19	24	0	414	0	437	
Fertilize: N (UN32 through drip line)	0.20	2	0	72	0	74	
Weed: Pre-emergent (Prowl H ₂ O & Matrix)	0.25	4	1	86	0	91	
Insect/Fertilizer: Orange worm (Dipel)/N Mn Zn	0.00	0	0	29	35	64	
Prune: Top Trees & Shred Prunings	0.00	0	0	0	100	100	
Prune: Hedge Rows & Shred Prunings	0.00	0	0	0	65	65	
Prune: Hand Prune & Shred Prunings	0.00	0	0	0	300	300	
Irrigate: Water & Labor	5.55	60	0	323	0	383	
Soil Amendment: Soluble Gypsum with irrigation	8.75	95	0	163	0	258	
Weed: Spot Spray (Roundup Power Max)	0.75	13	2	1	0	16	
Insect/Fertilizer: Thrips, Katydid (Delegate & Oil)/N	0.00	0	0	73	35	108	
Insect: Thrips (Delegate & Oil)	0.00	0	0	57	35	92	
Insect: Scale (Esteem)	0.00	0	0	72	85	157	
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: Citrus Fix	0.00	0	0	11	53	64	
Pickup Truck Use	3.33	57	45	0	0	102	
ATV Use	3.33	57	5	0	0	62	
PCA/Consultant Services	0.00	0	0	0	35	35	
TOTAL CULTURAL COSTS	24.41	314	52	1,337	784	2,487	
Harvest:							
Picking, Forklift and Hauling	0.00	0	0	0	2,385	2,385	
Sorting, Packing and Materials	0.00	0	0	0	7,326	7,326	
Assessments	0.00	0	0	146	0	146	
TOTAL HARVEST COSTS	0.00	0	0	146	9,711	9,856	
Interest on Operating Capital at 5.75%						215	
TOTAL OPERATING COSTS/ACRE	24.41	314	52	1,483	10,495	12,559	
CASH OVERHEAD:							
Liability Insurance						10	
Office Expenses						125	
Property Taxes						182	
Property Insurance						113	
Investment Repairs						100	
TOTAL CASH OVERHEAD COSTS/ACRE						529	
TOTAL CASH COSTS/ACRE						13,088	
NON-CASH OVERHEAD:							
		Per Producing Acre		Annual Cost Capital Recovery			
Building: 1,800 sqft		1,050		66		66	
Drip Irrigation System		1,550		87		87	
Fuel Tanks 2-250g		58		3		3	
Gypsum Machine		850		195		195	
Land		10,292		489		489	
Establishment Cost		8,011		464		464	
Shop Tools		250		24		24	
Wind Machine (1)		2,500		153		153	
Equipment		403		44		44	
TOTAL NON-CASH OVERHEAD COSTS		24,964		1,525		1,525	
TOTAL COSTS/ACRE						14,613	

UC COOPERATIVE EXTENSION
Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE MANDARINS (TANGO)
 SAN JOAQUIN VALLEY - SOUTH 2011

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Costs
GROSS RETURNS					
Mandarins (Tango) Mature	4,788	crtn*	3.95	18,913	
OPERATING COSTS					
Frost Protection:					
Water	2.20	acin	10.75	24	
Wind Machine Operation (propane at \$2.60/gal)	10.00	hour	39.00	390	
Fertilizer:					
UN 32 (32-0-0)	96.70	lb N	0.74	72	
Urea Low Biuret (46-0-0)	30.00	lb N	1.06	32	
Zinc Sulfate 36%	2.00	lb	0.64	1	
Tecmangam (31%Mn)	2.00	lb	0.73	1	
Soil Amendments:					
Gypsum Soluble	1.00	ton	162.60	163	
Herbicide:					
Prowl H2O	1.00	pin	5.86	6	
Matrix	4.00	oz	19.95	80	
Roundup Power Max	0.60	pint	2.40	1	
Insecticide:					
Dipel ES	2.00	pint	5.10	10	
Delegate	12.00	oz	8.96	108	
Spray Oil 415	1.00	gal	6.30	6	
Esteem	17.00	floz	4.26	72	
Custom/Contract:					
Harvest- Picking, Forklift & Hauling	38.00	bin	62.70	2,385	
Packing & Material	4,788.00	crtn	1.53	7,326	
Spray Ground - Orange worm	1.00	acre	35.00	35	
Prune-Top	1.00	acre	35.00	35	
Stack & Shred Prunings	1.00	acre	65.00	65	
Prune-Hedge	1.00	acre	35.00	35	
Stack & Shred Prunings	2.00	acre	30.00	60	
Prune-Hand, Stack & Shred Prunings	1.00	acre	270.00	270	
Spray Ground - Thrips	2.00	acre	35.00	70	
Spray Ground - Scale	1.00	acre	85.00	85	
Leaf Analysis	0.10	each	68.00	7	
Spray Ground - Copper or Fertilizer	1.00	acre	35.00	35	
Spray Ground - Growth Regulator	1.00	acre	52.50	53	
PCA Fees	1.00	acre	35.00	35	
Irrigation:					
Water	30.00	acin	10.75	323	
Fungicide:					
Hydrated Lime	10.00	lb	0.25	3	
Kocide 20/20	10.00	lb	3.53	35	
Growth Regulators:					
Citrus Fix (2, 4-D)	2.50	floz	4.41	11	
Assessment:					
Cal Citrus Improvement Program (CCIP)	4,788.00	box	0.01	48	
Citrus Pest Disease Prevention (CPDP)	4,788.00	box	0.02	72	
State Marketing Order	4,788.00	box	0.01	26	

UC COOPERATIVE EXTENSION
Table 4. Continued
 SAN JOAQUIN VALLEY - SOUTH 2011

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
Labor (Machine)	9.20	hrs	14.28	131	
Labor (Non-machine)	16.74	hrs	10.88	182	
Fuel-Gas	9.20	gal	3.85	35	
Lube				5	
Machinery Repair				12	
Interest on Operating Capital at 5.75%				215	
TOTAL OPERATING COSTS/ACRE				12,559	
NET RETURNS ABOVE OPERATING COSTS				6,459	
CASH OVERHEAD COSTS					
Liability Insurance				10	
Office Expenses				125	
Property Taxes				182	
Property Insurance				113	
Investment Repairs				100	
TOTAL CASH OVERHEAD COSTS/ACRE				530	
TOTAL CASH COSTS/ACRE				13,088	
NON-CASH OVERHEAD COSTS					
Buildings (1,800 sqft)				66	
Drip Irrigation				87	
Fuel Tanks 2-250g				3	
Gypsum Machine				195	
Land				489	
Establishment Cost				464	
Shop Tools				24	
Wind Machine (1)				153	
Equipment				44	
TOTAL NON-CASH OVERHEAD COSTS				1,525	
TOTAL COST/ACRE				14,613	
TOTAL COST/CARTON				3	
NET RETURNS ABOVE TOTAL COST				4,300	

*carton = 5 lbs.

UC COOPERATIVE EXTENSION

Table 5. MONTHLY CASH COSTS PER ACRE TO PRODUCE MANDARINS (TANGO)

SAN JOAQUIN VALLEY - SOUTH 2011

Beginning 04-11	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	TOTAL
Ending 04-12	11	11	11	11	11	11	11	11	11	12	12	12	12	
Cultural:														
Prune: Top Trees, Stack & Shred Prunings	100													100
Prune: Hedge Rows, Shred Prunings	65													65
Prune: Hand Prune, Stack & Shred Prunings	300													300
Irrigate (Water & Labor)	43	52	65	82	65	52	25							383
Soil Amendment: Soluble Gypsum w/ Irrigation	31	36	41	48	41	36	23							258
Weed: Spot Spray (Roundup Power Max)	5		5		5									16
Insect/Fertilizer: Thrips, Katydid (Delegate & Oil)/N		108												108
Insect: Thrips (Delegate & Oil)			92											92
Insect: Scale (Esteem)				157										157
Leaf Analysis (1 sample/10 acres)						7								7
Weed: Pre-emergent(Prowl&Matrix)							43					48		91
Disease: Brown Rot (Lime & Kocide)							73							73
Growth Regulators (Citrus Fix)							64							64
Frost Protection (Water & Wind Machines)								148	145	144				437
Fertilize: N (drip line)										24		25	25	74
Insect/Fertilizer: Orange worm (Dipel)/N Mn Zn												64		64
Pickup Truck Use	8	8	8	8	8	8	8	8	8	8	8	8	8	102
ATV Use	5	5	5	5	5	5	5	5	5	5	5	5	5	62
PCA/Consultant Services	3	3	3	3	3	3	3	3	3	3	3	3	3	35
TOTAL CULTURAL COSTS	560	211	218	302	127	111	243	164	160	184	15	152	40	2,487
Harvest:														
Picking & Forklift & Hauling										794		796	794	2,385
Sort & Pack										2,442		2,442	2,442	7,326
Assessments										49		49	49	146
TOTAL HARVEST COSTS	-	-	-	-	-	-	-	-	-	3,285	-	3,287	3,285	9,856
Interest on Operating Capital at 5.75%	3	4	5	6	7	7	8	9	10	27	27	43	59	215
TOTAL OPERATING COSTS/ACRE	563	215	223	309	133	118	252	173	170	3,495	42	3,482	3,384	12,558
OVERHEAD														
Liability Insurance														10
Office Expenses	10	10	10	10	10	10	10	10	10	10	10	10	10	125
Property Taxes														182
Property Insurance				56						56				113
Investment Repairs	8	8	8	8	8	8	8	8	8	8	8	8	8	100
TOTAL CASH OVERHEAD COSTS	18	18	18	75	18	18	18	18	18	75	18	18	18	530
TOTAL CASH COSTS/ACRE	581	233	241	383	151	136	270	191	188	3,570	60	3,500	3,402	13,088

UC COOPERATIVE EXTENSION
Table 6. RANGING ANALYSIS
 SAN JOAQUIN VALLEY - SOUTH 2011

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE MANDARINS (TANGO)

	YIELD (cartons/acre)*						
	2,898	3,528	4,158	4,788	5,418	6,048	6,678
OPERATING COSTS:							
Cultural Cost	2,487	2,487	2,487	2,487	2,487	2,487	2,487
Harvest Cost	8,560	8,992	9,424	9,856	10,289	10,720	11,153
Interest on operating capital at 5.75%	209	211	213	215	217	219	221
TOTAL OPERATING COSTS/ACRE	11,256	11,690	12,124	12,559	12,993	13,427	13,861
Total Operating Costs/Carton	3.88	3.31	2.92	2.62	2.40	2.22	2.08
CASH OVERHEAD COSTS/ACRE	530	530	530	530	530	530	530
TOTAL CASH COSTS/ACRE	11,785	12,220	12,654	13,088	13,523	13,957	14,391
Total Cash Costs/ Carton	4.07	3.46	3.04	2.73	2.50	2.31	2.15
NON-CASH OVERHEAD COSTS/ACRE	1,525	1,525	1,525	1,525	1,525	1,525	1,525
TOTAL COSTS/ACRE	13,310	13,745	14,179	14,613	15,047	15,481	15,916
Total COSTS/CARTON	4.59	3.90	3.41	3.05	2.78	2.56	2.38

*Cartons = 5 lbs.

NET RETURNS PER ACRE ABOVE OPERATING COSTS

Price \$/carton	YIELD (cartons/acre)*						
	2,898	3,528	4,158	4,788	5,418	6,048	6,678
3.50	-1,113	658	2,429	4,199	5,970	7,741	9,512
3.65	-678	1,187	3,053	4,918	6,783	8,648	10,513
3.80	-243	1,716	3,676	5,636	7,595	9,556	11,515
3.95	191	2,245	4,300	6,354	8,408	10,463	12,517
4.10	626	2,775	4,924	7,072	9,221	11,370	13,518
4.25	1,061	3,304	5,547	7,790	10,033	12,277	14,520
4.40	1,495	3,833	6,171	8,509	10,846	13,184	15,522

NET RETURNS PER ACRE ABOVE CASH COSTS

Price \$/carton	YIELD (cartons/acre)*						
	2,898	3,528	4,158	4,788	5,418	6,048	6,678
3.50	-1,642	128	1,899	3,670	5,440	7,211	8,982
3.65	-1,208	657	2,523	4,388	6,253	8,119	9,984
3.80	-773	1,186	3,147	5,106	7,066	9,026	10,985
3.95	-338	1,716	3,770	5,824	7,878	9,933	11,987
4.10	96	2,245	4,394	6,543	8,691	10,840	12,989
4.25	531	2,774	5,018	7,261	9,504	11,747	13,991
4.40	966	3,303	5,641	7,979	10,317	12,655	14,992

NET RETURNS PER ACRE ABOVE TOTAL COSTS

Price \$/carton	YIELD (cartons/acre)*						
	2,898	3,528	4,158	4,788	5,418	6,048	6,678
3.50	-3,167	-1,396	375	2,145	3,916	5,687	7,457
3.65	-2,732	-867	998	2,863	4,728	6,594	8,459
3.80	-2,298	-338	1,622	3,582	5,541	7,501	9,461
3.95	-1,863	191	2,246	4,300	6,354	8,409	10,463
4.10	-1,428	720	2,869	5,018	7,167	9,316	11,464
4.25	-994	1,250	3,493	5,736	7,979	10,223	12,466
4.40	-559	1,779	4,117	6,454	8,792	11,130	13,468

*Cartons = 5 lbs.

UC COOPERATIVE EXTENSION
Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 SAN JOAQUIN VALLEY - SOUTH 2011

ANNUAL EQUIPMENT COSTS

Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		
						Insurance	Taxes	Total
11	ATV 4WD	6,700	15	1,304	573	31	40	644
11	Pickup Truck, 1/2 ton	32,000	7	12,139	3,978	171	221	4,370
11	Weed Sprayer-Pull, ATV 55 gal	3,400	20	177	262	14	18	293
TOTAL		42,100		13,620	4,813	216	279	5,307
60% of new cost*		25,260		8,172	2,888	130	167	3,184

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead			
					Insurance	Taxes	Repairs	Total
Building (1,800 sq ft)	63,000	30	0	3,982	244	315	1,260	5,801
Drip Irrigation (10 acres)	15,500	40	0	873	60	78	310	1,320
Fuel Tanks 2-250g	3,500	40	350	194	15	19	70	298
Gypsum Machine (10 acres)	8,500	5	0	1,950	33	43	170	2,195
Land (65 acres)	617,500	40	617,500	29,331	4,786	6,175	0	40,292
Establishment Cost (10 acres)	80,110.00	37	0.00	4,638.24	31.05	400.55	0.00	5,069.84
Shop Tools	15,000	15	0	1,421	58	75	300	1,854
Wind Machine (1)	25,000	20	14,040	1,528	151	195	250	2,124
TOTAL INVESTMENT	828,110	227	631,890	43,917	5,378	7,300	2,360	58,955

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/		Price/	Total
	Farm	Unit	Unit	Cost
Liability Insurance	60	acre	9.78	587
Office Expense	60	acre	125.00	7,500

UC COOPERATIVE EXTENSION
Table 8. HOURLY EQUIPMENT COSTS
 SAN JOAQUIN VALLEY - SOUTH 2011

Yr.	Description	COSTS PER HOUR							
		Actual Hours Used	Capital Recovery	Cash Overhead		Operating			Total Costs/Hr.
				Insurance	Taxes	Lube & Repairs	Fuel	Total Oper.	
11	ATV 4WD	130	2.64	0.14	0.18	0.76	0.77	1.53	4.50
11	Pickup Truck, 1/2 ton	265	9.00	0.39	0.50	3.98	9.63	13.61	23.49
11	Weed Sprayer-Pull, ATV 55 gal	72	2.18	0.12	0.15	0.92	0.00	0.92	3.37

UC COOPERATIVE EXTENSION
Table 9. OPERATIONS WITH EQUIPMENT & MATERIALS
 SAN JOAQUIN VALLEY - SOUTH 2011

Operation	Operation			Field Labor		Rate/	
	Month	Tractor	Implement	Hr/Acre	Material	acre	Unit
Frost Protection (Water & Wind Machine)	Jan			0.73	Water	0.73	acin
					Wind Machine	3.30	hour
	Nov			0.73	Water	0.73	acin
					Wind Machine	3.40	hour
	Dec			0.73	Water	0.74	acin
					Wind Machine	3.30	hour
Fertilize - Nitrogen thru Drip	Jan			0.10	UN 32	32.23	lb. N
	Mar			0.10	UN 32	32.23	lb. N
	Apr			0.10	UN 32	32.23	lb. N
Weed-Pre-emergent(Prowl H ₂ O & Matrix)	Mar	ATV 4WD	Weed Sprayer	0.30	Prowl H ₂ O	0.50	pin
					Matrix	2.00	oz
	Oct	ATV 4WD	Weed Sprayer	0.30	Prowl H ₂ O	0.50	pin
Insect/Fertilizer: Orange worm (Dipel) /N Mn Zn	Mar				Matrix	2.00	oz
					Dipel ES	2.00	pint
					Urea Low Biuret	15.00	lb. N
					Tecmangam	2.00	lb.
Irrigate	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			0.35	Water	2.00	acin
	Top Trees, Stack & Shred	Apr	Custom			Prune-Top	1.00
Hedge Tree & Shred	Apr	Custom			Prune-Hedge	1.00	acre
Hand Prune & Shred	Apr	Custom			Prune&Stack/acre	1.00	acre
Soil Amendment: Soluble Gypsum	Apr			1.25	Gypsum Soluble	0.11	ton
	May			1.25	Gypsum Soluble	0.14	ton
	June			1.25	Gypsum Soluble	0.17	ton
	July			1.25	Gypsum Soluble	0.21	ton
	Aug			1.25	Gypsum Soluble	0.17	ton
	Sept			1.25	Gypsum Soluble	0.14	ton
	Oct			1.25	Gypsum Soluble	0.06	ton
	Weed: Spot Spray (Roundup Power Max)	Apr	ATV 4WD	Weed Sprayer		Roundup Power Max	0.20
June		ATV 4WD	Weed Sprayer		Roundup Power Max	0.20	pint
Aug		ATV 4WD	Weed Sprayer		Roundup Power Max	0.20	pint

UC COOPERATIVE EXTENSION
Table 9. Continued
 SAN JOAQUIN VALLEY - SOUTH 2011

Operation	Operation Month	Tractor	Implement	Field Labor Hr/Acre	Material	Rate/Acre	Unit
Insect/Fertilizer: Thrips, Katydid (Success & Oil)/ N	May	Custom			Delegate	6.00	oz
					Urea Low Biuret	15.00	lb. N
					Spray Oil 415	0.50	gal
Insect: Thrips (Success & Oil)	June	Custom			Delegate	6.00	oz
					Spray Oil 415	0.50	gal
Insect: Scale (Esteem)	July	Custom			Esteem	17.00	floz
Leaf Analysis (1 sample/10 acres)	Sept	Custom		0.05	Leaf Analysis SJV	0.10	each
Disease: Brown Rot (Lime & Kocide)	Oct	Custom			Hydrated Lime	10.00	lb.
					Kocide 20/20	10.00	lb.
					Citrus Fix	2.50	floz
Growth Regulators (Citrus Fix)	Oct	Custom					
Pick & Forklift & Haul	Jan	Custom			Harvest: Pick, Fork, Haul Mand.	12.67	bin
	Mar	Custom			Harvest: Pick, Fork, Haul Mand.	12.70	bin
	Apr	Custom			Harvest: Pick, Fork, Haul Mand.	12.67	bin
Sort & Pack	Jan	Custom			Packing & Material Cost Mandarin	1,596.00	crtn
	Mar	Custom			Packing & Material Cost Mandarin	1,596.00	crtn
	Apr	Custom			Packing & Material Cost Mandarin	1,596.00	crtn