UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

PRODUCTION PRACTICES AND SAMPLE COSTS FOR FRESH MARKET ORGANIC VALENCIA ORANGES

SOUTH COAST
1997

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

OVERVIEW FOR FRESH MARKET ORGANIC VALENCIA ORANGES SOUTH COAST - 1997

Introduction

The California citrus industry ranks second in citrus production in the nation with roughly 270,000 bearing acres, producing about 23% of the total United States citrus crop. Since 1992, oranges have been a leading commodity in the state, with gross production values ranging from between $458 and $472 million; Valencia oranges represent approximately 40% of the total gross values. Citrus production is located in four major regions in California: the San Joaquin Valley, southern California's coastal and interior districts, and the desert valley regions of southern California. A small production region is also located in the northern Sacramento Valley.

Organic agriculture represented approximately 0.5% of the total farmed acres and total gross sales for all agriculture in California during the 1992-1993 time period, excluding dairy and livestock. Fruit and nut crops represented 42% of the total organic acreage and 44% of total gross sales for organic agriculture in the state.

The following overview is meant to familiarize the reader with grower practices and important issues facing producers of organic Valencia oranges today. The first section details the seasonal flow of cultural practices for organic orange production. The subsequent sections discuss cover crops and pest management practices, and are followed by discussions of grower risk and marketing. In the final section, the current status of regulations governing organic commodities is summarized. *The practices discussed in this study are those typically used by organic citrus growers and should not necessarily be considered recommended practices by the University of California*.

Production Practices

Some of the production practices for organically grown Valencia oranges (e.g., pruning, irrigation and harvest) are similar to those of a conventionally grown crop. Cultural operations for a production year begin in early spring by foliar fertilizing orange trees. Most of the other fertilization, cultivation, irrigation, pest management and related operations are performed during the spring, summer and fall. In this region, oranges are harvested between April and September.

Fertilization Practices. Fertilizing materials such as foliar nutrient sprays and soil amendments are applied to orange trees and orchard soils when plant tissue and soil analyses, as well as grower experience, show it to be appropriate. In this region, production practices typically begin in the early spring by foliar fertilizing trees with a mixture of fish and kelp products, and micronutrients such as zinc and manganese. Some fertilizing materials may also be applied to the soil through irrigation lines. Fish and kelp products provide trees with small amounts of nitrogen, phosphorus, potassium, micronutrients and other organic constituents. Zinc and manganese are two important micronutrients for citrus production; chelated forms are often used in organic orchards. Other nutrients including iron, calcium and phosphorus may also be included in the spray mixture in some years depending on the nutrient needs of an orchard. Fertilizing materials are commonly applied prior to and/or at bloom, and then again once or twice during the summer and fall. They are generally timed to coincide with an orchard's growth flushes, however, the total number of applications ultimately depends on the nutrient requirements of each orchard.

Organic growers amend orchard soils with animal manures or composts unless sloped or hilly land prevents the entry of farm equipment. When manure or compost is used, it is spread throughout the orchard to supply nitrogen and other nutrients to the trees, stimulate soil microbial activity and add organic matter to the soil. These materials are applied either in the spring or fall months.

Cover crops are also planted in orange groves in this region to help manage soil fertility, build soil structure, suppress weeds, attract and sustain beneficial arthropods (parasitic wasps, generalist insect predators and predatory mites) and help control soil erosion. Refer to the Cover Crops and Their Management section for additional information.

Fertilizing materials such as manures, composts and cover crops may or may not be incorporated into orchard soils. Many growers try to minimize discing and other tillage operations because citrus trees have shallow root systems that can be damaged by these practices. In addition, some growers view tillage practices as disruptive to soil microbial populations and soil management practices. When tillage operations are utilized, they are usually shallow in depth, and are performed only when necessary.

Pest Management. Pest management techniques for the control of diseases, insects, weeds, snails and vertebrates begin in April and continue throughout the growing season. In some orchards snail control may be required throughout the year. Pest pressure varies depending on farm location and seasonal conditions. Refer to the Pest Management section for further information.

Irrigation and Frost Protection. In the South Coast, orchard irrigations are usually performed from April through November, but may need to be extended during drought years. Low-volume irrigation (e.g., microsprinkler and drip) systems are commonly used to irrigate orange groves. Irrigation water is pumped from private underground wells or delivered from water companies in the area. Total water use for each orchard varies from location to location and depends on soil type and structure, the amount of rainfall and residual soil moisture, cover crop species and management practices and climatic conditions.

In the South Coast region, frost protection for oranges (both organic and conventional) may be achieved through floor management practices. For example, in periods of frost danger growers minimize the risk of damage by mowing vegetative growth on orchard floors close to the soil surface. Because citrus crops are frost sensitive, however, some growers install wind machines in their orchards. When utilized, wind machines mix cold and warm air within the orchard to raise temperatures and protect the crop from frost. Whether or not wind machines are installed depends on the orchard's location and the risk of frost hazard, and orchard size and available capital.

Pruning. Pruning practices depend on orchard planting density, location, production conditions and grower management practices. Orange groves are often skirt pruned every year, which removes low hanging branches and fruit near the soil surface, and assists in control of the fungal diseases gummosis and brown rot (*Phytophthora* spp.). Skirt pruning also helps with snail and ant control because at least one access route to trees is removed. Hedging (side pruning) is performed once every three to five years to reduce the amount of vegetative growth in the orchard. In addition to skirt pruning and hedging, trees are mechanically topped to reduce tree height every fourth or fifth year. Brush from pruning operations is typically chipped and left on the orchard floor to return organic matter to the soil.

Harvest. Fruit maturity (sugar content) and size are the primary determining factors for the date of orange harvest. Market conditions also play a role in determining the time of harvest. For example, when fruit is mature and large enough in size, and market conditions are favorable, a once over harvest is generally performed. In situations where fruit is mature but small in size, or market conditions are not favorable, fruit may be held on the tree until such time as size increases or the market warrants its sale. Also, climatic and orchard conditions can vary, causing fruit to mature or size unevenly in different areas within an orchard. When this occurs, it often precludes a once over harvest and makes harvests at different times in different areas within the orchard necessary. Therefore, harvests are performed from April through September depending on fruit maturity, size, and orchard and market conditions.

Mature fruit is hand harvested by contract labor into 900-pound field bins and transported to a packing house where yield is reported on a per acre basis in terms of 55-pound field boxes. The 900-pound field bin is a unit of measure that is used to calculate harvest costs. The 55-pound field box is a unit of measure that is used to calculate returns to growers and assessment fees that are incurred by the California state marketing order for citrus. Both organic and conventional citrus growers must pay the assessment fees; the current rate is $0.022 per 55-pound field box. Fees are paid to the Citrus Research Board.

Yields for organically produced Valencia oranges are similar to those of a conventionally produced crop, ranging from 300 to 900 field boxes per acre and averaging 600 field boxes per acre. Between 55% and 70% of this yield is packed as fresh market organic fruit. The portion of the crop that is not packed for the organic fresh market is processed into juice for the organic or conventional market. Yields for organic Valencia oranges vary depending on a number of factors including the orchard planting density, tree age, cultural operations, production location and yearly growing conditions.

After harvest, the packer retains control of the product for marketing purposes. For additional information, refer to the Grower Risk and Marketing section.

Cover Crops and Their Management

Most organic growers successfully manage cover crops in orchards in this area, and find that the benefits associated with cover crop use far outweigh potential drawbacks. They strongly believe that cover crops and healthy, living soil (e.g., soil with organic matter additions, improved structure and a high level of biological activity) are essential to successful organic citrus production. Furthermore, most growers believe that with careful management of soil organic matter, there is potential for considerable water savings in citrus groves. A number of these growers would like to see more research performed in established organic systems, with particular attention paid to cover crop and soil management issues.

Potential Benefits. Cover crops have numerous potential benefits. Soil structure and water penetration and infiltration can be improved by root growth of the cover crop and by returning organic matter to the soil. Because of this, soil may be better able to retain moisture during rainy winter months and improve irrigation water use efficiency during the growing season by reducing surface ponding and/or runoff. The total amount of water that is applied to an orchard during the growing season may therefore be reduced. Grass type cover crops are particularly helpful in stimulating soil microbial activity, which has been shown to promote aggregate stability and improve soil structure. This is important because soil erosion and degradation processes are reduced in well aggregated soils. In addition, nutrients are released as soil microbes decompose organic matter. Leguminous cover crops can add nitrogen to the soil through nitrogen fixation. Weed suppression is another potential benefit. Cover crops increase plant diversity in an orchard and in the flowering stage can provide pollen and nectar to attract and sustain beneficial arthropods (insects, spiders and mites).

Potential Disadvantages. There are also potential disadvantages with the use of cover crops. Cover crops can attract pests such as insects, snails and rodents to the orchard. Cover crops increase the cash costs associated with planting and may require the rental or purchase of specialized farm equipment. Cover crops with tall or vining growth habits may interfere with some microsprinkler irrigation system designs. Increased hand weeding, and thus increased labor costs, can result. Under some orchard conditions, total seasonal water use may increase when cover crops are planted, especially those grown during the warm spring and summer months. In this area, however, many growers find that the opposite is true and in most cases total water use has decreased in cover cropped orchards, most likely due to improved soil structure and water penetration and infiltration within groves.

Research has shown that the presence of a cover crop may increase the hazard of frost due to the insulative effects that reduce radiant heat absorption during the day and its release at night from the soil. This is particularly true for orchards with thick, dense cover crop stands and tall-growing cover crop species. Growers minimize frost hazard by mowing the cover crop to reduce vegetative growth during periods of frost danger. Furthermore, growers report that their cover cropped orchards sustain no more frost damage than neighboring orchards without cover crops, and in some cases damage has been reduced. It is not clear, however, what role cover crops play in this phenomenon because many factors must be considered when evaluating an orchard's susceptibility to frost damage.

Cover Crop Selection. Cover crop species and mixes should be selected for compatibility to a particular orchard's location and operations, and should also be utilized to maximize potential benefits. In this area, mixes that include legumes, wildflowers and grasses are typically planted to benefit the orchard in the following ways: legumes are planted to add nitrogen and organic matter to the soil, wildflowers to attract and sustain beneficial insects, and grasses to add organic matter and help control soil erosion, especially on sloped or hilly land. Cover crop selection is generally tailored to meet the conditions and unique needs of each orchard and is often determined by observation and experimentation over a period of years.

Planting. In South Coast organic citrus groves, growers usually employ one of two basic cover crop schemes. The first, a mixture of winter annual species, typically consists of legumes such as bell beans, field peas and vetch, and cereal grasses such as oats or rye. This cover crop mix is planted each year in the fall by lightly discing the soil to prepare a seedbed, broadcasting seed, and then pulling a light farm implement across the orchard floor to cover the seed. It is important to note that some winter annual cover crop species such as vetch are capable of self-reseeding and may therefore be planted with this characteristic in mind.

The second cover crop scheme is a mixture of perennial species such as white clover, birdsfoot trefoil, and California native grasses and wildflowers. This cover crop type is selected for its perennial nature and its capability to self-reseed, thus is not planted on a yearly basis. Also, white clover is somewhat shade tolerant, and birdsfoot trefoil and some native grasses are drought tolerant. Both of these characteristics are helpful in managing cover crops in citrus orchards in this area. For perennial cover crops, planting practices are similar to those of the annual cover crops. In some years, growers may broadcast small amounts of additional seed to improve the existing stand and insure that adequate cover crop growth is maintained. Groves located on sloped or hilly land are usually planted with perennial cover crop mixtures because the entry of farm equipment may be difficult and preclude yearly planting.

Some growers plant a mixture of winter annual and perennial cover crop species. In this case, the winter annual species that are selected are generally those that are capable of self-reseeding. Planting and management would be similar to the practices of the second basic cover crop scheme.

After planting, cover crops are either irrigated or are dependent on fall and winter rains for germination and growth. Whether or not a cover crop is irrigated depends on the design of the irrigation system. Fall and winter rains can be sporadic in this area and may be insufficient for early cover crop growth. Stand establishment may therefore be improved if the cover crop is irrigated.

Management. Many cover crop mixes containing winter annual species are capable of producing substantial amounts of biomass and providing orchard soils with nitrogen and organic matter. In late spring or early summer cover crops of this regime are mowed to reduce above ground vegetative growth. The clippings are sometimes incorporated into the soil by discing to speed decomposition of organic matter and recycling of nutrients. Alternatively, the clippings are left on the soil surface after mowing to reduce tillage operations, and will thus decompose more

slowly. Some loss of nitrogen (volatilization) occurs when a cover crop is not incorporated, however, there is some debate as to the actual amount lost. The rate of nitrogen volatilization likely depends on location and conditions, and on cover crop species. Cover crop clippings are also left on the soil surface to serve as a protective mulch to decrease evaporative water loss from the soil and minimize fluctuations in orchard temperatures during the summer. This mulch may also help suppress summer weed growth in the orchard.

The perennial species contained in the mix of the second cover crop regime are mown in late spring or early summer to reduce a portion of the above ground vegetative growth; the clippings are left on the soil surface. In orchards with drip irrigation, perennial cover crops are not typically irrigated during the summer months and may therefore die back and form a protective mulch against evaporative water loss and weed growth. Under microsprinkler irrigation, cover crops may be irrigated along with trees and continue to grow during the summer.

Some organic growers have recently begun to introduce anecic earthworms in their orchards to assist with the incorporation of cover crop residues. These earthworms, commonly known as nightcrawlers (*Lumbricus terrestris*), live beneath the soil surface in deep, vertical burrows. They feed on decomposing plant materials, and are capable of incorporating large quantities of organic matter into a soil; their castings (fecal matter) can also enhance a soil's nutrient status. These characteristics could prove extremely useful in citrus production systems because decomposition of organic materials and recycling of nutrients could be stimulated without performing mechanical tillage operations. Moreover, earthworm burrowing activities have been shown to improve soil structure and water penetration and infiltration.

Pest Management

Pest identification, monitoring and prevention are essential elements of successful citrus production. This is especially true for organic production because many of the pesticides that are currently used by producers of conventionally grown citrus are not approved for use by organic citrus growers. Also, many of the legal (allowed) pest control products may be less effective for acute problems than the synthetically formulated pesticides prohibited in organic production. For organic Valencia oranges in the South Coast, growers either monitor their own orchards or work with a cooperative insectary that supplies biological control agents (e.g., beneficial insects and snails) and other information and assistance relevant to pest management.

All pests that are found in conventional orange orchards are also found in organic orange groves in this area. These pests have the potential to reduce fruit yield and quality, however, many organic orange growers believe that pests, particularly diseases and insects, do not pose serious production problems when soil fertility and tree health are carefully managed, and when beneficial insects are utilized. Natural pesticides and oil sprays are available to assist in pest control and reduce short-run economic risks, but are seldom utilized in organic orange groves in this area. Growers should be certain that any materials used are in compliance with the rules and regulations of federal, state and organic certification agencies. Refer to the Regulation of Organically Grown Commodities section for further information.

Diseases. The most commonly occurring diseases in South Coast organic orange groves, gummosis and brown rot, are caused by the *Phytophthora* fungus. Trees are infected when this pathogen is water-splashed from the soil onto trunks or fruit during the wet, rainy winter months. Disease prevention measures include using resistant rootstock and planting trees on berms to improve drainage and reduce water-splash. Bud unions should also be kept free of soil and irrigation water since all scions are susceptible to *Phytophthora.* Skirt pruning is also used to prevent brown rot through reduced water-splash of fungal spores. Large amounts of organic mulch covering bare soil may also reduce water-splash. Organically acceptable copper products, though rarely used in organic groves in this area, may be preventatively applied to trees to reduce the incidence of these fungal diseases. It should be noted, however, that copper is considered a restricted material by some certification organizations.

Insects. Growers indicate that crop damage from insects is not significant in long-standing organic orange groves in this region. For one reason, naturally occurring beneficial arthropods are often present in orchards in large enough numbers to assist in pest reduction. Nevertheless, fluctuations in both pest and beneficial arthropod populations occur. Therefore, growers commonly release parasitic wasps and lacewings to augment and maintain levels that already exist in the field. This helps regulate pest densities on a year-to-year basis.

Two insect pests have been responsible for some damage in mature organic orange groves in this area in years when conditions were optimal for insect development. These insect pests are: California red scale (*Aonidiella aurantii*) and black scale (*Saissetia oleae*). Life cycles and feeding habits for each pest vary. In general, twigs, leaves and fruit are most often damaged by these insects.

Scale pests are largely controlled by resident populations and yearly augmentative releases of the parasitic wasp *Aphytis melinus* (for California red scale), and periodic releases of the wasp *Metaphycus helvolus* (for black scale). Oils may also be used to control scale insects, but are rarely sprayed in organic orange orchards in this area. When oils are used, beneficial insects within the orchard will be killed if sprayed directly. In general, however, overall populations of beneficial insects are not adversely affected by the use of oil sprays. Nevertheless, if existing populations of beneficial insects are disrupted by pesticide sprays or other disturbances, inundative releases may be necessary.

Aphids are also found in organic orange groves in this area, but seldom cause damage that is substantial enough to warrant treatment in mature orchards. Aphids can, however, stunt the growth of young trees. If necessary, aphid populations can be reduced by releasing the predatory insect green lacewings (*Chrysopa* spp.) and by using oil sprays.

Pest control by beneficial insects may be disrupted in orchards with large ant populations because ants protect soft scales (e.g., black scale) and aphids from their natural enemies in order to feed on the aphid and scale honeydew exudate. If ants successfully reduce populations of natural enemies, pest species other than soft scales and aphids may increase in orchards because natural controls are reduced in general. As discussed above, skirt pruning also assists in ant control.

Weeds. Weeds in organic orange groves are most often controlled by hand weeding, mechanical mowing and cover crop mulches. Orchards are typically weeded three times each year during April, June and August; some of these operations are also considered cover crop management practices.

In addition to the cover crop mulches discussed above, some growers also smother weeds by utilizing yard waste diverted from county landfills to mulch around young, and sometimes older, trees. This practice may also conserve water and regulate the wet-dry cycles and temperature extremes in orchards. In addition, these mulches add organic matter to the soil and may provide some nutrients as well.

Snail Pests. In organic citrus orchards in this area, populations of the brown garden snail *(Helix aspersa*) are often significant enough to warrant yearly control. Snail pest numbers are usually higher during heavy rainfall years and/or warm spring periods. Cover crops may also increase snail populations. Growers release ducks in orange groves, typically during the months of April and May, to feed on snail pests and reduce their numbers. Growers may also use the predatory decollate snail (*Rumina decollata*) to control snail pests. Ducks are more effective for immediate control of brown garden snail, whereas decollate snails are helpful for long-term control of snail pests. Copper slurries or copper bands may be applied to tree trunks to prevent movement of snails into trees, however, these practices are seldom used in organic citrus groves in this area. As mentioned previously, skirt pruning also helps reduce access to trees by snails.

Vertebrate Pests. Gophers can be a substantial problem in some organic orange groves in the South Coast, especially those with perennial cover crops. Growers control these pests by trapping and with smoke bombs. Barn owl houses have also been constructed and placed in or near groves to attract owls and assist in vertebrate pest control.

Grower Risk and Marketing

Risk. Some growers perceive that the risks associated with general farm management, and in particular pest management, are increased somewhat for organic orange production relative to conventional production. This is especially true for the transition years, or the years when agricultural production changes from conventional to organic practices. The production techniques commonly used in conventional systems are sometimes inappropriate for organic systems, necessitating adoption of new methods of production. However, support information that is relevant to alternative production practices is often lacking. Growers therefore find that the "learning curve" for organic production and farm management is steeper during the transition period, which may result in increased costs of production. Nevertheless, some organic growers report a willingness to bear potentially higher costs for organic production. These potentially higher costs are viewed as long-term investments in such areas as soil fertility and environmental quality rather than as short-term monetary losses.

In contrast, some growers with fully transitioned operations view organic production and marketing as less risky than conventional production and marketing. For one reason, the organic citrus industry is relatively small, and demand for organic oranges is high. Therefore, overproduction is not the problem for the organic industry that it sometimes is for conventional production. Also, most of the organic crop is sold for a premium price, or a price higher than the comparable conventional product. Growers may not market or sell their product as organic during the transition years, however, and therefore cannot take advantage of potentially higher returns to offset any increased management and production risks during this time.

Growers may purchase federal or private crop insurance, which reduces the production risks associated with specific natural hazards (e.g., frosts and freezes). The risks associated with frosts and freezes are somewhat lower in the South Coast than in other citrus production areas in the state. Therefore, only a small portion of the citrus crop is insured in this region.

Marketing. Organic growers receive payment for their crop from the packer after harvest operations have been completed. Returns to growers are based on 55-pound field boxes. In most cases, the crop is packed and sold on the organic fresh market for a premium price. The portion of the crop that is not sold as fresh market fruit is sold for juice on the organic or conventional market. Returns vary, but depend on the percentage of fruit that is packed for the fresh market, fruit size and overall market conditions. The crop is marketed by the packer through wholesale, retail and export channels.

Regulation of Organically Grown Commodities

State Registration. Growers who choose to produce and market their crops as organic must register on a yearly basis with the State of California under the California Organic Foods Act of 1990. The law contains rules and regulations to which all producers, processors and handlers of organic commodities must adhere. As of January 1, 1996, in order to qualify as organic, commodities must be produced on land where no prohibited substances have been applied for a minimum of three years immediately preceding harvest of the crop. Annual registration fees are levied by the state and, in addition, a one-time initial registration fee is assessed. Fees are payable before any sales of the commodity occur and are based on projected estimates of gross receipts. The state program is administered through the California Department of Food and Agriculture (CDFA).

Federal Regulations. On October 1, 1993, the federal Organic Foods Production Act of 1990 (OFPA) became effective. This act sets forth production standards and regulates all organic commodities on the national level. However, because of budget and time constraints, final recommendations for the law's implementation have not been completed. Therefore, even though the law is now in place, implementation and enforcement have been delayed. Nevertheless, it would be prudent for growers to follow current recommendations for the federal law (in addition to state regulations) even before implementation and enforcement take place. The federal program is administered through the United States Department of Agriculture (USDA).

In most cases the OFPA will preempt state law except in those cases where the state applies to the USDA for approval of stricter standards. One difference between state and federal law is noteworthy. The federal law currently recommends that growers be certified by a federally accredited certifying agent on an annual basis if yearly gross sales exceed $5,000. This federal requirement is separate from, and does not act as a substitute for, state registration.

Certification. The best available statistics for organic agriculture show that during the 1992-1993 time period, 45% of California's registered organic farmers were also certified by a private certification agency. Of the 45% that were certified, 90% were certified by California Certified Organic Farmers (CCOF). These figures are indicative of the number of growers only and do not necessarily reflect total acreage or value of production by certification group. In addition to CCOF, eight other organizations now actively certify growers in the state. They are: California Organic Farmers Association (COFA), Farm Verified Organic (FVO), Oregon Tilth Certified Organically Grown (OTCO), Organic Certifiers (OC), the Organic Crop Improvement Association (OCIA), the Organic Growers and Buyers Association (OGBA), Quality Assurance International (QAI) and Scientific Certification Systems (SCS). Each agency must adhere to all state and federal laws regulating organic commodities, and in addition may enforce procedures specific to their own agencies. Organizations differ with respect to the certification process and associated costs. Domestic and international product sales may also be affected by certification itself, and by the certification agency used. The above organizations are registered with the State of California. However, none are currently accredited by the USDA since the USDA's certification program has not yet been implemented. Additional sources of information are provided in the Reference section of this publication.

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

COST AND RETURNS STUDY FOR FRESH MARKET ORGANIC VALENCIA ORANGES - SOUTH COAST - 1997

General Information

The practices described for the hypothetical organic orchard used in this report are considered common for fresh market Valencia oranges in the South Coast region of California. Sample costs given for labor, materials, equipment and contract services are based on 1997 prices. *The use of trade names is not an endorsement or a recommendation, nor is criticism implied by omission of similar products*. A blank Your Cost column is provided to enter your actual costs on Table 1 Costs Per Acre - Operations and Table 2 Detail of Costs Per Acre - Inputs. Costs and practices detailed in this study may not be applicable to all situations. This study is only intended as a guide and can be used in making production decisions, determining potential returns, preparing budgets and evaluating production loans.

This report consists of the set of assumptions used for fresh market organic Valencia orange production, along with the following six tables.

Table 1. Costs Per Acre - Operations
Table 2. Detail of Costs Per Acre - Inputs
Table 3. Monthly Cash Costs Per Acre
Table 4. Annual Equipment, Investment And Business Overhead Costs
Table 5. Hourly Equipment Costs
Table 6. Ranging Analysis

For an explanation of calculations used for this study 1) refer to the attached assumptions, 2) call the Department of Agricultural and Resource Economics, Cooperative Extension, University of California, Davis, California, (530) 752-3563 or 3) call the farm advisor in the county of interest.

Two related studies entitled *Sample Costs to Establish an Orange Orchard and Produce Oranges in the San Joaquin Valley - 1995* and *Sample Costs to Establish a Grove and Produce Valencia Oranges in Ventura County - 1997* are available for those interested in orchard establishment costs and for production costs of conventionally grown oranges.

Copies of this, and the above studies can be requested through the Department of Agricultural and Resource Economics, U.C. Davis, or from selected county Cooperative Extension offices.

Cost of Production Assumptions For Fresh Market Organic Valencia Oranges

This study reflects the practices and costs associated with organically grown fresh market Valencia oranges in the South Coast region of California. While every effort is made to model a production system based on real world practices, this report cannot fully represent the costs and practices that are specific to each orchard or production region. This study should be interpreted as a representative operation only and not as a statistical average. Costs are presented on an annual per acre basis.

The following is a description of general assumptions pertaining to sample costs for fresh market organic Valencia oranges.

Orchard Land. The total farm size is 45 acres, 25 of which are an established, mature organic Valencia orange grove. The remaining 20 acres are dedicated to other agricultural enterprises and land for the farmstead and roads. For this study, land for the established grove is assumed to be owned by the grower and is valued at $14,000 per acre. This figure is within the low and high range of values for land with an established orange grove in the South Coast region of California. The price includes the cost of the land, mature trees and irrigation system, and is included as an investment in Table 4 Annual Equipment, Investment and Business Overhead Costs. Land costs per acre vary within the region and will affect grower returns. Land does not depreciate from use. Land is assumed to be gently sloped, with well-drained soils of moderate depth and fertility.

In this study, the mature orchard is assumed to have been established over a six year period as a conventional orchard for orange production but is now registered and certified as organic. To be registered and certified organic, a three year transition period is required when any farm or production unit changes from conventionally to organically acceptable practices. Federal, state and certification agency rules and regulations specific to organic commodities must be adhered to during the transition period if crops are to be marketed as organic. Crops grown in transition years may not be sold or labeled as organic. Commodities that are produced organically can often be sold for a higher, premium price than conventionally grown products. However, the supply of organic products, market competition, and consumer demand will affect grower returns. Orchard life is assumed to be 31 years beyond the six establishment years and three transition years.

Trees/Spacing. The orange variety is assumed to be Valencia. Trees are planted on an 18' x 20' spacing with 121 trees per acre.

Cover Crop Planting and Floor Management. This study assumes that a cover crop mix of winter annual species is planted in the orchard each year. Planting begins in the fall by lightly disking the orchard once to prepare a seedbed. Cover crop seed is then broadcast with a hand-held seeder, and covered by pulling a light implement (e.g., a chain or section of chain link fence) across the orchard floor. The cover crop is irrigated after planting to insure adequate germination and good stand establishment. After this time, cover crop growth is dependent on fall and winter rains. Costs associated with planting are shown on Table 1 Costs Per Acre - Operations, Table 2 Detail of Costs Per Acre - Inputs, and Table 3 Monthly Cash Costs Per Acre.

The cover crop is a mixture of bell beans, purple vetch and cereal rye, which is planted into strips in orchard middles at a rate of 60 pounds per planted acre. This represents 50% of the seeding rate per acre to account for space taken up by the tree rows.

The cover crop is mechanically mowed once in June and the clippings are left on the soil surface to minimize tillage operations. After this time, vegetative growth is managed by mechanically mowing orchard middles again in August. Tree rows are hand weeded with weed string trimmers at the same time.

Production Practices. Production practices for organic Valencia oranges are listed in Table 1. This table shows the order in which the operations are performed, as well as the hours per acre required for each operation. Labor, contract, materials, and fuel and repair costs are also included in this table. Detailed input costs can be found in Table 2. In addition, the sequence of operations and monthly cash costs per acre for the crop are located in Table 3.

Irrigation and Frost Protection. In this region the amount of water that is used to irrigate an orchard each year ranges from 1.3 to 3.0 acre-feet per acre, with 2.0 acre-feet per acre commonly applied. However, this amount is dependent on soil type and structure and rainfall and residual soil moisture. This study assumes that a total of 2.0 acre-feet of water is used to irrigate the orange crop. An additional two acre-inches of water is also used to irrigate the cover crop each year. No assumption is made with respect to effective rainfall.

Costs for water vary greatly within the area and can significantly affect grower returns. Water costs range from $50 to $400 per acre-foot depending upon whether an underground private well or a water company is used. Charges of $190 per acre-foot for water are commonly incurred and are therefore used in this study. The irrigation system is a microsprinkler design with one sprinkler per tree. Labor costs include time to turn the system on and monitor irrigation lines and sprinklers for proper function. The orchard is irrigated from April through November. In drought years, the irrigation period may need to be extended.

The orchard is assumed to be located in an area with a low risk of frost hazard. Therefore, no specific on-farm investments or costs for frost protection have been included in this study. In years with increased frost danger, growers mow vegetative growth on the orchard floor close to the soil surface to reduce the risk of frost damage.

Pest Management. Disease, insect, snail and vertebrate pest damage vary on a year-to-year basis depending on pest populations and management techniques. In this area, beneficial arthropods naturally inhabit fully transitioned organic orchards. Nevertheless, many growers in the South Coast release beneficial insects every year, primarily *Aphytis melinus* for the control of California red scale, to maintain the levels that already exist in the field. *Metaphycus helvolus* is sometimes released for the control of black scale, as are green lacewings (*Chrysopa* spp.) for the control of aphids and other soft-bodied insects.

Orchards are monitored for insect pests during the growing season by the grower and a representative from a cooperative insectary. This study includes an estimated cost of $32 per acre per year to cover charges for the purchase and release of beneficial insects, which includes three releases of *Aphytis melinus* per year and periodic releases of *Metaphycus helvolus* when necessary. Costs per acre will vary depending on the level of pest management services agreed to by both the grower and the cooperative insectary, and on the type and number of beneficial insects purchased and released.

This study assumes that a total of 60 ducks are purchased and utilized for snail control in the orange grove. The initial cost is included in Table 4 as an investment, with an estimated attrition rate of 50% per year. Costs for replacement ducks are included on a per acre basis in Tables 1, 2 and 3.

Harvest. Harvest dates are determined primarily by fruit maturity (sugar content) and fruit size. Market supply and demand may also affect the date of harvest. In this study, oranges are assumed to be hand harvested by a labor contractor into 900-pound field bins and then transported to a packing house. Contract labor rates range from $15 to $26 per 900-pound field bin depending on the size of trees and amount of fruit to be harvested. An average cost of $20 per field bin is used in this study, which includes labor and taxes. Transportation of fruit from the field to the packing house is $3 per field bin. Harvest is assumed to be performed once a year in June, but can vary from farm to farm. Harvest costs are located in Tables 1 through 3.

Because contract services are assumed for harvest operations, costs for harvest equipment are not included in this study. If growers choose to perform all harvest operations, equipment for the appropriate operations should be inventoried and labor, fuel, repairs and capital recovery costs should be added as a cost of production. Contract harvest costs, then, would not be included.

Yield and Return Ranges. Yields are reported on a per acre basis in terms of 55-pound field boxes. Field boxes are used to calculate returns to growers and assessment fees that are incurred by the California state marketing order for citrus (refer to the Assessments section). Yields for organically produced Valencia oranges are similar to those of a conventionally produced crop, ranging from 300 to 900 field boxes per acre. This study assumes an average yield of 600 field boxes per acre in Tables 1 to 3. Approximately 55% to 70% of the total yield is packed as fresh market fruit. The portion of the crop that is not packed for fresh market fruit goes to a processor for juice.

Organic growers receive payment for their crop from the packer after harvest operations have been completed. The exact price per field box that each grower receives varies depending on fresh market pack-out percentage, fruit size and market conditions. In most years, all of the crop is sold for a premium price on the organic market. For this study, returns to growers are estimated to range from $5.00 to $9.00 per field box with an average price of $7.00 per field box. By comparison, prices for conventional fruit range from $4.50 to $7.50, and average $6.00 per field box.

For the orange operation analyzed in this study, the breakeven yield is estimated to be 489 field boxes per acre at average price of $7.00 per field box. Breakeven yields are 761 field boxes per acre at a low price of $5.00 per field box, and 360 field boxes per acre at the high price of $9.00 per field box.

Marketing. The crop is marketed by the packer through wholesale, retail and export channels after harvest and packing operations have been completed.

Labor. Basic hourly wages for workers are $8.75 and $7.00 per hour for machine operators and field workers, respectively. Adding 34% for workers compensation, social security, insurance and other benefits increases the labor rates to $11.72 per hour for machine labor and $9.38 per hour for non-machine labor. The percentage charged for benefits varies depending upon whether or not growers utilize labor contractors or hire their own laborers. For those growers handling their own labor, benefit percentages may be lower than 34%.

The labor hours for operations involving machinery are 20% higher than the operation times listed on Table 1 to account for extra labor involved in equipment set-up, moving, maintenance, work breaks and repair. Wages for managers are not included as a cash cost. Any returns above total costs are considered returns to management and risk.

Cash Overhead. Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include, but are not limited to, property taxes, interest on operating capital, office expenses, property and liability insurance, sanitation services and equipment repairs. Cash overhead costs are found in Tables 1 through 3.

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 additional taxes are charged 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 two, on a per acre basis.

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 10% per year. A nominal interest rate is the going market cost for borrowed funds. This short-term interest rate is a typical rate charged by the Production Credit Association. Costs incurred after harvest are discounted back to the harvest date at the same interest rate. This allows all costs to be adjusted at the same point in time.

Office and Business Expense. Office and business expenses are estimated at $100 per acre. These expenses include, but are not limited to, office supplies, telephones, bookkeeping, accounting, legal fees and road maintenance.

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 0.713% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $469 per year.

Sanitation Services. Sanitation services (portable toilets) are provided by the contractor when contract labor is used. Because contract labor is assumed for some of the operations included in this study, the minimal cost of $100 for sanitation services is included here.

Non-Cash Overhead. Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments. Although farm equipment is often purchased used, this study shows the current purchase price for new equipment adjusted to 60% of the new value to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in Tables 1, 2 and 4. They represent the capital recovery cost for each investment on an annual per acre basis.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest cost for a capital investment. In other words, it is the amount of money required each year to recover the difference between the purchase price and salvage value, or unrecovered capital. Capital recovery cost is equivalent to the annual payment on a loan for an investment with the down payment equal to the discounted salvage value. This is a more complex method of calculating ownership costs than by using straight-line depreciation and opportunity costs. However, it more accurately represents the annual costs of ownership because it takes the time value of money into account. The calculation for annual capital recovery cost is taken from the publication *Farm Management* (Boehlje and Eidman 1984) and is as follows.

[(Purchase Price - Salvage Value) x (Capital Recovery Factor)] +
[Salvage Value x Interest Rate]

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its life. For farm machinery (e.g., tractors and implements) the remaining value is a percentage of the new cost of the investment. The life in years is estimated by dividing the wear-out life as given by the American Society of Agricultural Engineers (ASAE) by the annual use hours. Salvage value is calculated by Boehlje and Eidman (1984) as follows.

[New Price x % Remaining Value]

Salvage value for other investments including farm buildings, irrigation systems and miscellaneous tools and equipment is zero. The salvage value for land is equal to the purchase price because land does not depreciate from use. Purchase price and salvage value for the equipment and investments used in this study are shown on Table 4.

Capital Recovery Factor. The capital recovery factor is the amortization factor or annual payment whose present value at compound interest is equal to one. The capital recovery factor is a function of the interest rate and years of life of the equipment.

Interest Rate. An interest rate of 8.25% is used to calculate capital recovery costs. This interest rate is the United States Department of Agriculture Economic Research Service's (USDA-ERS's) ten year average of the 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 the specialized resources that can only be used effectively in the agricultural sector. In other words, the next best alternative use of these resources is in another agricultural enterprise.

Equipment Cash Costs. Equipment costs are composed of three parts: cash overhead, non-cash overhead and operating costs. Both of the overhead factors are detailed in previous sections. The operating costs consist of fuel, lubrication and repairs.

In allocating the equipment costs on a per acre basis, the following hourly charges are calculated first and shown in Table 5. Repair costs are based on the purchase price, annual hours of use, total hours of life and repair coefficients formulated by the ASAE. Fuel and lubrication costs are also determined by the ASAE equations based on maximum power take-off (PTO) horsepower (hp) and the type of fuel used. The fuel and repair costs per acre for each operation in Table 1 are determined by multiplying the total hourly operating cost in Table 5 for each piece of equipment used for the cultural practice by the number of hours per acre for that operation. Tractor operation time is 10% higher than implement operation time to account for fueling, equipment moving and setup time. Prices for on-farm delivery of diesel and gasoline are $0.97 and $1.30 per gallon, respectively.

Assessments. In this study, assessment fees are estimated and included as a cost of production for the state marketing order for citrus, and for registration and certification of an established organic orchard. All organic growers who produce and market their crop as organic must pay state registration fees. Certification is currently optional for organic production, but in most cases will become mandatory upon implementation of the federal law. Certification fees for new operations may be higher than for established operations because of the initial certification and inspection process.

For comparison purposes, fees from two different certification organizations are listed below. However, only fees from California Certified Organic Farmers (CCOF) are included in the actual cost calculations of this study. The costs can be adjusted for Quality Assurance International (QAI) by subtracting CCOF fees and adding QAI fees. Some growers have multiple certifications for marketing purposes. In this case, both sets of fees would be added.

State Marketing Order. Under the state marketing order for citrus, mandatory assessment fees of $0.022 per 55-pound field box are incurred. Fees are collected by the Citrus Research Board, and are used to fund industry research programs.

California Department of Food and Agriculture (CDFA) Organic Program. A stepped scale organic grower's registration fee of $300 is assessed by the State of California on the gross sales amount of $105,000. The gross sales amount is calculated by multiplying the yield of the crop per acre (600 field boxes) by the price received for the crop per field box ($7), and the number of planted acres for the crop (25). This is only an estimate of potential fees; they will vary depending on yields and returns. Contact the County Agricultural Commissioner in your area for further details.

California Certified Organic Farmers (CCOF). Annual membership fees are estimated to be $175. Annual inspection fees are $250. In addition, CCOF growers are also required to pay assessment fees of 0.5% of their gross sales. Total CCOF assessments for the 25 acres of oranges in this study are $525. Fees are based on the production amount, the number of acres and parcels contained in an operation as well as whether or not the farm is totally organic. Therefore, individual situations will vary.

Quality Assurance International (QAI). Certification fees for QAI are based on various factors of a farming operation including farm size and number of crops produced and marketed as organic. Total fees consist of a basic annual fixed cost fee and charges for farm inspection and other factors that may affect the certification process. QAI's basic annual fixed cost fee for a 40 acre farming operation is estimated to be $1,945. Inspection fees and fees associated with other factors of a farming operation are quoted on an individual basis and will therefore vary from farm to farm. No additional charges are incurred for gross sales or other user fees.

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REFERENCES

American Society of Farm Managers and Rural Appraisers. California Chapter. 1997. *Trends in Agricultural Land and Lease Values. Spring Outlook Forum*. American Society of Farm Managers and Rural Appraisers. Visalia, California.

Boehlje, Michael D. and Vernon R. Eidman. 1984. Farm Management. John Wiley & Sons, Inc. New York, New York. Pp. 806.

Bugg, Robert L., Chuck Ingels and Rick Miller. 1991. Challenges of intercropping in citrus orchards. UC Sustainable Agriculture Research and Education Program. *Components*. 2(3):5-9.

California Certified Organic Farmers, Inc. (CCOF). 1996. *California Certified Organic Farmers Certification Handbook*. California Certified Organic Farmers, Inc. Santa Cruz, California.

California Department of Food and Agriculture. 1996. *1996 California Agricultural Resource Directory Including Agricultural Production and Export Statistics for 1995*. California Department of Food and Agriculture. Sacramento, California.

California Department of Food and Agriculture Organic Program. 1996. *California Organic Program. Producing, Handling, and Processing Organic Products In California*. California Department of Food and Agriculture Organic Program. Sacramento, California.

Carter, Harold O, and George Goldman. 1996. *The Measure of California Agriculture: Its Impact on the State Economy (Revised Edition, 1996).* Division of Agriculture and Natural Resources. University of California. Oakland, California. Publication 21517.

Chaney, David E., Laurie E. Drinkwater, and G. Stuart Pettygrove. 1992. *Organic Soil Amendments and Fertilizers*. UC Sustainable Agriculture Research and Education Program. Division of Agriculture and Natural Resources. University of California. Oakland, California. Publication 21505.

Davidson, Nita A., John E. Dibble, Mary Louis Flint, Patrick J. Marer and Anne Guye. 1991. *Managing Insects and Mites with Spray Oils*. IPM Education and Publications. Statewide

Integrated Pest Management Project. Division of Agriculture and Natural Resources. University of California. Oakland, California. Publication 3347.

Debach, Paul and David Rosen. 1991. *Biological control by natural enemies*. Second Edition. Cambridge University Press. United Kingdom. Pp. 440.

Edwards, C.A. and P.J. Bohlen. 1996. *Biology and Ecology of Earthworms*. Third Edition. Chapman and Hall. United Kingdom. Pp. 300.

Flint, Mary Louise. 1990. *Pests of the Garden and Small Farm: A Grower's Guide to Using Less Pesticide.* Statewide Integrated Pest Management Project, Division of Agriculture and Natural Resources. University of California, Oakland, California. Publication 3332.

Ingels, Chuck. 1994. *Protecting Groundwater Quality in Citrus Production*. UC Sustainable Agriculture Research and Education Program. Division of Agriculture and Natural Resources. University of California. Oakland, California. Leaflet 21521.

Ingels, Chuck, Mark Van Horn, Robert L. Bugg and P. Rick Miller. 1994. Selecting the right cover crop gives multiple benefits. *California Agriculture*. 48(5):43-48.

Integrated Pest Management Education and Publications. 1992. *Integrated Pest Management for Citrus.* Second Edition. Statewide Integrated Pest Management Project. Division of Agriculture and Natural Resources. University of California. Oakland, California. Publication 3339.

Integrated Pest Management Education and Publications. 1992. *U.C. IPM Pest Management Guidelines.* Statewide Integrated Pest Management Project. Division of Agriculture and Natural Resources. University of California. Oakland, California. Publication 3339.

Klonsky, Karen and Laura Tourte. 1994. *State Registration and Organic Certification: A Guide for California Growers.* Department of Agricultural Economics, University of California. Davis, California.

Klonsky, Karen and Laura Tourte. 1995. *Statistical Review for California's Organic Agriculture 1992-1993*. Department of Agricultural Economics, University of California. Davis, California.

Miller, P.R., W.L. Graves, W.A. Williams, and B.A. Madson. 1989. *Covercrops for California Agriculture.* Division of Agriculture and Natural Resources. University of California. Oakland, California. Leaflet 21471.

Parnes, Robert. 1990. *Fertile Soil: A Grower's Guide to Organic & Inorganic Fertilizers.* agAccess. Davis, California.

Sakovich, Nicholas. 1993. *Ventura County Citrus Costs*. University of California Cooperative Extension. Ventura, California.

United States Department of Agriculture. 1996. C*itrus Fruits 1996. Summary*. United States Department of Agriculture. National Agricultural Statistics Service. Washington D.C.

Werner, Matthew R. 1993. *Earthworm Ecology and Sustaining Agriculture*. In: Chuck Ingels (ed.). Proceedings Sustainable Soil Management Symposium. UC Sustainable Agriculture Research and Education Program. Davis, California.

U.C. COOPERATIVE EXTENSION
Table 1. COSTS PER ACRE TO PRODUCE FRESH MARKET ORGANIC VALENCIA ORANGES - OPERATIONS
SOUTH COAST - 1997

Labor Rate: $ 11.72/hr. machine labor
$ 9.38/hr. non-machine labor
Interest Rate: 10.00%
Yield per Acre: 600.00 55-pound field boxes

Operation	Time (Hrs/A)	Labor Cost	Fuel,Lube & Repairs	Material Cost	Custom/ Rent	Total Cost*	Your Cost
	Cash and Labor Costs per Acre						
Cultural:							
Fish/Kelp/Micronutrient Application	0.33	5	2	25	0	32	
Weed 3X-Hand	6.00	56	0	0	0	56	
Gopher Control-Monitor & Trap	1.00	9	0	0	0	9	
Snail Control-Ducks	1.20	11	0	5	0	16	
Release Beneficial Insects	0.00	0	0	0	32	32	
Manure Application	0.00	0	0	0	90	90	
Irrigation	2.08	20	0	380	0	399	
Mow-Cover Crop	0.50	14	4	0	0	18	
Fish/Kelp/Micronutrient Application	0.33	5	2	25	0	32	
Mow-Weed Control	0.50	14	4	0	0	18	
Machine Top (every 4th year)	0.00	0	0	0	25	25	
Hedge (every 4th year)	2.10	20	0	0	0	20	
Shred Brush (every 4th year)	0.15	4	1	0	10	15	
Soil/Tissue Analysis	0.00	0	0	0	9	9	
Disc-Prepare Cover Crop Seedbed	0.21	3	1	0	0	4	
Plant-Cover Crop	0.33	8	1	28	0	37	
Irrigate-Cover Crop	0.26	2	0	32	0	34	
Skirt Pruning	1.33	12	0	0	0	12	
Shred Brush	0.33	9	2	0	0	12	
Pick Up Truck	2.50	35	10	0	0	45	
Miscellaneous	2.00	19	0	0	0	19	
TOTAL CULTURAL COSTS	21.15	247	26	495	165	934	
Harvest:							
Contract	0.00	0	0	0	740	740	
Transport to Packing House	0.00	0	0	0	111	111	
TOTAL HARVEST COSTS	0.00	0	0	0	851	851	
Assessment:							
Citrus Research Board Fees	0.00	0	0	13	0	13	
CA State Organic Registration Fees	0.00	0	0	12	0	12	
CCOF Membership Fees	0.00	0	0	4	0	4	
CCOF Inspection Fees	0.00	0	0	6	0	6	
CCOF .5% Gross Sales	0.00	0	0	21	0	21	
TOTAL ASSESSMENT COSTS	0.00	0	0	56	0	56	
Interest on operating capital @ 10.00%						2	
TOTAL OPERATING COSTS/ACRE		247	26	551	1016	1843	
CASH OVERHEAD:							
Office Expense						100	
Liability Insurance						10	
Sanitation Services						2	
Property Taxes						145	
Property Insurance						103	
Investment Repairs						5	
TOTAL CASH OVERHEAD COSTS						366	
TOTAL CASH COSTS/ACRE						2208	

U.C. COOPERATIVE EXTENSION
FRESH MARKET ORGANIC VALENCIA ORANGES - SOUTH COAST - 1997
Table 1. continued

Operation	Time (Hrs/A)	Labor Cost	Fuel,Lube & Repairs	Material Cost	Custom/ Rent	Total Cost*	Your Cost
	Operation	Cash and Labor Costs per Acre					
NON-CASH OVERHEAD:							
Investment	Per producing Acre		-- Annual Cost -- Capital Recovery				
Buildings		382		35		35	
Shop tools		111		13		13	
Pruning Equipment		27		4		4	
Weed String Trimmers (2)		55		14		14	
Established Orchard		14000		1155		1155	
Ducks-Snail Control		12		7		7	
Equipment		311		43		43	
TOTAL NON-CASH OVERHEAD COSTS		14898		1271		1271	
TOTAL COSTS/ACRE						3479	

* Total cost in categories may not add because of rounding to nearest dollar.

U.C. COOPERATIVE EXTENSION

Table 2. DETAIL OF COSTS PER ACRE TO PRODUCE FRESH MARKET ORGANIC VALENCIA ORANGES - INPUTS
SOUTH COAST - 1997

Labor Rate: $ 11.72/hr. machine labor
$ 9.38/hr. non-machine labor

Interest Rate: 10.00%

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre*	Your Cost
OPERATING COSTS					
Fertilizing Materials:					
Fish Powder	10.00	lb	1.30	13	
Kelp Extract	4.00	lb	5.68	23	
Zinc-Biomin	2.00	qt	3.72	7	
Manganese-Biomin	2.00	qt	3.72	7	
Pest Management:					
Ducks	1.00	duck	5.00	5	
Contract:					
Beneficial Insects	3.00	appl	10.66	32	
Manure - Dairy	6.00	ton	15.00	90	
Harvest	37.00	bin	20.00	740	
Transport to Pack House	37.00	bin	3.00	111	
Topping	1.00	acre	25.00	25	
Shred Brush	1.00	acre	10.00	10	
Soil/Tissue Analysis	1.00	acre	8.50	9	
Water:					
Water Company	26.00	acin	15.83	412	
Assessment:					
Citrus Research Board	600.00	box	0.022	13	
Ca. St. Org. Reg. Fees	1.00	acre	12.00	12	
CCOF Membership Fees	1.00	acre	3.89	4	
CCOF Inspection Fees	1.00	acre	5.55	6	
CCOF .5% Gross Sales	1.00	acre	21.00	21	
Cover Crop**:					
Bell Beans	36.00	lb	0.38	14	
Purple Vetch	18.00	lb	0.68	12	
Cereal Rye	6.00	lb	0.34	2	
Labor (machine)	8.00	hrs	11.72	94	
Labor (non-machine)	16.30	hrs	9.38	153	
Fuel - Gas	4.69	gal	1.30	6	
Fuel - Diesel	8.71	gal	0.97	8	
Lube				2	
Machinery repair				10	
Interest on operating capital @ 10.00%				2	
TOTAL OPERATING COSTS/ACRE				1843	
CASH OVERHEAD COSTS:					
Office Expense				100	
Liability Insurance				10	
Sanitation Services				2	
Property Taxes				145	
Property Insurance				103	
Investment Repairs				5	
TOTAL CASH OVERHEAD COSTS/ACRE				366	
TOTAL CASH COSTS/ACRE				2208	

U.C. COOPERATIVE EXTENSION
DETAIL OF COSTS PER ACRE TO PRODUCE FRESH MARKET ORGANIC VALENCIA ORANGES - INPUTS

Table 2. Continued

NON-CASH OVERHEAD COSTS (CAPITAL RECOVERY):	
Buildings	35
Shop tools	13
Pruning Equipment	4
Weed String Trimmers (2)	14
Established Orchard	1155
Ducks - Snail Control	7
Equipment	43
TOTAL NON-CASH OVERHEAD COSTS/ACRE	1271
TOTAL COSTS/ACRE	3479

* Figures are rounded to nearest dollar.
** Quantity per acre represents planting 50% of acreage.

U.C. COOPERATIVE EXTENSION

Table 3. MONTHLY CASH COSTS PER ACRE TO PRODUCE FRESH MARKET ORGANIC VALENCIA ORANGES
SOUTH COAST - 1997

Beginning MAR 97 Ending FEB 98	MAR 97	APR 97	MAY 97	JUN 97	JUL 97	AUG 97	SEP 97	OCT 97	NOV 97	DEC 97	JAN 98	FEB 98	TOTAL*
Cultural:													
Fish/Kelp/Micronutrient Appl.	32												32
Weed 3X-Hand		19		19		19							56
Gopher Control-Monitor & Trap		9											9
Snail Control-Ducks		16											16
Release Beneficial Insects		11	11	11									32
Manure Application		90											90
Irrigation		50	50	50	50	50	50	50	50				399
Mow-Cover Crop				18									18
Fish/Kelp/Micronutrient Appl.				32									32
Mow-Weed Control						18							18
Machine Top (every 4th year)							25						25
Hedge (every 4th year)							20						20
Shred Brush (every 4th year)							15						15
Soil/Tissue Analysis							9						9
Disc-Prepare Cover Crop Seedbed								4					4
Plant-Cover Crop								37					37
Irrigate-Cover Crop								34					34
Skirt Pruning										6	6		12
Shred Brush											12		12
Pick Up Truck	4	4	4	4	4	4	4	4	4	4	4		45
Miscellaneous	2	2	2	2	2	2	2	2	2	2	2		19
TOTAL CULTURAL COSTS	37	201	66	134	56	92	124	131	56	12	24		934
Harvest:													
Contract				740									740
Transport to Packing House				111									111
TOTAL HARVEST COSTS				851									851
Assessment:													
Citrus Research Board Fees				13									13
Ca. St. Org. Reg. Fees				12									12
CCOF Membership Fees				4									4
CCOF Inspection Fees				6									6
CCOF .5% Gross Sales				21									21
TOTAL ASSESSMENT COSTS				56									56
Interest on oper. capital	0	2	3	11	-4	-3	-3	-2	-1	-0	-0		2
TOTAL OPERATING COSTS/ACRE	38	203	69	1052	52	89	121	129	55	12	23		1843
OVERHEAD:													
Office Expense	9	9	9	9	9	9	9	9	9	9	9		100
Liability Insurance											10		10
Sanitation Services	0	0	0	0	0	0	0	0	0	0	0		2
Property Taxes		72								72			145
Property Insurance											103		103
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0	0	5
TOTAL CASH OVERHEAD COSTS	10	82	10	10	10	10	10	10	10	82	123	0	366
TOTAL CASH COSTS/ACRE	47	285	79	1062	62	98	131	139	65	94	147	0	2208

* Totals in categories may not add because of rounding to nearest dollar.

U.C. COOPERATIVE EXTENSION

Table 4. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS FOR FRESH MARKET ORGANIC VALENCIA ORANGES
SOUTH COAST - 1997

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	- Cash Overhead - Insurance	Taxes	Total
97	60 HP 4WD Tractor	34320	12	8580	4168	153	215	4535
97	Disc - 8'	3802	10	672	527	16	22	565
97	Flail Mower - 8'	7008	10	1239	972	29	41	1042
97	Pick up - 1/2 ton	16226	7	6155	2459	80	112	2650
97	Sprayer - 150 gallon	3255	10	576	451	14	19	484
TOTAL		64611		17222	8577	292	409	9278
60% of New Cost *		38767		10333	5146	175	246	5567

* 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
INVESTMENT								
Buildings	17200	30		1564	61	86	100	1811
Ducks - Snail Control	300	2		169	1	2	0	171
Established Orchard	350000	31	350000	28875	2496	3500	0	34870
Pruning Equipment	1200	10		181	4	6	25	216
Shop tools	5000	15		593	18	25	50	686
Weed String Trimmers (2)	1373	5		346	5	7	20	378
TOTAL INVESTMENT	375073		350000	31728	2585	3625	195	38133

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	1.00	year	469.00	469
Office Expense	25.00	acre	100.00	2500
Sanitation Services	1.00	farm	100.00	100

U.C. COOPERATIVE EXTENSION
Table 5. HOURLY EQUIPMENT COSTS FOR FRESH MARKET ORGANIC VALENCIA ORANGES
SOUTH COAST - 1997

Yr	Description	Actual Hours Used*	COSTS PER HOUR - Capital Recovery	- Cash Overhead - Insurance	Taxes	Repairs	Operating - Fuel & Lube	Total Oper.	Total Costs/Hr.
97	60 HP 4WD Tractor	573.8	4.36	0.16	0.22	0.62	3.29	3.91	8.66
97	Disc - 8'	105.4	3.00	0.09	0.13	0.60	0.00	0.60	3.82
97	Flail Mower - 8'	137.0	4.26	0.13	0.18	2.82	0.00	2.82	7.38
97	Pick up - 1/2 ton	162.5	9.08	0.29	0.41	1.18	2.80	3.98	13.76
97	Sprayer - 150 gallon	91.5	2.96	0.09	0.13	0.86	0.00	0.86	4.03

* Actual hours used equals combined hours for oranges and other enterprises.

Table 6. RANGING ANALYSIS FOR FRESH MARKET ORGANIC VALENCIA ORANGES
SOUTH COAST - 1997

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ORGANIC VALENCIA ORANGES

	YIELD (55-POUND FIELD BOXES/ACRE) 300	400	500	600	700	800	900
OPERATING COSTS/ACRE:							
Cultural Cost	934	934	934	934	934	934	934
Harvest & Assessment Costs	458	608	757	907	1056	1206	1355
Interest on operating capital	-1	-0	1	2	4	5	6
TOTAL OPERATING COSTS/ACRE	1390	1541	1692	1843	1993	2144	2295
TOTAL OPERATING COSTS/BOX	4.63	3.85	3.38	3.07	2.85	2.68	2.55
CASH OVERHEAD COSTS/ACRE	366	366	366	366	366	366	366
TOTAL CASH COSTS/ACRE	1756	1907	2057	2208	2359	2510	2661
TOTAL CASH COSTS/BOX	5.85	4.77	4.11	3.68	3.37	3.14	2.96
NON-CASH OVERHEAD COSTS/ACRE	1271	1271	1271	1271	1271	1271	1271
TOTAL COSTS/ACRE	3027	3178	3328	3479	3630	3781	3931
TOTAL COSTS/BOX	10.09	7.94	6.66	5.80	5.19	4.73	4.37

U.C. COOPERATIVE EXTENSION
FRESH MARKET ORGANIC VALENCIA ORANGES - SOUTH COAST - 1997
Table 6. continued

NET RETURNS PER ACRE ABOVE OPERATING COSTS FOR ORGANIC VALENCIA ORANGES*

PRICE (DOLLARS/BOX)	YIELD (55-POUND FIELD BOXES/ACRE)						
Oranges	300	400	500	600	700	800	900
5.00	110	459	808	1157	1507	1856	2205
5.75	335	759	1183	1607	2032	2456	2880
6.50	560	1059	1558	2057	2557	3056	3555
7.00	710	1259	1808	2357	2907	3456	4005
7.50	860	1459	2058	2657	3257	3856	4455
8.25	1085	1759	2433	3107	3782	4456	5130
9.00	1310	2059	2808	3557	4307	5056	5805

NET RETURNS PER ACRE ABOVE CASH COSTS FOR ORGANIC VALENCIA ORANGES*

PRICE (DOLLARS/BOX)	YIELD (55-POUND FIELD BOXES/ACRE)						
Oranges	300	400	500	600	700	800	900
5.00	-256	93	443	792	1141	1490	1839
5.75	-31	393	818	1242	1666	2090	2514
6.50	194	693	1193	1692	2191	2690	3189
7.00	344	893	1443	1992	2541	3090	3639
7.50	494	1093	1693	2292	2891	3490	4089
8.25	719	1393	2068	2742	3416	4090	4764
9.00	944	1693	2443	3192	3941	4690	5439

NET RETURNS PER ACRE ABOVE TOTAL COSTS FOR ORGANIC VALENCIA ORANGES* **

PRICE (DOLLARS/BOX)	YIELD (55-POUND FIELD BOXES/ACRE)						
Oranges	300	400	500	600	700	800	900
5.00	-1527	-1178	-828	-479	-130	219	569
5.75	-1302	-878	-453	-29	395	819	1244
6.50	-1077	-578	-78	421	920	1419	1919
7.00	-927	-378	172	721	1270	1819	2369
7.50	-777	-178	422	1021	1620	2219	2819
8.25	-552	122	797	1471	2145	2819	3494
9.00	-327	422	1172	1921	2670	3419	4169

* Water costs vary and can significantly affect net returns per acre.
** Investment costs for an established orchard (including costs for land, mature trees and irrigation system) vary and can significantly affect net returns per acre.