
UNIVERSITY OF CALIFORNIA AGRICULTURE AND NATURAL RESOURCES
COOPERATIVE EXTENSION
AGRICULTURAL ISSUES CENTER
UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS
2019
SAMPLE COSTS TO ESTABLISH AN ORCHARD AND PRODUCE
ALMONDS



(photo courtesy of Blake Sanden)

SAN JOAQUIN VALLEY SOUTH

Double-line Drip Irrigation

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 San Joaquin Valley South - 2019

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INTRODUCTION

Sample costs to establish an almond orchard and produce almonds under double-line drip irrigation in the southern San Joaquin Valley are presented in this study. This analysis does not represent any single farm and is intended as a guide only. It can be used to help guide production decisions, estimate potential returns, prepare budgets and evaluate production loans. Sample costs given for labor, materials, equipment and contract services are based on October 2019 figures. The same sample costs (ex. Labor rates) are used from establishment through the production years, knowing that costs will change from year to year. A blank column titled Your Costs is provided in Tables 1, 2 and 3 for your convenience.

For an explanation of calculations used in the study, refer to the section titled Assumptions. For more information contact Donald Stewart, University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, at 530-752-4651 or destewart@ucdavis.edu. To discuss this study with a local San Joaquin valley extension farm advisor contact your county cooperative extension office. ucanr.edu/County_Offices/

Sample Cost of Production studies for many commodities are available and can be downloaded from the Department website, coststudies.ucdavis.edu. Archived studies are also available on the website.

Costs and Returns Study Program/Acknowledgements. A “costs and returns” study is a compilation of specific crop data collected from meetings with professionals working in production agriculture from the region the study is based. The authors thank the farmer cooperators, UC Cooperative Extension and other industry representatives

who provided information, assistance and expert advice. **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.** *The University is an affirmative action/equal opportunity employer.*

ASSUMPTIONS

The assumptions contain background in developing Tables 1 to 8 and pertain to sample costs to establish an orchard and produce almonds under double-line drip irrigation in the southern San Joaquin Valley. The cultural practices described represent production operations and materials considered typical for a well-managed farm in the region.

This study explains the annual costs associated with an ongoing operation, under the assumptions that the farm was operated this way in prior years and will continue in subsequent years. The costs, materials, and practices will not apply to all farms. Timing of and types of cultural practices will vary among growers within the region and from season to season due to variables such as weather, soil, insect and disease pressure.

Farm. The hypothetical orchard consists of 105 contiguous acres of almonds farmed by the owner. Smaller non-contiguous parcels may have additional costs for travel time and equipment re-calibration. Larger farms will have increased efficiencies and lower per acre costs. Almonds are being established on 100 acres; roads, irrigation systems and farmstead occupy five acres. This orchard would be part of a larger farming operation with other orchards or field crops.

Establishment Cultural Practices and Material Inputs

Site Preparation. This 100-acre orchard is established on land previously planted to an orchard. The land is assumed to be well drained and either a class I or II soil. The existing well, main lines and sub-main lines stay in place, while the lateral lines and emitters are removed and replaced as part of the new above-ground double-line drip irrigation system.

Orchard Removal/Land Preparation. After the last harvest, orchard removal begins with the extraction of the irrigation system. Once the lateral and emitter lines are removed, a custom operator uses a tractor with a dozer blade to push over the trees. A front-end loader with a clamp grabs the trees and hauls them to the horizontal grinder to mulch the wood into chips. The chips are pushed to the edge of the orchard. The tree-row is ripped/sub-soiled to about three feet deep. A second pass, at a 45 or 90 degree angle to the first pass at a depth of six feet, breaks up underlying hardpan and pull up any remaining roots.

The new orchard site is disced and rolled twice. The site is laser leveled to reduce or eliminate the possibility of standing water, fumigated in the fall and then left unattended over the winter. A custom operator fumigates the tree-row area (14' strip) with Telone II. Fall operations that prepare the orchard for planting are done the year prior to planting; however, the costs are reflected in the first establishment year.

Prior to planting in January, a custom operator using GPS makes berms and marks the planting sites. Composite soil samples from the various depths, soil types and soil layers are taken at that time to determine major salinity (sodium, chloride, boron) concerns. The grower collects two soil samples at three different depths per 50 acres. An appropriate soil amendment and leaching requirements can then be determined. The irrigation system is installed and the row middles are floated/smoothed.

Trees. No specific almond variety is planted, but cultural practices are based on mid-season maturing varieties. Almond orchards will include at least two or more varieties in which pollen shedding and bloom periods overlap

to insure good pollination. Having two or more varieties in the orchard can affect cultural practices including harvest. The varieties do not mature at the same time. The custom crew will harvest one variety and will have to come back to harvest the other variety. Self-fertile varieties are available. Planting densities may range from 75 to 180 trees per acre. The trees, 124 per acre are planted on a 16' X 22' spacing (tree x row). The life of the orchard at the time of planting is estimated to be 23 years. Contact the local UCCE advisor or a commercial nursery for varieties and rootstocks that are available.

Planting. Potted trees are planted and staked by hand, resulting in higher planting costs. A commercial planting crew plants and trims the trees, places a tree guard or carton around the trunk and applies 3-5 gallons of water to each tree. The tree guard protects against above ground rodents, herbicide sprays, and sunburn.

Train/Prune. Training, including suckering and light trimming for shape, is done in February or March during the first three years. Prunings in the first two years are placed in the row middles and shredded with the regular mowing. The young trees are pruned late to avoid bacterial canker. In the fourth and following years, pruning is done in November or December removing limbs for equipment access and safety. Starting in the third year, the prunings are stacked in the row middles and shredded by a custom operator. Tree tying is done late (November/December) in the second year and again early (January/February) in the fourth year. The tie (small rope) is made around the tree about one-third of the way from the top of the tree. In the fourth year there are two ties per tree.

Fertilizer. Fertilizer rates shown in Table A below reflect typical nutrient requirements, but do not take into account soil and water nutrients. In the first and second year, N is applied monthly from April to August through the irrigation system using CAN-17 for the first two applications (50 percent of the nitrogen budget) and UAN-32 thereafter. In year three and the following years, UAN-32 is applied monthly from March–July. Half of the potassium allotment (as K₂O equivalent) is banded along the tree row in December or January in all years using potassium sulfate (K₂SO₄). The remainder is fertigated with the nitrogen applications using potassium thiosulfate (KTS). Phosphorous (P₂O₅ equivalent) is fertigated as urea ammonium phosphate (10-34-0) in February, April and June.

Table A. Production Information.

Year	Applied Fertilizer (lbs./acre)			Total Applied Water Acre-Inches/Year **	Annual Yields/Acre Kernel (meat) Lbs.
	N	P ₂ O ₅	K ₂ SO ₄		
1	30	30	30	5	-
2	30	30	30	16	-
3*	80	30	30	26	600
4*	100	30	50	47	1,200
5*	200	30	100	52	2,400
Prod*	250	40	200	52	3,000

* Applied fertilizer amounts are dependent on yield. Refer to the “Young Orchard handbook.”

** Add 3 to 10 acre-inches/year, depending on irrigation water quality for leaching salts below 4 foot depth.

Sampling. Beginning in the third year, leaf samples are taken 40 days after bloom (early April) and again in July for nutrient analysis and the fertilizers are applied according to analytical recommendations. Leaf samples are calculated at five per 100 acres. The samples are collected by the PCA and the cost is for the lab analysis. Hull samples for boron analysis are taken immediately prior to harvest at a rate of two samples per 100 acres. Many orchards on the east side of the San Joaquin Valley are boron deficient and an application of boron may be required.

In addition, soil samples are taken every other year. Samples are taken at a rate of four samples per 100 acres to determine salinity, pH and nutrient levels. The samples are taken at three depths (0-1ft, 1-3ft and 3-5ft), to allow for a complete soil profile, from multiple areas in the orchard with specified depths pooled for analysis.

Fall Defoliation. Beginning in the 3rd year, zinc sulfate is applied in mid-November to defoliate the trees to reduce the amount of rust and shot hole inoculum. This practice allows for early pruning and also serves as secondary control for some diseases.

Irrigation. Water is pumped from a well to a reservoir (common in Kern county) and then through a filtration system into the above ground double-line sprinkler system. The double-line drip irrigation system and micro-sprinkler system are the prevalent systems in the region. A double-line drip irrigation system reduces evaporation losses compared to micro sprinklers and; therefore, provides some water savings. Fertilizer use efficiency may also benefit from this more targeted application to the tree roots. This economic study assumes 80 percent application efficiency for all years.

Water costs will vary considerably depending upon the irrigation district and, when pumped, upon the pumping level, energy costs and type of irrigation system. Water costs may also change depending on availability and ground water regulations. This study assumed 100 percent ground water usage and availability. An estimated cost of \$22 per acre-inch (\$264 per acre-foot) is used. Irrigation labor is listed as a separate line item.

Water is applied to the orchard approximately once to twice a week from mid-March through mid-October. The amount of water applied each year is shown in Table A. Effective rainfall has not been considered in this study, because it is too variable; therefore, it is assumed that the season begins with a full soil profile following a winter watering for salt leaching (see “Soil Salinity Management” below).

Sustainable Groundwater Management Act (SGMA). SGMA requires governments and water agencies of high and medium priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. For detailed information visit the website; water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management

Frost Protection. This study does not include irrigation costs for frost protection, as protection may not be needed every year and the amount of water applied for protection will vary. An annual water analysis to determine nitrate availability and to maintain regulatory records is included.

Soil Salinity Management. Almond trees are relatively sensitive to sodium, chloride, and boron. If the salt levels within the soil are high, they must be leached from the soil. This process is typically done with either an application of a leaching fraction in-season or applications of water during the dormant season, when evapotranspiration rates are low. In this study, 6 acre-inches are added in early January each year to leach salt and to refill the soil profile.

Pollination. A commercial beekeeper sets out one-half hive per acre in the third year, one hive per acre in the fourth and two hives thereafter. The hives are placed in the orchard in early February, prior to bloom. Bee colony strength should be a standard 8 frames per hive and the cost ranges from \$150-\$225 per hive, a charge of \$200 per hive is used.

Bees. Bees are sensitive to pesticides and timing of applications must coordinate with bee pollinating activity. See the individual pesticide labels, environmental hazards section. For more information visit the websites listed below. ipm.ucanr.edu/bee precaution/
honeybeehealthcoalition.org/wp-content/uploads/2017/05/HBHC_grower_flyer_v9.pdf

The Almond Board of California recently refreshed the BMPs, (Honey Bee Best Management Practices) incorporating new tips and resources that growers and other stakeholders can use to protect honey bees and plan for a productive pollination. almonds.com/pollination

Pest Management. The pesticides and rates mentioned in this cost study are listed in UC Integrated Pest Management Guidelines, *Almonds*. For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at ipm.ucanr.edu.

Pest Control Advisor/Certified Crop Advisor (PCA/CCA). Written recommendations are required for many pesticides and are available from licensed pest control advisors. The PCA monitors the field for agronomic problems including irrigation and nutrition. Growers may hire a private PCA or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. The PCA charge is \$20 per acre during the establishment years and \$35 per acre during the production years.

Application Methods. Pesticide and fertilizer applications are made by either chemigation (pesticides and/or fertilizers applied through the irrigation water), by UTV mounted ground or spot sprayer or foliar-broadcast by tractor pulled, PTO driven air-blast sprayer. Check individual pesticide labels for compatibility, mixing and usage.

Vegetation Management-Weeds. In the first year, Gramoxone and Prowl are applied to the tree row (strip spray) in February soon after planting. In the second year, a pre-emergent herbicide (Chateau) is applied to the tree row during the dormant season (early January) and a delayed dormant spot spray of Gramoxone is applied in late January. Beginning in the third year, a dormant strip spray of Matrix and Gramoxone is applied to the tree row in the fall (November). Each year, the row middles are mowed in March and August (before harvest) plus a chemical mow using Roundup in April.

Insects and Mites. Treatment for peach twig borer includes a dormant spray of Asana in December of the first and second year. Also starting in the 1st year, a miticide application is made at hull-split (July) using Zeal. Beginning in the third year, ant bait, Clinch is broadcast for ant control in July. Also starting in the third year, the trees are treated for navel orangeworm (NOW) with Intrepid at hull split (late June), followed by a second spray in mid-July using Altacor. Additional insecticide sprays for leaf-footed bug, stink bug and San Jose scale may be necessary in some areas of this region.

Winter Sanitation. Winter sanitation destroys overwintering sites for navel orangeworm and should be done before bud swell. For this study, winter sanitation is completed in January. The mummy nuts are shaken from the trees and swept into the row middles. After the mechanical shaking, a crew hand poles the remaining mummy nuts off the trees. The mummy nuts are shredded using a flail mower.

Disease. Treatment for rust starts in the first year and continues thereafter. The trees are treated with an application of Quash in March. Wettable sulfur may be added to increase fungicide efficacy. The following list of applications commences in the 3rd year: Scab is treated with a delayed dormant liquid copper spray in January followed by a second spray around five weeks after petal fall (late March to April) using Bravo WeatherStik. An application of Vanguard WG is made at late bloom (late February) for brown rot. Around two weeks after petal fall (Mid-March), Pristine is applied to the trees for shot hole. As treatment for alternaria, one application of Luna Sensation in May. To prevent hull rot, an application of Quash is made at hull-split.

Vertebrate Pest. Poison bait is applied in the spring (March) by a mechanical applicator for gopher control. Ground squirrels are controlled by the use of anti-coagulant baits with above ground bait stations in the spring. The costs of the bait stations is included in Shop/Field Tools under investments. Late winter fumigation for squirrels can be effective when soil moisture is adequate.

Harvest. Mechanical harvesting and pickup by the grower begins in the third year. The nuts are removed from the trees by shaking, followed by a custom labor crew that hand poles the remaining nuts from the trees. Next, the nuts are blown and swept into windrows. The grower provides hand labor to rake/blow any missed nuts into the windrows. The harvesting machine picks up the nuts, removes sticks, rocks and dirt, and places them in a nut cart

which is then pulled to the edge of the orchard. The nuts are loaded and hauled to the Huller/Sheller for processing. The nuts are loaded into trucks using a conveyor/elevator and hauled to a hulling and shelling facility. The hulling and shelling facility charges for the processing. The grower also pays the transportation costs of the nuts from the orchard to the processing facility. Some growers engage custom operators to conduct the entire harvesting process which would include hauling.

Yields. Almonds begin bearing an economic crop in the third year after planting. Yields and revenue are further discussed in the section below and estimated yields by year of production are shown in Table A.

Production Cultural Practices and Material Inputs

Pruning. Maintenance hand pruning for safety and equipment access is done in November, but can be done anytime from harvest through the dormant period. Prunings are stacked in the row middles and shredded by a custom operator. Some growers elect to continue tying and roping up until year eight depending on previous training, variety and tree spacing, albeit this cost is not included. Starting in the eighth year, the trees in every other row are trimmed via mechanical hedging (alternating rows each year). Some growers choose to top the trees starting in the 18th year.

Fertilization. In the production years, UAN-32 is fertigated monthly from March – July. 10-34-0 is fertigated in February, April and June. K₂SO₄ is banded along the tree row in the winter in all years (50 percent of the potassium budget) and KTS is applied through the irrigation system with the nitrogen application. Fertilizer rates in this study are typical nutrient requirements, but do not take into account soil and water nutrients.

Zinc Nutrition/Fall Defoliation. Zinc Sulfate is applied in mid-November to early December to defoliate the trees to reduce the amount of inoculum for rust and shot hole and provide for foliar uptake to prevent zinc deficiency. This also allows for early pruning and provides secondary control for some diseases.

Sampling. Leaf samples are taken in April and July for nutrient analysis and the fertilizers are applied according to analysis recommendations. Leaf samples are calculated at five per 100 acres. Hull samples for boron analysis are taken immediately prior to harvest at a rate of 2 samples per 100 acres. The samples are collected by the PCA and the cost is for the lab analysis.

In addition, soil samples are taken every other year, as such, 50 percent of the cost is reflected. Samples are taken a rate of four samples per 100 acres to determine salinity, pH and nutrient levels. The samples are taken at three depths (0-1ft, 1-3ft and 3-5ft), to allow for a complete soil profile, from multiple areas in the orchard with specified depths pooled for analysis. The grower uses an UTV to collect the samples, which is assumed to take one hour.

Irrigation. Irrigation costs include water pumping and labor costs, with irrigation labor provided as a separate line item. Water is pumped from a well to a reservoir and then through a filtration system into the double line drip system at a cost of \$22 per acre-inch (\$264 per acre-foot). A total of fifty-two acre-inches of water is applied to the orchard. An application efficiency/uniformity assumption of 100 percent is often used as the scheduling criteria for most micro systems in the San Joaquin Valley. This assumption includes additional significant water allocations for salinity management. In this study, 6 acre-inches are applied in early January to leach salt and refill the soil profile. No assumption is made about effective rainfall, evaporation, and runoff. Cost for frost protection is not included.

Pollination. Two hives (8+ frames/hive) per acre are contracted for pollination and set in the orchard in February by the beekeeper prior to bloom. The charge used is \$200 per hive.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Almonds*. For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at ipm.ucanr.edu. Pesticides mentioned in this study are not recommendations, but those commonly used in the region. For information regarding pesticide use permits, contact the local county agricultural commissioner's office.

Pesticides with different active ingredients, mode of action, and sites of action should be rotated as needed to combat species shift and resistance. Adjuvants are recommended for use with many pesticides for effective control, but the adjuvants and their costs are not included.

Vegetation Management-Weeds. Beginning in the third year, a dormant strip spray of Matrix and Gramoxone is applied to the tree row in the fall (November). Each year, the row middles are mowed in March and August before harvest, plus a chemical mow using Roundup in April.

Insects. Mites are controlled with a miticide application made at hull-split (July) using Zeal. Ant bait, Clinch is broadcast for control in July. The trees are treated for navel orangeworm (NOW) with Intrepid at hull split (late June), followed by a second spray in mid-July using Altacor.

Pheromone traps with lures as well as egg traps (& female traps in many orchards) are used to monitor NOW. The traps are placed in the orchard in March or April to monitor insect flights through hull-split. All the traps are monitored by the PCA/CCA and the costs are included in their fees.

Winter Sanitation. Winter sanitation destroys over wintering sites for navel orangeworm and should be done before bud swell. Winter sanitation is completed in January. The mummy nuts are shaken from the trees and swept into the row middles. The remaining mummy nuts are hand poled off the trees. All mummy nuts are shredded with a flail mower.

Disease. The trees are treated for rust with an application of Quash in March. Scab is treated with a delayed dormant copper spray in January followed by a second spray around five weeks after petal fall (late March to April) using Bravo WeatherStik. An application of Vanguard WG is made at late bloom (late February) for brown rot. Around two weeks after petal fall (Mid-March), Pristine is applied to the trees for shot hole. As treatment for Alternaria, an application of Luna Sensation in May. To prevent hull rot, an application of Quash is made at hull-split (late June).

Vertebrate Pest. Poison bait is applied in the spring (March) by a mechanical applicator for gopher control. Ground squirrels are controlled by the use of anti-coagulant baits with above ground bait stations in the spring. Late winter fumigation for squirrels can be done when soil moisture is adequate; this cost is not included.

Harvest, Yields and Revenue

Harvest. The grower mechanically harvests the almond crop. The grower shakes the nuts from the trees. A custom labor crew hand poles the remaining nuts from the tree. The grower sweeps the nuts into a windrow and provides hand labor to rake any missed nuts into the windrow. A pick-up machine picks up the nuts and places them into a nut cart, which is then pulled to the edge of the orchard. The nuts are loaded and hauled to the Huller/Sheller for processing. Harvest begins in August for the early maturing varieties and continues into October for late maturing varieties.

Yields. Typical annual yields for almonds are measured in meat (kernel) pounds per acre and are shown in Table A. Yields will vary by location, grower, year, and age of orchard. For this study, it is assumed the orchard will average 3,000 pounds per acre over the production years of the orchard.

Revenue. An estimated price of a \$2.50 per meat pound is assumed based on reported current returns. Prices will vary depending on market condition, almond variety and quality, among other factors. Table 5 has a range of prices used for calculating returns per acre at different yields, with prices ranging from \$1.00 to \$4.00.

Ranging Analysis. Table 5 shows a range of yields, 2,000 – 3,900 kernel pounds per acre over a range of prices, \$1.00 - \$4.00 per pound. Almond producers target yields and prices such that in general, lower yields tend to be associated with higher prices. Therefore, the ranging analysis does not show the cases of very high yields with very high return prices or very low yields with very low return prices.

Almond Hulls and By-Products. Almond by-products include hulls, shells, almond hash, huller dust, and press cakes, which all can be used as livestock feed. Wood from tree removal used for firewood or for composting could be another source of income. These potential sources of income are not included.

Assessment. The Almond Board of California (ABC) assesses all almonds commercially grown in the state to pay for almond promotions and research. The mandatory assessment is paid by processors and is not reflected in grower costs. ams.usda.gov/rules-regulations/almonds-grown-california-increased-assessment-rate

Labor, Equipment, and Operating Interest

Labor. Hourly wages for workers are \$18.00 for machine operators and \$12.50 per hour non-machine labor. Adding 41.72 percent for the employer’s share of federal and state payroll taxes, workers’ compensation insurance, for nut crops (0045) and other possible benefits gives the labor rates shown of \$25.51 and \$17.72 per hour for machine labor and non-machine labor, respectively. Workers’ compensation costs will vary among growers, but the cost is based upon the average industry final rate as of October 2019. Labor for operations involving machinery are 20 percent higher than the operation time to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

Management Salaries. The grower farms the orchard; therefore, no salaries are included for management. Returns above costs are considered a return to management.

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 (ASABE). Fuel and lubrication costs are also determined by ASABE equations based on maximum power takeoff (PTO) horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are \$3.95 and \$3.63 per gallon, respectively. The cost includes a 13.0 percent sales tax on diesel fuel and 2.25 percent sales tax on gasoline. The cost also includes state excise tax for diesel and gasoline at \$0.36 and \$0.42, which are refundable for on-farm use when filing your income tax. Federal Highway tax and local District sales taxes are not included.

Fuel/Lube/Repairs. The fuel, lube, and repair cost per acre for each operation in Table 2 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 percent higher than implement time for a given operation to account for setup, travel and down time.

Pickup Truck/Utility Vehicle, (UTV). The half-ton pickup is used around the farm to monitor the orchard and for hauling tools and supplies. The UTV is used for herbicide spraying, baiting ants, checking irrigation and vertebrate traps.

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 5.25 percent 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 rate will vary depending upon various factors, but the rate is considered a typical lending rate by a farm lending agency as of October 2019.

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 of almond production. Because of so many potential risk factors, effective risk management must combine specific tactics in a detailed manner, in various combinations for a sustainable operation.

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.

Property Taxes. Counties charge a base property tax rate of 1 percent 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 percent of the average value of the property.

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage.

Property Insurance. This provides coverage for property loss and is charged at 8.86 percent per \$1,000 of the average value of the assets over their useful life.

Liability Insurance. A standard farm liability insurance policy will help cover the expenses for which you become legally obligated to pay for bodily injury claims on your property and damages to another person's property as a result of a covered accident. Common liability expenses covered under your policy include attorney fees and court costs, medical expenses for people injured on your property, injury or damage to another's property. In this study, \$833 is charged and covers the entire farm.

Crop Insurance. This is available to almond growers for any unavoidable loss of production, damage or poor quality resulting from adverse weather conditions such as cool wet weather, freeze, frost, hail, heat, rain, wind and damage from birds, drought, earthquakes and fire. Coverage levels are from 50-85 percent of the approved average yield as established by verifiable production records from the orchard. Actual insurance coverage is by unit, not by acre. A significant number of growers purchase crop insurance in this region. Due to variability in coverages no level is specified. rma.usda.gov/policies/.

Office Expense. Office and business expenses are estimated at \$60 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, and miscellaneous administrative charges.

Environmental/Regulatory Costs. Various environmental fees are collected by the county and state. The fees will vary by county. For example, there are fees assessed by the Air Resources Board (state agency) regulating air pollution, a Water Coalition Fee (local coalition), for water discharges and a hazardous material storage fee (local coalition). The grower must also provide safety training, pesticide continuing education, safety equipment and maintain training records. The cost of \$40 per acre is reported.

Sanitation Services. Sanitation services provide trailer mounted, double portable toilets and washbasins for the orchard and cost the farm \$8.60 per acre. The cost includes delivery and weekly service.

Investment Repairs. Annual maintenance is calculated as two percent of the purchase price. The average tree replacement cost over the life of the orchard is assumed to be 0.50 percent of the establishment cost or \$5,055 (\$50.55 per acre) per year.

Non-Cash Overhead

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 prices and salvage values (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 & Biological Engineers (ASABE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASABE 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. The purchase price and salvage value for equipment and investments are shown in the tables below.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. The amortization factor is a table value that corresponds to the interest rate used and the life of the machine.

Interest Rate. The interest rate of 6 percent is used to calculate capital recovery. The rate will vary depending upon size of loan and other lending agency conditions, but is a suggested rate by a farm lending agency in October 2019.

Irrigation System. The pump and well cost is based on one 125 horsepower pump lifting from a water level depth of 400 feet into a reservoir. The reservoir, the pump and a 1,000-foot deep well already existed on the site. The cost of the irrigation system includes a 40 horsepower booster pump that delivers and pressurizes water from the reservoir into the double line drip system.

The life of the irrigation system is estimated to be 23 years. The irrigation system is considered an improvement and is shown in the non-cash overhead sections and the investment portion of the tables. A bi-annual pump test is performed in December or January to monitor pumping level and efficiency (gallons/minute) at a cost of \$200 for the test. The cost of the pump test is applied at a 50 percent rate to the total acreage of the orchard during the production years.

Land. Bare cropland with available water, (district or well) plantable to almonds ranges from \$17,000 to \$24,000 per acre. For this study, bare cropland is valued at \$20,000 per acre, (\$21,000 per producing acre), \$2,100,000 for the 105 acres. Established almond orchards in this region range in value from \$20,000 - \$32,000 per acre (2019 Trends).

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 almonds are harvested minus any returns from production. The Total *Accumulated Net Cash Cost* on Table 1, in the third year represents the establishment cost. The cost is \$10,109 per acre or \$1,010,900 for the 100 acre orchard. The cost is amortized over the remaining 20 years of orchard production to estimate the annual capital recovery cost. The establishment costs added to the bare land value is consistent with the value of an established mature orchard; ($\$20,000 + \$10,109 = \$30,109$). Establishment costs are based on typical basic operations, but can vary considerably, depending upon terrain, soil type, local regulations, and other factors.

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 percent to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in the Whole Farm Annual Equipment, Investment, and Business Overhead Costs table. 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.

Tree Replacement. One or more trees per acre may die each year and are replaced in late winter. Costs are basic costs that will vary with each orchard and type of tree loss. Tree replacement is included in investment repairs under Cash Overhead.

Tools. This includes tools and equipment for the pickup truck, hand tools, vertebrate traps and miscellaneous field tools.

Fuel Tanks. Two 1,000-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.

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

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UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. COSTS PER ACRE TO ESTABLISH AN ALMOND ORCHARD
 San Joaquin Valley South - 2019

Operation:	Year:	Costs per Acre				
		1st	2nd	3rd	4th	5th
Meat Pounds Per Acre @ \$2.50/lb.				600	1,200	2,400
Pre-Plant:						
Irrigation System Removal		53				
Tree Removal		1,200				
Rip: 3' & 6' 2x, Root Removal		627				
Disk & Roll (2x)		130				
Laser Leveling		120				
Fumigate Tree Row (14" Strip)		1,050				
List Berms		35				
Install Irrigation Lines: Labor		89				
Smooth/Float Middles		35				
Soil Analysis		2				
TOTAL PRE-PLANT COSTS		3,340				
Planting:						
Trim/Plant/Wrap/Stake		1,837				
TOTAL PLANTING COSTS		1,837				
Cultural:						
Prune: Train & Sucker		310	310	310		
Shred Pruning				28	28	28
Tree Tying: Ropes & Labor			102		124	
Prune: Maintenance (Hand)					120	120
Pollination				100	200	400
Irrigation: Profile Refill & Salt Leaching		155	155	155	155	155
Irrigate: (Mar - Oct)		122	389	632	1,142	1,264
Irrigation: Pump Test (every other year) /Water Analysis (all years)		5		5	1	5
Fertilize: CAN-17 & KTS (2x)		13	13			
Fertilize: UAN-32 & KTS (3x in Yrs. 1 & 2, 5x in Yrs. 3+)		18	18	49	81	162
Fertilize: K ₂ SO ₄		22	22	22	32	56
Fertilize: 10-34-0 (3x)		26	26	26	26	26
Fertilize: Soil Analysis				2		3
Fertilize: Leaf Analysis				2	2	2
Fertilize: Hull Analysis				1	1	1
Fertilize: Fall Defoliation (Zn)				16	16	16
Weeds: Strip Spray		38	22	36	36	36
Weeds: Spot Spray			16			
Weeds: Mow Middles (2x)		16	16	16	16	16
Weeds: Chemical Mow		10	10	10	10	10
Insects: Mites		74	74	74	74	74
Insects: PTB		26	26			
Insects: NOW (2x)				126	126	126
Insects: Ants				19	19	19
Disease: Scab/Rust (2x)		40	40	62	62	62
Disease: Brown Rot				37	47	61
Disease: Shot Hole				48	48	62
Disease: Alternaria				51	89	89
Disease: Hull Rot				47	47	47
Vertebrate: Gophers		8	8	9	9	9
Vertebrate: Squirrels		13	13	13	13	13
Winter Sanitation				98	163	200
PCA Fee		20	20	35	35	35
Pickup Truck		74	74	74	74	74
UTV		46	46	46	46	46
TOTAL CULTURAL COSTS		1,037	1,402	2,149	2,842	3,217

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 1. CONTINUED
San Joaquin Valley-South 2019

Operation:	Year:	Costs per Acre				
		1st	2nd	3rd	4th	5th
Meat Pounds Per Acre @ \$2.50/lb.				600	1,200	2,400
Harvest:						
Pole Nuts				50	100	125
Shake Trees				18	22	40
Sweep/Windrow/Blow/Rake Nuts				12	12	16
Pickup Nuts				26	26	28
Hull & Shell Nuts				42	84	168
TOTAL HARVEST COSTS				148	253	386
Interest on Operating Capital @ 5.25%		351	59	61	76	88
TOTAL OPERATING COSTS/ACRE		6,565	1,462	2,358	3,171	3,691
Cash Overhead:						
Liability Insurance		8	8	8	8	8
Office Expense		60	60	60	60	60
Sanitation Fees		9	9	9	9	9
Environmental Fee		40	40	40	40	40
Property Taxes		213	213	216	267	270
Property Insurance		19	19	19	24	24
Investment Repairs		45	45	45	96	96
TOTAL CASH OVERHEAD COSTS		394	394	397	503	506
TOTAL CASH COSTS/ACRE		6,959	1,895	2,755	3,675	4,197
INCOME/ACRE FROM PRODUCTION				1,500	3,000	6,000
NET CASH COSTS/ACRE FOR THE YEAR		6,959	1,895	1,255	675	
PROFIT/ACRE ABOVE CASH COSTS						1,803
ACCUMULATED NET CASH COSTS/ACRE		6,959	8,854	10,109	10,784	8,981
Non-Cash Overhead:						
Fuel Tanks: 2-1,000 Gallon		9	9	9	9	9
Shop/Field Tools		11	11	11	11	11
Irrigation System: Double-Line Drip		163	163	163	163	163
Land		1,200	1,200	1,200	1,200	1,200
Establishment Costs					881	881
Equipment		26	27	95	100	149
TOTAL NON-CASH OVERHEAD COST/ACRE		1,409	1,409	1,478	2,365	2,413
TOTAL COST/ACRE FOR THE YEAR		8,368	3,265	4,233	6,039	6,610
INCOME/ACRE FROM PRODUCTION				1,500	3,000	6,000
TOTAL NET COST/ACRE FOR THE YEAR		8,368	3,265	2,733	3,039	610
NET PROFIT/ACRE ABOVE TOTAL COSTS						
TOTAL ACCUMULATED NET COST/ACRE		8,368	11,633	14,366	17,405	18,051

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 2. COSTS PER ACRE TO PRODUCE ALMONDS

San Joaquin Valley South - 2019

Operation	Equipment Time (Hrs./Ac)	Cash and Labor Costs per Acre					Total Cost	Your Cost
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:								
Pruning: Hand Pruning	0 00	0	0	0	0	120	120	
Pruning: Shred Prunings	0 00	0	0	0	0	28	28	
Pollination-Bee Hives	0 00	0	0	0	0	400	400	
Pests-Disease-Scab/Rust 2x	0 41	13	7	4	39	0	62	
Pests- Disease- Brown Rot	0 21	6	4	2	50	0	61	
Pests- Disease- Shot Hole	0 21	6	4	2	49	0	61	
Pests- Disease- Alternaria	0 21	6	4	2	78	0	89	
Pests- Disease- Hull Rot	0 21	6	4	2	35	0	47	
Pests- Insects - Mites	0 21	6	4	2	62	0	74	
Pests-Insects-NOW 2x	0 50	15	9	5	96	0	126	
Pests-Insects Ants	0 19	6	1	0	12	0	19	
Pests- Gophers	0 11	3	1	0	5	0	9	
Pests- Squirrels	0 00	9	0	0	4	0	13	
Irrigation: Salt Leaching	0 00	23	0	0	132	0	155	
Irrigate: Water and Labor	0 00	120	0	0	1,144	0	1,264	
Irrigation: Pump Test (50%)	0 00	0	0	0	0	1	1	
Irrigation: Water Analysis	0 00	0	0	0	1	0	1	
Weeds: Mow Middles (2x)	0 31	9	6	3	0	0	18	
Weeds: Strip Spray	0 13	4	1	0	31	0	36	
Weeds: Chemical Mow	0 13	4	1	0	5	0	10	
Fertilize: Soil Analysis (50%)	0 00	0	0	0	0	2	2	
Fertilize-Leaf Analysis (2x)	0 00	0	0	0	0	5	5	
Fertilize-Hull Analysis	0 00	0	0	0	0	1	1	
Fertigate-UAN-32 & KTS (5x)	0 00	0	0	0	257	0	257	
Fertilize- K ₂ SO ₄	0 15	5	1	1	98	0	105	
Fertilize: 10-34-0 (3x)	0 00	0	0	0	35	0	35	
Fertilize: Fall Defoliation (Zn)	0 25	8	5	2	1	0	16	
Winter Sanitation	2 58	185	43	17	0	0	246	
PCA Fee	0 00	0	0	0	0	35	35	
Pickup	1 67	51	16	6	0	0	74	
UTV-4WD	1 25	38	7	1	0	0	46	
TOTAL CULTURAL COSTS	8 72	525	116	52	2,133	591	3,416	
Harvest :								
Shake Trees	0 75	23	13	4	0	0	40	
Pole Nuts	0 00	0	0	0	0	200	200	
Sweep/Windrow/Blow/Rake Nuts	0 14	18	2	1	0	0	20	
Pick-up Nuts	0 67	20	9	4	0	0	33	
Hull & Shell Nuts	0 00	0	0	0	0	210	210	
TOTAL HARVEST COSTS	1 56	61	23	9	0	410	503	
<u>Interest on Operating Capital at 5.25%</u>							<u>67</u>	
TOTAL OPERATING COSTS/ACRE	10 00	586	140	60	2,133	1,001	3,987	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 2. CONTINUED
San Joaquin Valley-South 2019

		Total Cost	Your Cost
CASH OVERHEAD:			
Environmental/Safety Training		40	
Liability Insurance		8	
Office Expense		60	
Sanitation Fee		9	
Property Taxes		270	
Property Insurance		24	
Investment Repairs		96	
TOTAL CASH OVERHEAD COSTS/ACRE		506	
TOTAL CASH COSTS/ACRE		4,493	
NON-CASH OVERHEAD:			
	Per Producing Acre	Annual Cost Capital Recovery	
Fuel Tanks 2-1,000 Gallon	119	9	9
Field Tools	143	11	11
Irrigation System: Double-Line Drip	2,000	163	163
Land	20,000	1,200	1,200
Establishment Costs	10,109	881	881
Equipment	1,393	151	151
TOTAL NON-CASH OVERHEAD COSTS	33,764	2,416	2,416
TOTAL COSTS/ACRE			6,909

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 3. COSTS AND RETURNS PER ACRE TO PRODUCE ALMONDS
 San Joaquin Valley-South 2019

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Almonds	3,000	Lb	2 50	7,500	
TOTAL GROSS RETURNS				7,500	
OPERATING COSTS					
Herbicide:					36
Matrix SG	1 50	Oz	14 39	22	
Gramoxone SL	3 00	Pint	3 00	9	
Roundup PowerMax	1 40	Pint	3 75	5	
Fungicide:					250
Liquid Copper Spray	2 00	FlOz	0 87	2	
Bravo Weather Stik	4 00	FlOz	0 45	2	
Quash	7 00	FlOz	10 00	70	
Vanguard WG	10.00	Oz	4 95	50	
Pristine	14 50	FlOz	3 40	49	
Luna Sensation	10.00	FlOz	7 75	78	
Insecticide:					170
Zeal	3 00	FlOz	20 75	62	
Intrepid 2F	24 00	FlOz	2 25	54	
Altacor	4 00	FlOz	10 61	42	
Clinch	1 00	Lb	11 80	12	
Rodenticide:					9
Vertebrate Pest Bait	4 50	Lb	1 92	9	
Custom:					1,001
Pruning (Hand) and Stacking	1 00	Acre	120 00	120	
Shred Prunings	0 25	Hour	110 00	28	
Pollination Fee	2 00	Hive	200 00	400	
Irrigation Pump Test	0 01	Each	200 00	1	
Soil Analysis	1 00	Acre	2 00	2	
Leaf Analysis	2 00	Acre	2 25	5	
Hull Analysis	1 00	Acre	1 00	1	
Hand Poling	4 00	Acre	50 00	200	
Hull/Shell Nuts	3,000 00	Lb	0 07	210	
PCA/CCA Fee (Prod Yrs.)	1 00	Acre	35 00	35	
Irrigation:					1,277
Water SJV south	58.00	AcIn	22 00	1,276	
Water Analysis	0 02	Each	50 00	1	
Fertilizer:					391
UAN32 (32-0-0)	250 00	Lb N	0 45	113	
KTS (0-0-25) 25% w/17% Sulfur	400 00	Lb	0 36	144	
Potassium Sulfate (K ₂ SO ₄)	200 00	Lb	0 49	98	
10-34-0 (Ammonium Phosphate)	117 66	Lb	0 30	35	
Zinc Sulfate 36%	1 00	Lb	0 95	1	
Labor:					586
Equipment Operator Labor	12.33	hrs	25 51	315	
Irrigation Labor	7 25	hrs	17 72	128	
Non-Machine Labor	8 07	hrs	17 72	143	
Machinery:					200
Fuel-Gas	2 57	gal	3 63	9	
Fuel-Diesel	32.98	gal	3 95	130	
Lube				21	
Machinery Repair				39	
Interest on Operating Capital @ 5.25%				67 45	
TOTAL OPERATING COSTS/ACRE				3,987	
TOTAL OPERATING COSTS/LB				1 32	
NET RETURNS ABOVE OPERATING COSTS				3,513	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 3. CONTINUED
San Joaquin Valley-South 2019

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS					
Environmental/Safety Training				40	
Liability Insurance				8	
Office Expense				60	
Sanitation Fee				9	
Property Taxes				270	
Property Insurance				24	
Investment Repairs				96	
TOTAL CASH OVERHEAD COSTS/ACRE				506	
TOTAL CASH OVERHEAD COSTS/LB				0 17	
TOTAL CASH COSTS/ACRE				4,493	
TOTAL CASH COSTS/LB				1.50	
NET RETURNS ABOVE CASH COSTS				3,007	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Fuel Tanks 2-1,000 Gallon				9	
Field Tools				11	
Irrigation System: Double-Line Drip				163	
Land				1,200	
Establishment Costs				881	
Equipment				151	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				2,416	
TOTAL NON-CASH OVERHEAD COSTS/LB				0 81	
TOTAL COST/ACRE				6,909	
TOTAL COST/LB				2 30	
NET RETURNS ABOVE TOTAL COST				591	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE ALMONDS
 San Joaquin Valley-South 2019

	JAN 19	FEB 19	MAR 19	APR 19	MAY 19	JUN 19	JUL 19	AUG 19	SEP 19	OCT 19	NOV 19	DEC 19	Total
Cultural:													
Pruning: Hand Pruning											120		120
Pruning: Shred Prunings											28		28
Pollination-Bee Hives		400											400
Pests-Disease-Scab/Rust 2x	14		49										62
Pests- Disease- Brown Rot		61											61
Pests- Disease- Shot Hole			61										61
Pests- Disease- Alternaria					89								89
Pests- Disease- Hull Rot						47							47
Pests- Insects - Mites							74						74
Pests-Insects-NOW 2x						69	57						126
Pests-Insects Ants							19						19
Pests- Gophers			9										9
Pests- Squirrels			13										13
Irrigation: Salt Leaching	155												155
Irrigate: Water and Labor			55	109	158	207	249	219	164	103			1,264
Irrigation: Pump Test (50%)	1												1
Irrigation: Water Analysis	1												1
Weeds: Mow Middles (2x)			9					9					18
Weeds: Strip Spray											36		36
Weeds: Chemical Mow				10									10
Fertilize: Soil Analysis (50%)	2												2
Fertilize-Leaf Analysis (2x)				2			2						5
Fertilize-Hull Analysis								1					1
Fertigate-UAN32 & KTS (5x)			51	51	51	51	51						257
Fertilize- K ₂ SO ₄												105	105
Fertilize: 10-34-0 (3x)		12		12		12							35
Fertilize: Fall Defoliation (Zn)											16		16
Winter Sanitation	246												246
PCA Fee											35		35
Pickup	6	6	6	6	6	6	6	6	6	6	6	6	74
UTV-4WD	4	4	4	4	4	4	4	4	4	4	4	4	46
TOTAL CULTURAL COSTS	428	483	257	195	309	395	463	239	174	113	244	115	3,416
Harvest:													
Shake Trees									40				40
Pole Nuts									200				200
Sweep/Windrow/Blow/Rake Nuts									20				20
Pick-up Nuts									33				33
Hull & Shell Nuts									210				210
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	0	503	0	0	0	503
Interest on Operating Capital @5.25%	1 87	3 99	5 11	5 97	7 32	9 05	11 07	12 12	15 08	-2 07	-1 57	-0 50	67 45
TOTAL OPERATING COSTS/ACRE	430	487	262	201	316	404	474	251	692	111	242	115	3,987

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 4. CONTINUED
San Joaquin Valley-South 2019

	JAN 19	FEB 19	MAR 19	APR 19	MAY 19	JUN 19	JUL 19	AUG 19	SEP 19	OCT 19	NOV 19	DEC 19	Total
Cash Overhead:													
Environmental/Safety Training									40				40
Liability Insurance	1	1	1	1	1	1	1	1	1	1	1	1	8
Office Expense	5	5	5	5	5	5	5	5	5	5	5	5	60
Sanitation Fee									9				9
Property Taxes		270											270
Property Insurance		12							12				24
Investment Repairs	8	8	8	8	8	8	8	8	8	8	8	8	96
TOTAL CASH OVERHEAD COSTS	14	295	14	14	14	14	14	14	74	14	14	14	506
TOTAL CASH COSTS/ACRE	444	782	276	215	330	418	488	265	767	125	256	128	4,493

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 5. RANGING ANALYSIS-ALMONDS
 San Joaquin Valley-South 2019

COSTS PER ACRE AND PER LB AT VARYING YIELDS TO PRODUCE ALMOND

	YIELD (Lbs. /Acre)						
	2,000 00	2,300 00	2,600 00	3,000 00	3,300 00	3,600 00	3,900 00
OPERATING COSTS/ACRE:							
Cultural	3,416	3,416	3,416	3,416	3,416	3,416	3,416
Harvest	429	451	473	503	526	548	570
Interest on Operating Capital @ 5.25%	67 12	67 22	67 32	67 45	67 54	67 64	67 74
TOTAL OPERATING COSTS/ACRE	3,912	3,935	3,957	3,987	4,009	4,032	4,054
TOTAL OPERATING COSTS/LB	1 96	1 71	1 52	1 33	1 21	1 12	1 04
CASH OVERHEAD COSTS/ACRE	506	506	506	506	506	506	506
TOTAL CASH COSTS/ACRE	4,418	4,441	4,463	4,493	4,516	4,538	4,561
TOTAL CASH COSTS/LB	2 21	1 93	1 72	1 50	1 37	1 26	1 17
NON-CASH OVERHEAD COSTS/ACRE	2,416	2,416	2,416	2,416	2,416	2,416	2,416
TOTAL COSTS/ACRE	6,834	6,856	6,879	6,909	6,931	6,954	6,976
TOTAL COSTS/LB	3 42	2 98	2 65	2 30	2 10	1 93	1 79

Net Return per Acre above Operating Costs for Almond

PRICE (\$/lb)	YIELD (lbs /Acre)						
	Almonds	2,000 00	2,300 00	2,600 00	3,000 00	3,300 00	3,600 00
1 00	-1,912	-1,635	-1,357	-987	-709	-432	-154
1 50	-912	-485	-57	513	941	1,368	1,796
2 00	88	665	1,243	2,013	2,591	3,168	3,746
2 50	1,088	1,815	2,543	3,513	4,241	4,968	5,696
3 00	2,088	2,965	3,843	5,013	5,891	6,768	7,646
3 50	3,088	4,115	5,143	6,513	7,541	8,568	9,596
4 00	4,088	5,265	6,443	8,013	9,191	10,368	11,546

Net Return per Acre above Cash Costs for Almond

PRICE (\$/lb)	YIELD (lbs /Acre)						
	Almonds	2,000 00	2,300 00	2,600 00	3,000 00	3,300 00	3,600 00
1 00	-2,418	-2,141	-1,863	-1,493	-1,216	-938	-661
1 50	-1,418	-991	-563	7	434	862	1,289
2 00	-418	159	737	1,507	2,084	2,662	3,239
2 50	582	1,309	2,037	3,007	3,734	4,462	5,189
3 00	1,582	2,459	3,337	4,507	5,384	6,262	7,139
3 50	2,582	3,609	4,637	6,007	7,034	8,062	9,089
4 00	3,582	4,759	5,937	7,507	8,684	9,862	11,039

Net Return per Acre above Total Costs for Almond

PRICE (\$/lb)	YIELD (lbs /Acre)						
	Almonds	2,000 00	2,300 00	2,600 00	3,000 00	3,300 00	3,600 00
1 00	-4,834	-4,556	-4,279	-3,909	-3,631	-3,354	-3,076
1 50	-3,834	-3,406	-2,979	-2,409	-1,981	-1,554	-1,126
2 00	-2,834	-2,256	-1,679	-909	-331	246	824
2 50	-1,834	-1,106	-379	591	1,319	2,046	2,774
3 00	-834	44	921	2,091	2,969	3,846	4,724
3 50	166	1,194	2,221	3,591	4,619	5,646	6,674
4 00	1,166	2,344	3,521	5,091	6,269	7,446	8,624

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

TABLE 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

San Joaquin Valley-South 2019

ANNUAL EQUIPMENT COSTS								
Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
19	34HP4WD Tractor	31,000	12	7,750	3,238	17 17	193.75	3,449
19	85HP4WD Low-Profile Tractor	76,000	15	14,796	7,189	40 22	453.98	7,684
19	Air-Blast PTO 500 Gallon	28,000	8	6,322	3,870	15 20	171.61	4,057
19	Bait Applicator	2,495	10	441	306	1 30	14.68	321
19	Fertilizer Applicator PTO	15,000	10	2,653	1,837	7 82	88.26	1,933
19	Flail Mower 16'	13,900	10	2,458	1,702	7 25	81.79	1,791
19	Nut Kart #1	19,500	20	1,016	1,672	9 09	102.58	1,784
19	Nut Kart #2	19,500	20	1,016	1,672	9 09	102.58	1,784
19	Nut Pickup Machine	150,000	15	14,401	14,826	72 83	822.00	15,721
19	Nut Sweeper/Blower	78,000	15	7,489	7,709	37 87	427.44	8,175
19	Pickup Truck 1/2 Ton	32,000	5	14,342	5,053	20 53	231.71	5,305
19	Tree Shaker-Side Bullet	135,000	14	14,645	13,827	66 29	748.23	14,642
19	UTV Sprayer 100 Gallon	3,460	10	612	424	1 80	20.36	446
19	UTV-4WD	9,500	8	3,315	1,195	5 68	64.08	1,265
	TOTAL	613,355	-	91,256	64,520	312	3,523	68,356
	60% of New Cost*	368,013	-	54,754	38,712	187	2,114	41,013

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS								
Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Insurance	Taxes	Repairs	Total
INVESTMENT								
Fuel Tanks 2-1,000Gal	12,500	23	875	997	6	67	250	1,320
Shop/Field Tools	15,000	25	1,500	1,146	7	83	300	1,536
Irrigation System: Double-Line	200,000	23	0	16,256	89	1,000	4,000	21,344
Land	2,100,000	30	2,100,000	126,000	1,861	21,000	0	148,861
Establishment Costs	1,010,900	20	0	88,135	448	5,055	5,055	98,692
TOTAL INVESTMENT	3,338,400	-	2,102,375	232,534	2,410	27,204	9,605	271,753

ANNUAL BUSINESS OVERHEAD COSTS				
Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Environmental/Safety Training	100	Acre	40 00	4,000
Liability Insurance	105	Acre	8 33	875
Office Expense	105	Acre	60 00	6,300
Sanitation Fee	100	Acre	8 60	860

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

TABLE 7. HOURLY EQUIPMENT COSTS

San Joaquin Valley-South 2019

Description	Almond		Cash Overhead		Operating			Total Costs/Hr
	Hours Used	Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel	Total Oper.	
34HP4WD Tractor	56	1 94	0 01	0 12	2 37	6.60	8.97	11 04
85HP4WD Low-Profile Tractor	384	4 05	0 02	0 26	4 35	16.49	20.84	25 16
Air-Blast PTO 500 Gallon	219	9 29	0 04	0 41	4 82	0.00	4.82	14 56
Bait Applicator	11	1 53	0 01	0 07	0 96	0.00	0.96	2 57
Fertilizer Applicator PTO	15	9 18	0 04	0 44	5 76	0.00	5.76	15 42
Flail Mower 16'	106	5 11	0 02	0 25	5 77	0.00	5.77	11 14
Nut Kart #1	25	6 69	0 04	0 41	2 85	0.00	2.85	9 99
Nut Kart #2	25	6 69	0 04	0 41	2 85	0.00	2.85	9 99
Nut Pickup Machine	18	35 58	0 17	1 97	4 61	11.85	16.46	54 19
Nut Sweeper/Blower	71	18 50	0 09	1 03	3 25	11.85	15.10	34 72
Pickup Truck 1/2 Ton	167	7 58	0 03	0 35	3 86	9.88	13.73	21 69
Tree Shaker-Side Bullet	229	30 17	0 14	1 63	4 96	15.80	20.76	52 70
UTV Sprayer 100 Gallon	46	1 69	0 01	0 08	0 92	0.00	0.92	2 71
UTV-4WD	171	1 15	0 01	0 06	1 03	5.45	6.47	7 68

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 8. OPERATIONS WITH EQUIPMENT & MATERIALS
 San Joaquin Valley-South 2019

Operation	Month	Tractor & Implement	Labor Type/ Materials	Rate/ acre	Unit
Pruning: Hand Pruning	Nov		Pruning (Hand) and Stacking	1.00	Acre
Pruning: Shred Pruning	Nov		Shredding	0.25	Hour
Pollination	Feb		Pollination Fee	2.00	Hive
Pests – Disease - Scab/Rust	Jan	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Liquid Copper Spray	2.00	FIOz
	Mar	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Bravo Weather Stik	4.00	Pint
			Quash	3.50	FIOz
Pests: Disease – Brown Rot	Feb	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Vanguard WG	10.00	FIOz
Pests: Disease – Shot Hole	Mar	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Pristine	14.50	FIOz
Pests: Disease - Alternaria	May	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Luna Sensation	10.00	FIOz
Pests: Disease – Hull Rot	June	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Quash	3.50	FIOz
Pests: Insects - Mites	July	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Zeal	3.00	FIOz
Pests: Insects -NOW	June	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	hour
		Air Blast PTO 500 Gal. Tractor	Intrepid 2F	24.00	FIOz
Pests: Insects - Ants	July	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.25	Hour
		Air Blast PTO 500 Gal. Tractor	Altacor	4.00	FIOz
Pests: Insects - Ants	July	UTV-4WD	Equipment Operator Labor	0.23	hour
		UTV Mounted Spot Sprayer	Clinch	1.00	Lb.
Pests: Gophers	Mar	34HP4WD Tractor	Equipment Operator Labor	0.13	hour
		Bait Applicator	Vertebrate Pest Bait	2.50	Lb.
Pests: Squirrels	Mar	UTV-4WD	Non-Machine Labor	0.50	hour
			Vertebrate Pest Bait	2.00	Lb.
Irrigation: Refill Profile & Salt Leaching	Jan		Irrigation Labor	1.30	hours
			Water-Pumped	6.00	Ac In
Irrigate	Mar		Irrigation Labor	0.29	hour
			Water-Pumped	2.25	Ac In
	Apr		Irrigation Labor	0.59	hour
			Water-Pumped	4.50	Ac In
	May		Irrigation Labor	0.85	hour
			Water-Pumped	6.50	Ac In
	June		Irrigation Labor	1.11	hours
			Water-Pumped	8.50	Ac In
	July		Irrigation Labor	1.33	hours
			Water-Pumped	10.25	Ac In
	Aug		Irrigation Labor	1.17	hours
			Water-Pumped	9.00	Ac In
	Sept		Irrigation Labor	0.88	hour
			Water-Pumped	6.75	Ac In
	Oct		Irrigation Labor	0.55	hour
			Water-Pumped	4.25	Ac In
Irrigation: Pump Test	Jan		Irrigation Pump Test	0.01	Each
Irrigation: Water Analysis	Jan		Water Analysis	0.02	Each
Weeds: Mow Middles	Mar	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.18	hour
		Flail Mower 16'			
	Aug	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.18	hour
		Flail Mower 16'			
Weeds: Strip Spray	Nov	UTV-4WD	Equipment Operator Labor	0.16	hour
		UTV Sprayer System 100 Gal	Matrix SG	1.50	Oz
			Gramoxone	3.00	Pint
			Equipment Operator Labor	0.16	hour
Weeds: Chemical Mow	Apr	UTV-4WD	Roundup PowerMax	1.40	Pint
		UTV Sprayer System 100 Gal			
Fertilize: Soil Analysis	Jan		Soil Analysis	1.00	Acre
Fertilize: Leaf Analysis	Apr		Leaf Analysis	1.00	Acre
	July		Leaf Analysis	1.00	Acre
Fertilize: Hull Analysis	Aug		Hull Analysis	1.00	Acre

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 8. CONTINUED
 San Joaquin Valley-South 2019

Operation	Month	Tractor & Implement	Labor Type/ Materials	Rate/ acre	Unit
Fertilize: UAN32 & KTS	Mar		UAN32 (32-0-0)	50.00	Lb. N
			KTS (0-0-25) 25% w/17% Sulfur	80.00	Lb.
	Apr		UAN32 (32-0-0)	50.00	Lb. N
			KTS (0-0-25) 25% w/17% Sulfur	80.00	Lb.
	May		UAN32 (32-0-0)	50.00	Lb. N
			KTS (0-0-25) 25% w/17% Sulfur	80.00	Lb.
	June		UAN32 (32-0-0)	50.00	Lb. N
KTS (0-0-25) 25% w/17% Sulfur			80.00	Lb.	
July		UAN32 (32-0-0)	50.00	Lb. N	
		KTS (0-0-25) 25% w/17% Sulfur	80.00	Lb.	
Fertilize: K ₂ SO ₄	Dec	34HP4WD Tractor Fertilizer Applicator PTO	Equipment Operator Labor Potassium Sulfate-K ₂ SO ₄	0.18 200.00	Hour Lb.
Fertilize: 10-34-0	Feb		10-34-0 (Ammonium Phosphate)	39.22	Lb.
	Apr		10-34-0 (Ammonium Phosphate)	39.22	Lb.
	June		10-34-0 (Ammonium Phosphate)	39.22	Lb.
Fertilize: Fall Defoliation	Nov	85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.30	Hour
		Air-Blast PTO 500 Gal.	Zinc Sulfate 36%	1.00	Lb.
Winter Sanitation	Jan	Tree Shaker-Side Bullet	Equipment Operator Labor	1.60	hours
		Nut Sweeper/Blower	Equipment Operator Labor	0.60	hour
		85HP4WD Low-Profile Tractor	Equipment Operator Labor	0.90	hours
		Air-Blast PTO 500 Gal.	Non-Machine Labor	6.00	Hours
PCA Fee	Nov		PCA/CCA Fee (Prod Yrs.)	1.00	Acre
Pickup	Nov	Pickup Truck 3/4 Ton	Equipment Operator Labor	2.00	Hour
UTV	Nov	UTV-4WD	Equipment Operator Labor	1.50	Hour
Harvest: Shake Trees	Sept	Tree Shaker-Side Bullet	Equipment Operator Labor	0.90	Hour
Harvest: Pole Nuts	Sept		Hand Poling	4.00	Acre
Harvest: Sweep/Windrow Blow/Rake	Sept	Nut Sweeper/Blower	Equipment Operator Labor	0.17	Hour
			Non-Machine Labor	0.75	Hour
Harvest: Pick-up Nuts	Sept	Nut Pickup Machine	Equipment Operator Labor	0.20	Hour
	Sept	85HP4WD Low-Profile Tractor Nut Kart #1	Equipment Operator Labor	0.30	Hour
Sept	34HP4WD Tractor Nut Kart #2	Equipment Operator Labor	0.30	Hour	
Harvest: Hull & Shell	Sept		Hull/Shell Nuts	3,000.00	Lb.