
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 Luke Milliron)

SACRAMENTO VALLEY
Micro-Sprinkler Irrigation

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INTRODUCTION

Sample costs to establish an almond orchard and produce almonds under micro-sprinkler irrigation in the Sacramento 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 August 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 Sacramento valley extension 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 micro-sprinkler irrigation in the Sacramento 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 farm consists of 105 contiguous acres 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.

Establishment Cultural Practices and Material Inputs

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

Orchard Removal/Land Preparation. As soon as possible 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 can be pushed to the edge of the orchard and burnt or spread back into the orchard, which is reported in this analysis. The ground is sub-soiled to 3-feet. A second sub-soil pass, at a 45 or 90 degree angle to the first pass at 6-feet deep, breaks up underlying hardpan and pulls up remaining roots. The roots are removed by hand. The orchard site is disced and rolled twice to break up clods.

The new orchard site is laser leveled to reduce or eliminate the possibility of standing water. Fumigation, if needed based on nematode test results, is done in the fall using Telone II or Telone C35. Many areas of the Sacramento Valley do not require soil fumigation; these charges are not included in this study. A survey crew is hired to mark the orchard site. Berms for the tree rows are formed with a ridger using GPS. The irrigation system is installed after the tree sites are marked. The row middles are then smoothed/floated to fill in borrow pits. The berms are strip sprayed with Gramoxone SL and Surflan. All operations that prepare the orchard for planting are completed in the fall of the year prior, but these costs are shown in the first year.

Planting. The trees are planted in February or March. The trees are grown in pots at the nursery.

A commercial planting crew plants the trees by hand and applies 3-5 gallons of water with each tree. The trees are whitewashed, cartons put on, topped and staked by the grower. Note; for tree support, in east-west plantings, the trees are typically staked, which potentially may have higher costs. On north-south rows, the trees are typically trellised and the cost would include the tree ties and tying of the trees by the planting crew.

Trees. Almond orchards will include at least two or more varieties in which bloom periods overlap to ensure adequate pollination. No specific variety is mentioned, self-fertile varieties are available. 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. Planting densities may range from 100 to 180 trees per acre, for this study 124 trees per acre are planted on a 16 foot x 22 foot spacing (tree x row spacing). The life of the orchard at the time of planting is estimated at 25 years. Contact the local UCCE advisor or a commercial nursery for varieties and rootstocks that are available.

Train/Prune. Pruning begins in the first year when newly planted trees are topped by the planting crew and is included in the planting costs. In early summer of that year, the trees are suckered. Prunings in the first year are placed in the row middles and shredded with the regular mowing. From year two onward, minimal pruning is required, aside from light hand pruning in December to allow for equipment access and safety. Starting in year two, prunings are pushed to the edge of the orchard and burned.

Fertilizer. Triple fifteen (15-15-15), is applied by hand within the drip line of the trees in March, April and June during the first year. From the second year through the production years, liquid UAN-32 is applied through the irrigation system in equal amounts in March, April/May and June. Annual rates of actual nitrogen (N) applied are shown in Table A. Beginning in the fall of the second year, zinc sulfate is applied as a foliar spray and boron (Solubor, boric acid, etc.) maybe added if hull sample analysis results show need. Beginning in year two, potassium sulfate (K₂SO₄) is banded along the tree row in the fall using a pull type fertilizer applicator.

Table A. Production Information.

Year	Fertilizer Applied			Applied Water Acre-Inches	Yields Kernel lbs./Acre
	Lbs. N/Ac	Lbs.K ₂ SO ₄ /Ac	Lbs. B/Ac		
1	15	-	-	18	-
2	30	40	-	18	-
*3	60	80	0.4	26	400
*4	120	160	0.4	32	800
*5	160	280	0.4	38	1,600
*6	220	400	0.4	38	2,000
*P	220	400	0.4	38	2,200

*Applied fertilizer rates are dependent on yields.

Sampling. Starting in the third year, leaf samples are collected by the PCA in July to analyze tree nutrient status. If the leaf analysis shows a nitrogen deficiency, a small amount of UAN-32 is applied through the irrigation system after harvest. Hull samples are collected by the PCA from the windrow at harvest. If this sample shows a boron deficiency, a post-harvest boron application should be applied before leaf drop.

Irrigation. The cost for water is calculated at \$100 per acre-foot or \$8.33 per acre-inch. Price per acre-foot of water will vary by grower depending on water source – well or district water, well characteristics, and water district. It is assumed soil stored water from rainfall will supply a portion of the early season water requirements (this amounts to approximately 6 acre-inches of water stored in the soil that is not included in the applied water amounts). The field is irrigated an average of twice per week from April to October. Amounts will vary each year

depending upon the weather. The average, annual water applied to an almond orchard is shown in Table A. Irrigation labor costs are provided as a separate line item.

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

Water analysis/Well Test. An annual water analysis to determine nitrate availability, maintain regulatory records and monitor levels of potentially toxic elements chlorine, boron and sodium is shown and the costs are combined with the annual well test.

The micro-sprinkler irrigation system requires chemical flushing to retard calcium buildup in the lines and emitter clogging. This operation is performed annually in the fall or after harvest with N-pHuric acid applied through the system with .25 acre-inches of water.

Frost Protection. Frost protection begins in February or March of the fourth year. Frost protection may not be required every year and the amount of protection needed will vary. This study assumes two acre-inches of water will be applied annually in February, which is in addition to the amounts of water shown in Table A.

Pollination. A commercial beekeeper sets out one-half hive per acre in the third year, one hive in the fourth year, two hives in the fifth year and the rest of the production years. Bee colony strength should be a standard eight frames per hive and the cost ranges from \$180-\$220 per hive. For this study, \$200 per hive is charged.

Pest Management. The pesticides and rates mentioned in this cost study, as well as other materials available, are listed in the *UC Integrated Pest Management Guidelines for Almonds* and the *2017 Fungicide Efficacy and Treatment Timing for Almonds* publication located on the UC IPM website at ipm.ucanr.edu. For information on other pesticides available, pest identification, monitoring, and management, check with your PCA and/or visit the UC IPM website. For information and pesticide use permits, contact the local county agricultural commissioner's office.

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 Control Adviser/Certified Crop Advisor (PCA/CCA). The PCA/CCA monitors the field for agronomic problems including pests and nutrition and writes recommendations for pesticide applications. Growers may hire a private PCA/CCA or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. The PCA/CCA charge is \$35 per acre.

Vegetation Management-Weeds. In the first year, weeds are controlled in the row middles by mowing in May, June and August. The tree row (strip spray) is sprayed with Gramoxone SL in April, June and August.

In the second calendar year, the row middles are mowed twice, February and June. The tree row is sprayed with

a dormant strip spray using Surflan and Roundup in January. Two spot or strip sprays with Roundup tank mixed with Rely 280 are applied to the tree row twice, once in April and again in July. Trunk protectors must be in place for Rely 280 to be used in the 2nd leaf.

From the third year on, the row middles are mowed five times in February, April, May, June and August. A dormant season strip spray with Alion, Matrix and Roundup is applied in January. Roundup and Rely 280 are applied as a strip spray in May to pick up escaped weeds. A pre-harvest weed spray in July, again with Roundup and Rely 280 are applied to the entire orchard floor (row middles and tree row).

Insects and Mites. In the first year, sprays are applied using a sprayer with a handgun due to the small tree size; the applied rate is 10 percent of recommended total volume. An insecticide treatment of Altacor for peach twig borer (PTB) control and AgriMek for mites is made in May.

Starting in the second year an air-blast sprayer is used to apply the materials. It is assumed that biological insecticides such as Dipel, (which is considered bee safe) applied at bloom and post bloom will control peach twig borer (PTB); therefore, dormant sprays are not needed. For PTB in the third, fourth, fifth, and sixth years, a biological insecticide, Dipel, is added to the brown rot materials; two treatments are made, one at bloom in February and one at petal fall in early March.

Beginning in the third year and in subsequent years, navel orangeworm NOW, *Amyelois transitella* is monitored using pheromone traps with lures as well as egg traps (& female traps in many orchards). The traps are placed in the orchard in March to monitor insect flights through hull-split. Insecticide applications of Altacor for NOW (with Zeal-once, for mites) is applied twice at hull-split (two varieties). All the traps are monitored by the PCA/CCA and the costs are included in their fees.

Winter Sanitation. Winter sanitation, November-January destroys overwintering sites and spring food sources for NOW. The trees containing mummy nuts are mechanically shaken and poled by hand to drop the mummies to the orchard floor where they are swept into the middles and shredded with a flail mower. The shaking and sweeping operations are custom hired and the grower does the shredding. This operation begins in the third year and continues for the life of the orchard.

Some years, mummy nuts stick worse than others ensuing that more labor for hand polling may be required. This study shows the hand labor charges combined and split over two years.

Diseases. In the third, fourth, and fifth years, Vanguard WG is applied in February to control brown rot. In the fourth and fifth year, Ziram is applied in March/April to control shot hole, scab and rust. In the sixth year, brown rot may be controlled with Vanguard in February and shot hole with Merivon, Luna, or Bravo (this study applies Bravo) in early March and Ziram in late March. Additional fungicide sprays can be applied in April or later (approximately 5 weeks after petal fall) for control of scab, rust, and Alternaria. Some growers may include a fungicide with the first hull-split spray for hull rot control.

Vertebrate Pests. Treatments will vary depending upon rodent populations and orchard location. Gophers are managed with poison bait applied in the spring and fall using a hand bait applicator. Trapping is used to control squirrels at a cost of \$8.50/trap, which is included in shop tools under investments. Squirrel traps are set from March through October. The grower uses 2.5 traps/acre. See the following websites for additional information.
ucanr.org/sites/Ground_Squirrel_BMP/
ipm.ucdavis.edu/PMG/menu.vertebrate.html.

Harvest. Beginning in the third year, the almonds are mechanically harvested; albeit, great care is taken when shaking the trees in the first harvest year as to not damage the root system. A farm of this size may not own the harvesting equipment. For this situation the grower contracts with a custom harvesting operation.

The grower furnishes labor for hand raking and blowing the nuts missed by the sweeper into the windrows. Almond harvest starts in August and goes through October. A shaker head attaches to the tree trunk to shake the nuts from the tree. The nuts fall to the ground, are allowed to dry and in a separate operation are blown from around the tree and swept into windrows. A pickup machine gathers the nuts from the windrow and loads them into a cart or bankout wagon. The nuts are elevated into bottom dump trailers (set of doubles) and transported to the hulling operation.

Production Cultural Practices and Material Inputs

Prune. Hand pruning is done in alternate years which can begin after harvest and continue through the winter months to remove dead or diseased wood, facilitate orchard management and provide equipment access. One-half of the cost is charged each year to the orchard operation. Prunings are placed into the row middles and pushed out of the orchard by a tractor with a brush rake and burned. Some growers elect to shred prunings in the rows.

Fertilizer. Nitrogen fertilization is based on estimated yield, while leaf samples are used to monitor long-term trends. UAN-32 is applied through the irrigation system at 220 pounds of N per acre and is split into equal applications in April, May and June. Zinc sulfate is applied as a foliar spray in October or November. Boron may be included with the fall zinc spray, depending on hull analysis reports. Outside of the Cache Creek watershed (Yolo/Solano Counties), many Sacramento Valley orchards are boron deficient. Potassium sulfate (K_2SO_4) at 440 + pounds per acre is banded along the tree row in late November, depending on tree nutrient status.

Samples: Leaf samples are collected by the PCA in July to analyze tree nutrient status. If the leaf analysis shows a nitrogen deficiency, a small amount of UAN-32 is applied through the irrigation system just prior to hull-split. Hull samples are collected from the windrow by the PCA at harvest or post-harvest. If this sample shows a boron deficiency, a post-harvest boron application should be applied before leaf drop. The charges shown are for the lab analysis.

Irrigation. The water is pumped from a well and passes through a filtration system into the micro-sprinkler system. Thirty-eight acre-inches of water are applied to the orchard from April to October averaging two irrigation per week over the 25-week period. Irrigations early and late in the season may be less than twice per week. Pumping costs are \$8.33 per acre-inch, (\$100 per Acre-foot) based on current grower costs. Rates will vary depending upon pump and well specifications and rate program selected. Irrigation labor costs are included.

Frost Protection. Frost protection may not be required every year and the amount of protection needed will vary. This study assumes two acre-inches of water will be applied annually in February, which is in addition to the amounts of water shown in Table A.

Pollination. For maximum pollination, mature orchards require two hives (8 frames of bees per hive) per acre for pollination during February through mid-March.

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

Vegetation Management-Weeds. Weeds in mature orchards are controlled in the tree row (strip spray) in the winter

(January) using Alion, Matrix and Roundup. In addition, one spot spray with Roundup and Rely 280 is made during May. Row middles are mowed five times to control vegetation. To prepare the orchard floor for harvest, an herbicide application of Rely 280 and Roundup is made in late July. The grower uses a UTV and pull sprayer for spraying the herbicides.

Insects and Mites. Several insect and mite pests are controlled each year using integrated pest management. It is assumed that biological insecticides such as Dipel, (which is considered bee safe) applied at bloom and post bloom will control peach twig borer (PTB); therefore, dormant sprays are not needed. The materials are applied with the disease sprays in early to late March.

Insecticide applications of Altacor for NOW (with Zeal-once, for mites) is applied twice, (two varieties) in separate applications at hull-split in July. These applications may not be done every year, other insecticides and timings may be utilized depending upon insect and pressure.

Naval orangeworm is also monitored with pheromone traps with lures as well as egg traps (& female traps in many orchards). The traps are placed in the orchard in March or April to monitor insect flights through hull-split. Vine mealybugs are continually monitored with traps for flights through harvest, continuing into the fall. All the traps are monitored by the PCA/CCA and the costs are included in their fees.

Winter Sanitation. Winter sanitation, November - January destroys overwintering sites and spring food sources for NOW. The trees containing mummy nuts are mechanically shaken and poled by hand to drop the mummies to the orchard floor where they are swept into the middles and shredded with a flail mower. The shaking and sweeping operations are custom hired and the grower does the shredding.

Some years, mummy nuts stick worse than others ensuing that more labor for hand polling may be required. This study shows the hand labor charges combined and split over two years.

Diseases. Fungicide applications are made to control brown rot, shot hole, scab, Alternaria and anthracnose. Applications for brown rot control are made with Vanguard during bloom in February. Bravo is applied at late petal fall for shot hole in March and Ziram for scab and anthracnose later in March. Additional fungicide sprays may be applied in April or later for scab, rust, alternaria and anthracnose. A fungicide (Merivon, Luna Sensation, Ph-D, Quash, etc.) may be applied with the first hull split spray for hull rot. Alternate fungicides with different modes of action should be used to protect against chemical resistance. See Efficacy and Timing of Fungicides, Bactericides, and Biologicals for Deciduous Tree Fruit, Nut Crops, and Grapevines at ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf

Vertebrate Pests. Gophers are managed with poison bait applied in the spring and late summer using a hand bait applicator. Trapping is used to control squirrels at a cost of \$8.50/trap, which is included in shop tools under investments. Squirrel traps are set from March through October. The grower uses a UTV to check bait stations and set 2.5 traps/acres. Vertebrate control costs will vary considerably between orchards.

Harvest, Yields and Revenue

Harvest. The almonds are mechanically shaken, mechanically blown and swept to the row middles, into windrows. The nuts are mechanically picked up and hauled to the roadside truck or huller. The harvest is performed by a custom operator, with the grower providing the labor for hand raking missed nuts and gathering the nuts which stick in the crotches of the trees, into the windrows. Almond harvest starts in August and goes through October.

Orchards have more than one variety that mature separately. The custom operator harvests the earlier variety and will come back a few weeks later to harvest the later maturing variety. Some varieties can be harvested together. Added costs for a second harvest are not shown since this study is based on per acre charges.

Yields. Typical annual yields for almonds are measured in pounds of kernels (meats) 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 2,200 pounds per acre for the life of the orchard.

Revenue. The almond meats are sold for \$2.50 per pound based on reported current returns, Table 3.

Ranging Analysis. Table 5 shows a range of yields, 1,540 – 2,860 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. The almond hulls are high in fiber and are sold as a feed additive. Other by-products include shells, almond hash, huller dust, and press cakes, which all can be used as livestock feed. Wood for firewood, and wood chips for composting, from tree removal could be another source of income from the orchard. No revenues from any of these potential sources of income are shown.

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 \$14.50 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 (Code 0045) and other possible benefits gives the labor rates shown of \$20.55 and \$17.72 per hour for machine labor and non-machine labor, respectively. Workers' compensation costs will vary among growers. The costs are based upon the average industry final rate as of August 2019. Labor time for operations involving machinery is 20 percent higher than the equipment time to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

Management Salary. Wages for management are not included as a cash cost. Any return above total costs is 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 & Biological 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 costs are based on August 2019, Energy Information Administration (EIA), monthly data. The cost includes a 13.0 percent sales tax on diesel fuel and 2.25 percent sales tax on gasoline. Included in the cost per gallon is federal and state excise tax, \$0.36 on diesel fuel and \$0.42 on gasoline, 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/Utility Vehicle, (UTV). The study assumes the pickup is used to move equipment, supplies and tools. The UTV is used for baiting ants, gophers and squirrels. The UTV is also used to check the orchard for pest problems and irrigation monitoring.

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, the rate is considered a typical lending rate by a farm lending agency as of August 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. These costs include property taxes, interest on operating capital, office expenses, liability and property insurance, sanitation services, and equipment repairs.

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 baseline 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. For this analysis, \$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. The USDA Risk Management Agency, 2019 Crop Insurance Policies link: rma.usda.gov/policies/.

Office Expenses. Office and business expenses are estimated at \$60 per acre. These expenses include office supplies, communications, bookkeeping, accounting and legal fees.

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), formerly called an Ag Waiver Fee for water discharges and hazardous material storage fee (local coalition). The grower must also provide safety training, safety equipment, and maintain training records. For this study, a cost of \$10.00 per acre is included.

Miscellaneous Costs. Included expenses for employee safety training, continuing education for pesticide use, materials and applications for unique fields or special conditions.

Sanitation Services. Sanitation services provide one portable toilet and cost the farm \$860 annually. The cost includes one double toilet unit with washbasin, delivery and 4 months of weekly service.

Investment Repairs. Annual maintenance is calculated as two percent of the purchase price, except for tree replacement in the orchard.

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. The average tree replacement cost over the life of the orchard is assumed to be 0.10 percent of the establishment cost or \$767.80 (\$7.68 per acre) per year.

Non-Cash Overhead

Non-cash overhead, shown on an annual per acre basis 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 value (unrecovered capital). It is equivalent to the annual payment on a loan for the investment with the down payment equal to the discounted salvage value. This is a more complex method of calculating ownership costs than straight-line depreciation and opportunity costs, but more accurately represents the annual costs of ownership because it takes the time value of money into account (Boehlje and Eidman). The formula for the calculation of the annual capital recovery costs is $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$.

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements), the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by the American Society of Agricultural & 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 Table 7.

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

Interest Rate. An interest rate of 6 percent is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions, but is the basic suggested rate by a farm- lending agency as of August 2019.

Land. Open or bare land values range from \$20,000 to \$25,000 in the Sacramento Valley. The orchard site is valued at \$20,000 per acre or \$2,100,000 for the 105 acres and (\$21,000 per producing acre). Established almond orchards in this region range in value from \$20,000 - \$30,000 per acre (*2019 TRENDS*).

Establishment Cost. Costs to establish the orchard are used to determine the non-cash overhead expenses, capital recovery, and interest on investment for the production years. The establishment cost is the sum of cash costs for land preparation, planting, trees, production expenses, and cash overhead for growing almond trees through the third year less returns from production. The Accumulated Net Cash Cost in the third year shown in Table 1 represents the establishment cost per acre. The cost is \$7,678 per acre or \$767,800 for the 100-acre orchard. Establishment costs are amortized beginning in the fourth year and are continuous for the remaining 22 years of production. The establishment costs added to the bare land value is consistent with the value of an established mature orchard, ($\$20,000 + \$7,678 = \$27,678$). Establishment costs are based on typical basic operations, but can vary considerably, depending upon terrain, soil type, local regulations, and other factors.

Irrigation System. The pump and well cost are based on one 175 horsepower electric pump lifting from a water level depth of 75 feet. The pump and 300-foot deep well, already existed on the site. The cost of the irrigation system is for the re-casing of the well and refurbishing the pump. The sprinkler system costs include the installation of new filtration and chemigation systems, buried main lines and micro-sprinklers. A separate 75 HP booster pump, is used to pump the water through the filtration station out into the sprinkler system.

The life of the irrigation system is estimated to be 25 years. An annual pump test is performed in January to monitor pumping level and efficiency (gallons/minute) at a cost of \$200 for each pump. The irrigation system is considered an improvement and is shown in the non-cash overhead sections of the tables and the investment portion of Table 6.

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 Table 6. 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 and shown in Table 7.

Field/Service Tools. This includes an air compressor/welder and the tool boxes for the ranch truck. Also, field tools such as pruning equipment, bait stations, backpack blowers, rakes, and shovels. The frost protection alarm is also included in this cost.

Fuel Tanks. Two 1,000-gallon fuel tanks, one for diesel and one for gasoline, are placed on stands in a cement containment meeting federal, state, and local 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
 Sacramento Valley - 2019

	Year:	Cost Per Acre					Your Costs	
		1st	2nd	3rd	4th	5th		6th
Operations:	Meat Pounds Per Acre @ \$2.50/lbs.			400	800	1,400	2,000	
Pre-Plant:								
Remove Irrigation System		89						
Tree Removal/Chip		1,200						
Spread Chips		125						
Rip 3' Depth/Root Removal		250						
Rip 6' Depth/Root Removal		350						
Disc & Roll 2x		130						
Laser Leveling		75						
Survey Mark Site		125						
Make Berms/Rows		35						
Irrigation System Layout		53						
Sooth/Float Row Middles		35						
Strip Spray: Berms		43						
TOTAL PRE-PLANT COSTS		2,511						
Plant:								
Treat Roots/Plant/Top (124 trees/acre)		1,532						
Stake/Whitewash/Cartons/Irrigate-Hand		313						
TOTAL PLANTING COSTS		1,845						
Cultural:								
Irrigate: Pump Test		4	4	4	4	4	4	
Irrigate: Water Analysis		1	1	1	1	1	1	
Irrigate: Frost Protection					17	17	17	
Irrigate		150	150	217	267	317	317	
Irrigation Labor		26	26	35	48	57	57	
Irrigation: System Flush		12	12	12	12	12	12	
Pollination: Hive Rental				100	200	400	400	
Fertilize: Hand (15-15-15) 3x		115						
Fertilize: (UAN-32) 3x			17	34	67	90	123	
Fertilize: Zinc Sulfate & Yr. 3 + Solubor			28	28	28	28	28	
Fertilize: K ₂ SO ₄			22	47	86	108	204	
Fertilize: Leaf Sample				1	1	1	1	
Fertilize: Hull Sample				2	2	2	2	
Vertebrate Pests: Gophers – Bait 2x		26	26	27	27	27	27	
Vertebrate Pests: Squirrels – Traps 6x		27	53	53	53	53	53	
Weeds: Strip/Spot Spray		37	51	22	22	21	21	
Weeds: Pre-Harvest Spray				30	30	30	30	
Weeds: Mow Middles		32	21	50	50	50	50	
Weeds: Dormant Strip Spray			34	82	82	82	82	
Insects:(Yr.1 Hand, Yr.2 50% of ac., Yr.3+ NOW/Mites)		15	34	152	152	152	152	
Disease: (Yr. 3, + Insects Yr. 4 & 5 2x, Yr. 6 + 3x)				105	117	117	145	
PCA/CCA Fee		35	35	35	35	35	35	
Prune: Summer Suckering		23						
Prune: Dormant – Hand Crew			35	44	44	44	44	
Prune: Push Prunings			10	10	10	12	16	
Insects: NOW-Winter Sanitation				137	140	204	204	
Pickup Truck Use		63	63	63	63	63	63	
UTV Use		39	44	44	44	44	44	
TOTAL CULTURAL COSTS		606	668	1,336	1,604	1,971	2,132	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. CONTINUED
 Sacramento Valley - 2019

Operation:	Year:	Cost per Acre					
		1st	2nd	3rd	4th	5th	6th
Meat Pounds Per Acre @ \$2.50/lbs.				400	800	1,400	2,000
Costs							
Harvest:							
Shake Trees				113	113	113	128
Sweep Nuts				64	64	64	72
Hand Rake/Blow Nuts				9	9	18	18
Pick up/Haul Nuts				40	40	40	48
Hull/Shell Nuts				28	56	98	140
TOTAL HARVEST COSTS				253	281	332	405
Interest on Operating Capital @ 5.25%		229	18	14	19	24	25
TOTAL OPERATING COSTS/ACRE		5,191	686	1,603	1,903	2,327	2,562
Cash Overhead							
Liability Insurance		8	8	8	8	8	8
Office Expense		60	60	60	60	60	60
Sanitation Fees		9	9	9	9	9	9
Environmental Fee		10	10	10	10	10	10
Miscellaneous Costs		20	20	20	20	20	20
Property Taxes		215	216	217	255	255	255
Property Insurance		19	19	19	23	23	23
Investment Repairs		57	57	57	95	95	95
TOTAL CASH OVERHEAD COSTS		398	399	401	480	480	480
TOTAL CASH COSTS/ACRE		5,589	1,084	2,005	2,383	2,807	3,042
REVENUE/ACRE FROM PRODUCTION				1,000	2,000	3,500	5,000
NET CASH COSTS/ACRE FOR THE YEAR		5,589	1,084	1,005	383		
PROFIT/ACRE ABOVE CASH COSTS						693	1,958
ACCUMULATED NET CASH COSTS/ACRE		5,589	6,673	7,678	8,061	7,368	5,410
NON-CASH OVERHEAD:							
Fuel Tanks 2-1,000 Gallon		10	10	10	10	10	10
Well/Pump Refurbish		43	43	43	43	43	43
Shop/Field Tools		11	11	11	11	11	11
Irrigation System: Micro-sprinklers		156	156	156	156	156	156
Land: Sacramento Valley		1,200	1,200	1,200	1,200	1,200	1,200
Establishment Costs					638	638	638
Equipment		20	28	45	45	45	49
TOTAL NON-CASH OVERHEAD COST/ACRE		1,441	1,448	1,465	2,103	2,104	2,107
TOTAL COST/ACRE FOR THE YEAR		7,030	2,533	3,470	4,486	4,911	5,149
REVENUE/ACRE FROM PRODUCTION				1,000	2,000	3,500	5,000
TOTAL NET COST/ACRE FOR THE YEAR		7,030	2,533	2,470	2,486	1,411	149
NET PROFIT/ACRE ABOVE TOTAL COSTS							
TOTAL ACCUMULATED NET COST/ACRE		7,030	9,663	12,033	14,519	15,930	16,079

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 2. COSTS PER ACRE TO PRODUCE ALMONDS
 Sacramento Valley - 2019

Operation	Equipment		Cash and Labor Costs per Acre				Total Cost	Your Cost
	Time (Hrs/Ac)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent		
Cultural:								
Weeds: Dormant Strip Spray	0 16	4	1	0	76	0	82	
Weeds: Mow Middles 5x	1 30	32	24	14	0	0	70	
Pollination	0 00	0	0	0	0	400	400	
Irrigation: Frost Protection	0 00	4	0	0	17	0	21	
Irrigation: Pump Test/Water Analysis	0 00	0	0	0	0	5	5	
Disease/Insects 3x	0 75	18	14	7	109	0	148	
Vertebrate Pests: Squirrels 6x	0 00	53	0	0	0	0	53	
Vertebrate Pests: Gophers 2x	0 00	18	0	0	9	0	27	
Fertilize: UAN-32 3x	0 00	0	0	0	123	0	123	
Irrigate: (Water & Labor)	0 00	54	0	0	317	0	370	
Weeds: Spot Spray	0 25	6	1	0	16	0	24	
Fertilize: Leaf Sample	0 00	0	0	0	0	1	1	
Insects: NOW 2x/Mites 1x	0 50	12	9	5	126	0	152	
Weeds: Pre-Harvest Spray	0 16	4	1	0	25	0	30	
Fertilize: Hull Sample	0 00	0	0	0	0	2	2	
Fertilize: K ₂ SO ₄	0 19	5	1	2	216	0	223	
Fertilize: Zinc Sulfate/Solubor	0 25	6	5	2	15	0	28	
Insects: NOW Winter Sanitation	0 33	26	6	4	0	235	271	
Prune: Dormant	0 00	44	0	0	0	0	44	
Prune: Push Prunings	0 30	7	5	2	0	0	14	
Irrigation: System Flushing	0 00	4	0	0	8	0	12	
PCA/CCA Fees	0 00	0	0	0	0	35	35	
Pickup Truck Use	1 67	41	16	6	0	0	63	
UTV Use	1 42	35	8	1	0	0	44	
TOTAL CULTURAL COSTS	7 28	375	91	44	1,056	678	2,244	
Harvest:								
Shake Trees	0 00	0	0	0	0	135	135	
Hand Rake/Blow Nuts	0 00	18	0	0	0	0	18	
Sweep/Windrows Nuts	0 00	0	0	0	0	72	72	
Pickup/Haul Nuts	0 00	0	0	0	0	56	56	
Hull/Shell Nuts	0 00	0	0	0	0	154	154	
TOTAL HARVEST COSTS	0 00	18	0	0	0	417	435	
Interest on Operating Capital @ 5.25%							24 76	
TOTAL OPERATING COSTS/ACRE	7.28	393	91	44	1,056	1,096	2,704	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 2. CONTINUED
 Sacramento Valley - 2019

		Total Cost	Your Cost
CASH OVERHEAD:			
Environmental Fees		10	
Liability Insurance		8	
Office Expense		60	
Sanitation Fee		9	
Miscellaneous Costs		20	
Property Taxes		255	
Property Insurance		23	
Investment Repairs		95	
TOTAL CASH OVERHEAD COSTS/ACRE		480	
TOTAL CASH COSTS/ACRE		3,184	
NON-CASH OVERHEAD:			
	Per Producing Acre	Annual Cost Capital Recovery	
Land: Sacramento Valley	20,000	1,200	1,200
Well/Pump Refurbish	560	43	43
Shop/Field Tools	150	11	11
Irrigation System: Micro-sprinklers	2,000	156	156
Establishment Costs	7,678	638	638
Fuel Tanks 2-1,000 Gallon	125	10	10
Equipment	439	53	53
TOTAL NON-CASH OVERHEAD COSTS	30,952	2,112	2,112
TOTAL COSTS/ACRE			5,295

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

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Production	2,200	Lb	2.50	5,500	
TOTAL GROSS RETURNS				5,500	
OPERATING COSTS					
Herbicide:				117	
Matrix SG	2.00	Oz	14.39	10	
Alion	3.50	FlOz	12.50	29	
Roundup PowerMax	2.75	Pint	3.75	44	
Rely 280	4.00	Pint	8.56	34	
Fungicide:				86	
Vanguard WG	6.00	Oz	4.95	30	
Bravo-Weatherstik	32.00	FlOz	0.45	14	
Ziram WDG76	8.00	Lb	5.25	42	
Insecticide:				148	
Dipel Pro DF	1.40	Lb	16.00	22	
Altacor	6.00	FlOz	10.61	64	
Zeal	3.00	FlOz	20.75	62	
Rodenticide:				9	
Vertebrate Pest Bait	5.00	Lb	1.73	9	
Custom:				1,096	
Pollination Fee	2.00	Hive	200.00	400	
Irrigation Pump Test	0.02	Each	200.00	4	
Irrigation Water Analysis	0.02	Each	50.00	1	
Leaf Analysis (5/100Ac)	1.00	Acre	1.00	1	
Shake Trees: Harvest	0.90	Hour	150.00	135	
Sweep: Harvest	0.85	Hour	85.00	72	
Pickup & Haul Nuts	0.70	Hour	80.00	56	
Hull/Shell Nuts	2,200.00	Lb	0.07	154	
Hull Analysis (2.5/100Ac)	1.00	Acre	2.25	2	
Shake Trees: Sanitation	1.00	Hour	150.00	150	
Sweep: Sanitation	1.00	Hour	85.00	85	
PCA/CCA Fee	1.00	Acre	35.00	35	
Irrigation:				341	
Water-Pumped	40.25	AcIn	8.33	335	
N-pHuric Acid	0.12	Gal	47.54	6	
Fertilizer:				354	
UAN-32 (32-0-0)	220.00	Lb N	0.56	123	
Potassium Sulfate (K ₂ SO ₄) (0-0-50-18% S)	440.00	Lb	0.49	216	
Zinc Sulfate (0-0-0-35.5% Zn, 17.5% S)	20.00	Lb	0.72	14	
Solubor (20.5%)	1.95	Lb	0.49	1	
Labor:				393	
Equipment Operator Labor	8.74	hrs	20.55	180	
Irrigation Labor	3.54	hrs	17.72	63	
Non-Machine Labor	6.00	hrs	17.72	106	
Pruning Labor	2.50	hrs	17.72	44	
Machinery:				135	
Fuel-Gas	2.99	gal	3.63	11	
Fuel-Diesel	20.27	gal	3.95	80	
Lube				14	
Machinery Repair				30	
Interest on Operating Capital @ 5.25%				24.76	
TOTAL OPERATING COSTS/ACRE				2,704	
TOTAL OPERATING COSTS/LB				1.23	
NET RETURNS ABOVE OPERATING COSTS				2,796	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 3. CONTINUED
 Sacramento Valley - 2019

	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS		
Environmental Fees	10	
Liability Insurance	8	
Office Expense	60	
Sanitation Fee	9	
Miscellaneous Costs	20	
Property Taxes	255	
Property Insurance	23	
Investment Repairs	95	
TOTAL CASH OVERHEAD COSTS/ACRE	480	
TOTAL CASH OVERHEAD COSTS/LB	0 22	
TOTAL CASH COSTS/ACRE	3,184	
TOTAL CASH COSTS/LB	1 45	
NET RETURNS ABOVE CASH COSTS	2,316	
NON-CASH OVERHEAD COSTS (Capital Recovery)		
Fuel Tanks 2-1,000 Gallon	10	
Well/Pump Refurbish	43	
Shop/Field Tools	11	
Irrigation System: Micro-sprinklers	156	
Land: Sacramento Valley	1,200	
Establishment Costs	638	
Equipment	53	
TOTAL NON-CASH OVERHEAD COSTS/ACRE	2,112	
TOTAL NON-CASH OVERHEAD COSTS/LB	0 96	
TOTAL COST/ACRE	5,295	
TOTAL COST/LB	2 41	
NET RETURNS ABOVE TOTAL COST	205	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE ALMONDS
 Sacramento Valley - 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:													
Weeds: Dormant Strip Spray	82												82
Weeds: Mow Middles 5x		16		13	13	13		13					70
Pollination		400											400
Irrigation: Frost Protection		21											21
Irrigation: Pump Test/Water Analysis			5										5
Disease/Insects 3x		52	95										148
Vertebrate Pests: Squirrels 6x			9	9	9	9			9	9			53
Vertebrate Pests: Gophers 2x			13					13					26
Fertilize: UAN-32 3x				41	41	41							123
Irrigate: (Water & Labor)				39	49	68	78	58	49	29			370
Weeds: Spot Spray					24								24
Fertilize: Leaf Sample							1						1
Insects: NOW/Mites 2x							152						152
Weeds: Pre-Harvest Spray							30						30
Fertilize: Hull Sample								2					2
Irrigation: System Flushing										12			12
Fertilize: K ₂ SO ₄											223		223
Fertilize: Zinc Sulfate											28		28
Insects: NOW Winter Sanitation											271		271
Prune: Dormant (Alternate Years)												44	44
Prune: Push Prunings (Alternate Rows)												14	14
PCA/CCA Fees	3	3	3	3	3	3	3	3	3	3	3	3	35
Pickup Truck Use	5	5	5	5	5	5	5	5	5	5	5	5	63
UTV Use	4	4	4	4	4	4	4	4	4	4	4	4	44
TOTAL CULTURAL COSTS	93	501	135	114	148	143	273	99	69	62	534	71	2,244
Harvest:													
Shake Trees								135					135
Hand Rake/Blow Nuts								18					18
Sweep/Windrow Nuts								72					72
Pickup & Haul Nuts								56					56
Hull/Shell Nuts								154					154
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	435	0	0	0	0	435
Interest on Operating Capital @ 5.25%	0 41	2 60	3 19	3 69	4 34	4 96	6 16	8 50	-3 22	-2 92	-2 65	-0 31	24 76
TOTAL OPERATING COSTS/ACRE	94	504	138	118	152	148	280	543	66	59	531	70	2,704

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 4. CONTINUED
 Sacramento Valley - 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									10				10
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
Miscellaneous Costs									20				20
Property Taxes		255											255
Property Insurance		11							11				23
Investment Repairs	8	8	8	8	8	8	8	8	8	8	8	8	95
TOTAL CASH OVERHEAD COSTS	14	280	14	14	14	14	14	14	64	14	14	14	480
TOTAL CASH COSTS/ACRE	107	784	151	132	166	162	293	557	130	73	545	84	3,184

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 5. RANGING ANALYSIS
 Sacramento Valley – 2019

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ALMONDS

	YIELD (LBS.)						
	1,540	1,760	1,980	2,200	2,420	2,640	2,860
OPERATING COSTS/ACRE:							
Cultural	2,244	2,244	2,244	2,244	2,244	2,244	2,244
Harvest	305	348	392	435	479	522	566
Interest on Operating Capital @ 5.25%	24 19	24 38	24 57	24 76	24 95	25 14	25 33
TOTAL OPERATING COSTS/ACRE	2,573	2,616	2,660	2,704	2,748	2,791	2,835
TOTAL OPERATING COSTS/LB	1 67	1 49	1 34	1 23	1 14	1 06	0 99
CASH OVERHEAD COSTS/ACRE	480	480	480	480	480	480	480
TOTAL CASH COSTS/ACRE	3,053	3,096	3,141	3,184	3,228	3,271	3,315
TOTAL CASH COSTS/LB	1 98	1 76	1 59	1 45	1 33	1 24	1 16
NON-CASH OVERHEAD COSTS/ACRE	2,112	2,112	2,112	2,112	2,112	2,112	2,112
TOTAL COSTS/ACRE	5,165	5,208	5,252	5,295	5,339	5,383	5,427
TOTAL COSTS/LB	3 35	2 96	2 65	2 41	2 21	2 04	1 90

Net Return per Acre above Operating Costs for Almonds

PRICE (\$/lb)	YIELD (lbs./acre)							
	Production	1,540	1,760	1,980	2,200	2,420	2,640	2,860
1 00		-1,033	-856	-680	-504	-328	-151	25
1 50		-263	24	310	596	882	1,169	1,455
2 00		507	904	1,300	1,696	2,092	2,489	2,885
2 50		1,277	1,784	2,290	2,796	3,302	3,809	4,315
3 00		2,047	2,664	3,280	3,896	4,512	5,129	5,745
3 50		2,817	3,544	4,270	4,996	5,722	6,449	7,175
4 00		3,587	4,424	5,260	6,096	6,932	7,769	8,605

Net Return per Acre above Cash Costs for Almonds

PRICE (\$/lb)	YIELD (lbs./acre)							
	Production	1,540	1,760	1,980	2,200	2,420	2,640	2,860
1 00		-1,513	-1,336	-1,161	-984	-808	-631	-455
1 50		-743	-456	-171	116	402	689	975
2 00		27	424	819	1,216	1,612	2,009	2,405
2 50		797	1,304	1,809	2,316	2,822	3,329	3,835
3 00		1,567	2,184	2,799	3,416	4,032	4,649	5,265
3 50		2,337	3,064	3,789	4,516	5,242	5,969	6,695
4 00		3,107	3,944	4,779	5,616	6,452	7,289	8,125

Net Return per Acre above Total Costs for Almonds

PRICE (\$/lb)	YIELD (lbs./acre)							
	Production	1,540	1,760	1,980	2,200	2,420	2,640	2,860
1 00		-3,625	-3,448	-3,272	-3,095	-2,919	-2,743	-2,567
1 50		-2,855	-2,568	-2,282	-1,995	-1,709	-1,423	-1,137
2 00		-2,085	-1,688	-1,292	-895	-499	-103	293
2 50		-1,315	-808	-302	205	711	1,217	1,723
3 00		-545	72	688	1,305	1,921	2,537	3,153
3 50		225	952	1,678	2,405	3,131	3,857	4,583
4 00		995	1,832	2,668	3,505	4,341	5,177	6,013

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 Sacramento Valley - 2019

ANNUAL EQUIPMENT COSTS

Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
19	85HP4WD Low-Profile Tractor	76,000	15	14,796	7,189	40	454	7,684
19	34HP4WD Tractor	31,000	12	7,750	3,238	17	194	3,449
19	Air-Blast PTO 500Gal	28,000	8	6,322	3,870	15	172	4,057
19	Pickup Truck 1/2 Ton	28,000	5	12,549	4,421	18	203	4,642
19	Fertilizer Applicator PTO	15,000	10	2,653	1,837	8	88	1,933
19	Flail Mower 11'	12,600	10	2,228	1,543	7	74	1,624
19	UTV	8,350	8	2,914	1,050	5	56	1,112
19	UTV Sprayer System 100 Gal	3,460	10	612	424	2	20	446
19	Brush Rake 10'	2,400	15	230	237	1	13	252
TOTAL		204,810	-	50,054	23,810	113	1,274	25,197
60% of New Cost*		122,886	-	30,033	14,286	68	765	15,118

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Fuel Tanks (2) - 1,000 Gallon	12,500	25	875	962	6	67	250	1,285
Well/Pump Maintenance	56,000	25	3,920	4,309	27	300	1,120	5,755
Shop/Field Tools	15,000	25	1,500	1,146	7	83	300	1,536
Irrigation System-Micro-sprinkler	200,000	25	0	15,645	89	1,000	4,000	20,734
Land: Sacramento Valley	2,100,000	30	2,100,000	126,000	1,861	21,000	0	148,861
Establishment Costs	767,800	22	0	63,762	340	3,839	3,839	71,781
TOTAL INVESTMENT	3,151,300	-	2,106,295	211,825	2,329	26,288	9,509	249,951

ANNUAL BUSINESS OVERHEAD COSTS

Description	Farm	Units/ Unit	Price/ Unit	Total Cost
Environmental Fees	100	Acre	10.00	1,000
Liability Insurance	105	Acre	7.93	833
Office Expense	100	Acre	60.00	6,000
Sanitation Fees	100	Acre	8.60	860
Miscellaneous Costs	100	Acre	20.00	2,000

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 7. HOURLY EQUIPMENT COSTS
 Sacramento Valley - 2019

Description	Almonds		Cash Overhead			Operating		Total Costs/Hr.
	Hours Used	Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel	Total Oper.	
85HP4WD Low-Profile Tractor	378	4 05	0 02	0 26	4 35	16 49	20 84	25 16
UTV	200	1 01	0 00	0 05	1 00	5 45	6 45	7 51
Pickup Truck 1/2 Ton	167	6 63	0 03	0 30	3 56	9 88	13 43	20 40
Flail Mower 11'	163	4 63	0 02	0 22	6 02	0 00	6 02	10 89
Air-Blast PTO 500Gal	150	9 29	0 04	0 41	4 82	0 00	4 82	14 56
UTV Sprayer System 100 Gal	58	1 69	0 01	0 08	0 92	0 00	0 92	2 71
Brush Rake 10'	30	1 09	0 01	0 06	0 46	0 00	0 46	1 62
34HP4WD Tractor	21	1 94	0 01	0 12	2 37	6 60	8 97	11 04
Fertilizer Applicator PTO	19	9 18	0 04	0 44	5 76	0 00	5 76	15 43

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

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Weeds: Dormant Strip Spray	Jan	UTV	UTV Sprayer System 100 Gal	Equipment Operator Labor	0.20	hour
				Roundup PowerMax	1.00	Pint
				Matrix SG	2.00	Oz
				Alion	3.50	FIOz
Mow Middles	Feb	85HP4WD	Low-Profile Tractor Flail Mower 11'	Equipment Operator Labor	0.36	hour
	Apr	85HP4WD	Low-Profile Tractor Flail Mower 11'	Equipment Operator Labor	0.30	hour
	May	85HP4WD	Low-Profile Tractor Flail Mower 11'	Equipment Operator Labor	0.30	hour
	June	85HP4WD	Low-Profile Tractor Flail Mower 11'	Equipment Operator Labor	0.30	hour
	Aug	85HP4WD	Low-Profile Tractor Flail Mower 11'	Equipment Operator Labor	0.30	hour
Pollination	Feb			Pollination Fee	2.00	Hives
Frost Protection	Feb			Irrigation Labor	0.25	hour
				Water-Pumped	2.00	AcIn
Pump Test/ Water Analysis	Mar			Irrigation Pump Test	0.02	Each
				Irrigation Water Analysis	0.02	Each
Disease/Insects	Feb	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Dipel Pro DF	0.60	Lb
				Vanguard WG	6.00	Oz
				Equipment Operator Labor	0.30	hour
				Bravo-Weatherstik	32.00	FIOz
				Equipment Operator Labor	0.30	hour
				Ziram WDG76	8.00	Lb
Squirrels	Mar	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Dipel Pro DF	0.80	Lb
				Non-Machine Labor	0.50	hour
				Non-Machine Labor	0.50	hour
				Non-Machine Labor	0.50	hour
				Non-Machine Labor	0.50	hour
				Non-Machine Labor	0.50	hour
				Non-Machine Labor	0.50	hour
Gophers	Mar	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Non-Machine Labor	0.50	hour
				Vertebrate Pest Bait	2.50	Lb
				Non-Machine Labor	0.50	hour
Fertilizer:	Apr	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	UAN-32 (32-0-0)	73.34	Lb N
				UAN-32 (32-0-0)	73.33	Lb N
				UAN-32 (32-0-0)	73.33	Lb N
Irrigate	Apr	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Irrigation Labor	0.32	hour
				Water-Pumped	4.00	AcIn
				Irrigation Labor	0.40	hour
				Water-Pumped	5.00	AcIn
				Irrigation Labor	0.56	hour
				Water-Pumped	7.00	AcIn
				Irrigation Labor	0.64	hour
				Water-Pumped	8.00	AcIn
				Irrigation Labor	0.48	hour
				Water-Pumped	6.00	AcIn
Weeds: Spot Spray	May	UTV	UTV Sprayer System 100 Gal	Irrigation Labor	0.40	hour
				Water-Pumped	5.00	AcIn
				Irrigation Labor	0.24	hour
				Water-Pumped	5.00	AcIn
				Irrigation Labor	0.24	hour
				Water-Pumped	3.00	AcIn
				Equipment Operator Labor	0.30	hour
				Roundup PowerMax	0.75	Pint
				Rely 280	1.50	Pint
				Leaf Samples	July	
Insects: NOW/Mites	July	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Equipment Operator Labor	0.30	Hour
				Altacor	3.00	FIOz
				Zeal	3.00	FIOz
Insects: NOW	July	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Equipment Operator Labor	0.30	Hour
Weeds: Pre-Harvest Spray	July	UTV	UTV Sprayer System 100 Gal	Altacor	3.00	FIOz
				Equipment Operator Labor	0.20	Hour
				Roundup PowerMax	1.00	Pint
Hull Sample	Aug			Rely 280	2.50	Pint
				Hull Analysis (2.5/100Ac)	1.00	Acre
Irrigation: System Flush	Oct			Irrigation Labor	0.25	hour
				Water-Pumped	0.25	AcIn
				N-Phuric Acid	0.12	Gal
				Equipment Operator Labor	0.22	hour
Fertilizer: K ₂ SO ₄	Nov	34HP4WD Tractor	Fertilizer Applicator PTO	Potassium Sulfate-K ₂ SO ₄	440.00	Lb
Fertilizer: Zinc/Boron	Nov	85HP4WD	Low-Profile Tractor Air-blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Zinc Sulfate 35.5%	20.00	Lb
				Solubor 20.5%	1.95	Lb

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 8. CONTINUED
 Sacramento Valley – 2019

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Winter Sanitation	Nov	85HP4WD Low-Profile Tractor	Flail Mower 11'	Equipment Operator Labor	0.40	hour
				Shake Trees: Sanitation	1.00	Hour
				Sweep: Sanitation	1.00	Hour
				Non-Machine Labor	1.00	hour
Prune: Dormant	Dec			Pruning Labor	2.50	hours
Prune: Push Prunings	Dec	85HP4WD Low-Profile Tractor	Brush Rake 10'	Equipment Operator Labor	0.36	hour
Pickup Truck Use	Dec	Pickup Truck 1/2 Ton		Equipment Operator Labor	2.00	hours
UTV Use	Dec	UTV		Equipment Operator Labor	1.70	hours
Harvest: Shake Trees	Aug			Shake Trees: Harvest	0.90	Hour
Harvest: Rake/Blow Nuts	Aug			Non-Machine Labor	1.00	hour
Harvest: Sweep Nuts	Aug			Sweep: Harvest	0.85	Hour
Harvest: Pickup/Haul Nuts	Aug			Pickup & Haul Nuts	0.70	Hour
Harvest: Hull/Shell Nuts	Aug			Hull/Shell Nuts	2,200.00	Lb