
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
AGRICULTURE AND NATURAL RESOURCES
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2016

SAMPLE COSTS TO ESTABLISH AN ORCHARD AND PRODUCE

ALMONDS



SACRAMENTO VALLEY

Micro-Sprinkler Irrigation

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Sacramento Valley – 2016

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Acknowledgment. Appreciation is expressed to the UC Cooperative Extension, growers, input suppliers, and other industry representatives who provided information, assistance, and expertise for this study.

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 study 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 early 2016 figures. Practices described are based on production practices considered typical for the crop and area, but will not apply to every situation. A blank column titled Your Costs is provided in Tables 1 and 2 to enter your estimated costs.

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 dstewart@ucdavis.edu or Christine Gutierrez, University of California Agriculture and Natural Resources, Agricultural Issues Center, at 530-752-5355 or cagut@ucdavis.edu.

Sample Cost of Production studies for many commodities are available and can be down loaded from the Department website, <http://coststudies.ucdavis.edu>. Archived studies are also available on the website.

ASSUMPTIONS

The assumptions refer to 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. Costs, materials, and practices in this study will not apply to all farms. Timing of and types of cultural practices will vary among growers within the region and from season to season due to variables such as weather, soil, insect and disease pressure. The study is intended as a guide only. **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.**

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 a 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. Fifty percent of the cost to remove the old orchard is charged to this crop. A custom operator uses a dozer 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. A common practice is to either push the chips to the edge of the orchard and burn or transport the chips to a cogent plant. In this study, the chips are pushed and burned at the edge of the orchard. The soil is ripped 3 to 4-feet deep in two directions to break up underlying hardpan and pull up old 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 is in the fall and would be done based on nematode count using Telone C35. Most areas of the Sacramento Valley do not require soil fumigation; these charges are not included in this study. Berms in the tree row are formed with a ridger using GPS. The irrigation system is installed underground in the area between the trees; the cost of installation is included in the total cost of the irrigation system. The row middles are then smoothed/floated once to fill in borrow pits. All operations that prepare the orchard for planting are done in October/November of the year prior to planting, but costs are shown in the first year.

Trees. Almond orchards will include at least two or more varieties in which pollen shedding and bloom periods' overlap to insure adequate pollination or one self-cultivating variety. The Non-Pareil variety is the dominant variety planted in California and planted on approximately 50 percent of the acreage. Planting densities may range from 100 to 180 trees per acre. In 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 to be 25 years. Contact the local UCCE advisor or a commercial nursery for varieties and root stocks that are available.

Plant. The trees are planted in February. In this study, the trees are planted with bare roots; however, some growers choose to plant potted trees. Prior to planting, the trees are treated for crown gall prevention by treating the bare roots with Galltrol-A, or similar product. One Galltrol-A plate, (K-84) will treat 200 trees at ¾ inch

diameter. 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 that 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.

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.

Winter Sanitation. In November of the third year and subsequent years, the mummy nuts are shaken from the trees and swept into the row middles for shredding in this study. A custom operator shakes and sweeps the mummies, which are shredded by the grower.

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, and May. 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. Beginning in year two, Potassium sulfate (K₂SO₄) is banded along the tree row in the fall using a pull type fertilizer applicator. Table A below shows the amount of potassium sulfate per acre.

| Table A. Applied Nitrogen (N) | | | Table B. Total Applied Water | | Table C. Annual Yields/Acre | |
|-------------------------------|----------------|--|------------------------------|-----------|-----------------------------|--------------------|
| Year | Lbs. of N/Acre | Lbs. of K ₂ SO ₄ /Acre | Year | AcIn/Year | Year | Kernel (meat) Lbs. |
| 1 | 15 | 0 | 1-2 | 18 | 3 | 400 |
| 2 | 30 | 40 | 3 | 26 | 4 | 800 |
| 3 | 60 | 80 | 4 | 32 | 5 | 1,400 |
| 4 | 120 | 160 | 5+ | 38 | 6 | 2,000 |
| 5 | 160 | 280 | | | 7+ | 2,200 |
| 6+ | 220 | 400+ | | | | |

Sampling: Starting in the 3rd year, one leaf sample per 20 acres is 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. One hull sample per 25 acres is collected by the PCA post-harvest. If this sample shows a nitrogen deficiency, a small amount of UAN-32 is applied through the irrigation system in the fall.

Irrigation. In this study, the electrical cost for pumping well water is calculated to cost \$100.00 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 (in this study, 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 environment. The average, annual water applied to an almond orchard is shown in Table B. Irrigation labor is provided as a separate line item. An annual water analysis to determine nitrate availability and to maintain regulatory records is included in this study.

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 B.

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 two and one-half hives in the sixth year. Bee colony strength should be a standard eight frames per hive and the cost ranges from \$150-\$225 per hive. For this study, \$180 per hive is charges.

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials available are listed in *Integrated Pest Management Guidelines, Almonds* and the *2015 Fungicide Efficacy and Treatment Timing for Almonds* publication located on the UC Davis IPM website at www.ipm.ucdavis.edu. **For information on other pesticides available, pest identification, monitoring, and management, check with your PCA and/or visit the UC IPM website at www.ipm.ucdavis.edu.** Although growers commonly use the pesticides mentioned, many other pesticides are available. For information and 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.

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 these requirements in the following publication:** Oregon State University, “How to Reduce Bee Poisonings from Pesticides”: <https://catalog.extension.oregonstate.edu/pnw591>.

Pest Control Adviser (PCA/CCA). The PCA or crop consultant monitors the field for agronomic problems including pests and nutrition and writes pesticide recommendations. Growers may hire private PCAs or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. For this study, the PCA charge is \$20 per acre during the first three years and \$35 per acre thereafter.

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 Alion, Matrix and Super Gramoxone in January, 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 are applied to the tree row during the year, one in April and one in July.

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 is applied as a strip spray in May to pick up escaped weeds. A pre-harvest weed spray in July with Roundup and Rely 280 is applied to the entire orchard floor (row middles and tree row).

Insects. In the first year, sprays are applied using a sprayer with a handgun and due to the small tree size; the applied rate is 10 percent of recommended total volume. An insecticide treatment of Alticor for peach twig borer (PTB) control and AgriMek for mites is made in May. Starting in the second year an Airblast sprayer is used to apply the materials. Intrepid, and dormant oil are applied on alternate rows in late-January (delayed dormant) of the second year if complete coverage is possible. For PTB in the fourth, fifth and sixth year, 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.

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.

Vertebrate Pests. Treatments will vary depending upon rodent populations. Gophers in this study are managed with poison bait applied in the spring and fall using a hand bait applicator. The grower uses an ATV to check the stations. Trapping is used to control squirrels at a cost of \$8.50/trap, which is included in shop tools. Squirrel traps are set from March through October. The grower uses an ATV to set 2.5 traps/acre. Rates and times for vertebrate control are estimated. See the following websites for additional information.

http://ucanr.org/sites/Ground_Squirrel_BMP/

<http://www.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 own the harvesting equipment, but in this study, the grower contracts to have the almond crop custom harvested. The grower furnishes labor for hand raking to move nuts missed by the sweeper into the windrows. Almond harvest starts in August and goes through September. 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. In this study, the nuts are elevated or dumped into bottom dump trailers for delivery to the huller.

Production Cultural Practices and Material Inputs

Prune. Hand pruning is done in alternate years during the winter months (December-January) to remove dead or diseased wood, facilitate orchard management and provide equipment access. In this study, 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.

Winter Sanitation. Winter sanitation in January destroys overwintering sites for navel orange worm (NOW). The trees containing mummy nuts are mechanically shaken 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. For this study, this operation begins in November of the third year.

Fertilizer. UAN-32 is applied through the irrigation system at 220 pounds of N per acre and is split into equal applications in March, April, and May. Zinc sulfate is applied as a foliar spray in November. Potassium sulfate (K₂SO₄) at 440+ pounds per acre is banded along the tree row in late November, depending on tree nutrient status.

Samples: Tree nutrient status is determined by leaf analysis, with one sample per 20 acres is collected in July. 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. One hull sample per 25 acres is collected post-harvest. If this sample shows a nitrogen deficiency, a small amount of UAN-32 is applied through the irrigation system in the fall.

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 is a separate line item.

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 B.

Pollination. For maximum pollination, mature orchards require two and one-half hives (6 – 8 frames of bees per hive) per acre for pollination during February through mid-March at a cost of \$180/hive.

Pest Management. See Pest Management in the previous section.

Vegetation Management-Weeds. In this study, weeds in mature orchards are controlled in the tree row (strip spray) in the winter (January) using Alion, Matrix and Roundup. In addition, one strip spray with Roundup is made during May. Row middles are mowed five times to control resident vegetation. To prepare the orchard floor for harvest, an herbicide application of Rely 280 and Roundup is made in late July. The grower uses an ATV 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 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. An insecticide application of Altacor for navel orange worm (NOW) and Zeal for mites is applied in July. This spray may not be done every year, other insecticides and timings may be utilized depending upon insect type and timing.

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, Alternaria and anthracnose. 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 <http://ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf>

Vertebrate Pests. Treatments will vary depending upon rodent populations. Gophers in this study are managed with poison bait applied in the spring and fall using a hand bait applicator. The grower uses an ATV to check the stations. Trapping is used to control squirrels at a cost of \$8.50/trap, which is included in shop tools. Squirrel traps are set from March through October. The grower uses an ATV to set 2.5 traps/acres. Rates and times for vertebrate control are estimated.

Harvest. The almonds are mechanically shaken, mechanically swept and hand raked to the centers into windrows, then mechanically picked up and hauled to the huller. The harvest in this study is performed by a custom operator, with the grower providing the labor for hand raking missed nuts into the windrows. Almond harvest starts in August and goes through September.

Yields. Typical annual yields for almonds are measured in pounds of kernels (meats) per acre and are shown in Table C. 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.

Returns. In this study, the almond meats are sold for \$2.50 per pound based on reported current returns. A range of returns and yields are shown in the Ranging Analysis in Table 6.

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 included in this study.

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.

Pickup/ATV. The study assumes business use mileage of 100 minutes per acre per year for the pickup. The ATV is used for baiting ants and gophers and is included in those costs. ATV use at 50 minutes per acre of for checking the orchard, diseases and irrigation system is shown as an operation.

Labor, Equipment, and Interest

Labor. Hourly wages for workers are \$14.00 for machine operators and \$12.00 per hour non-machine labor. Adding 40 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 \$19.60 and \$16.80 per hour for machine labor and non-machine labor, respectively. Workers' compensation costs will vary among growers, but for this study, the cost is based upon the average industry final rate as of January 2016. 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.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by American Society of Agricultural Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum power takeoff (PTO) horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are \$2.49 and \$2.77 per gallon, respectively. The costs are based on January 2016, Energy Information Administration (EIA), monthly data. The cost includes a 2.5 percent local sales tax on diesel fuel and 7.5 percent sales tax on gasoline. Gasoline also includes federal and state excise tax, which are refundable for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in Table 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.

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 4.25 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 in this study is considered a typical lending rate by a farm-lending agency as of January 2016.

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 expense, 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 0.843 percent 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, \$792 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 in this study. The USDA Risk Management Agency, 2016 Crop Insurance Policies link: <http://www.rma.usda.gov/policies/2016policy.html>

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

Environmental/Regulatory/Safety Training 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.

Sanitation Services. Sanitation services provide one portable toilet and cost the farm \$800 annually. The cost includes one double toilet unit with washbasin, delivery and 4 months of weekly service.

Management Salary. Wages for management are not included as a cash cost. Any return above total costs is considered a return to management.

Investment Repairs. Annual maintenance is calculated as two percent of the purchase price.

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

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements), the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by the American Society of Agricultural Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. 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 3.25 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 January 2016.

Land. Crop or bare land values range from \$13,000 to \$28,000. The orchard site is assumed to be on previously farmed open agricultural ground and in this study is valued at \$18,000 per acre.

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. For this study, this cost is \$6,648 per acre or \$664,800 for the 100-acre orchard. Establishment cost is amortized beginning in the fourth year over the remaining 22 years of production.

Tree Replacement. One or more trees per acre may die each year and are replaced in late winter. Costs in this study are basic costs that will vary with each orchard and type of tree loss. Ongoing tree replacement is included Cash Overhead at a rate of 0.10 percent per acre in investment repairs for Establishment costs.

Irrigation System. The pump and well cost is based on one 75 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 125 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 7.

Building. The pole barn totals approximately 2,500 square feet and is used for equipment storage. The building is located on the grower owned land.

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.

Shop/Field Tools. Includes shop tools/equipment, hand tools, and field tools such as pruning equipment, bait stations, 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.

REFERENCES

- American Society of Agricultural and Biological Engineers. (ASABE). July 2013. “*American Society of Agricultural Engineers Standards Yearbook*”. Russell H. Hahn and Evelyn E. Rosentreter (ed.). St. Joseph, MO. 41st edition, ANSI/ASAE S279_17.PDF. hq@asabe.org
- Boehlje, Michael D., and Vernon R. Eidman. 1984. “*Farm Management*”. John Wiley and Sons. New York, New York.
- California Chapter of the American Society of Farm Managers and Rural Appraisers. 2015 “*Trends in Agricultural Land & Lease Values*”. American Society of Farm Managers and Rural Appraisers, Woodbridge, CA. www.calasfmra.com
- Energy Information Administration. *Weekly Retail on Highway Diesel Prices-October 2015*. <http://www.eia.gov/petroleum/gasdiesel/>
- California State Board of Equalization. *Fuel Tax Division Tax Rates*. Internet accessed January 2016. <http://www.boe.ca.gov/sptaxprog/spftdrates.htm>
- California Department of Insurance. 2016 *California Workers’ Compensation Rating Data for Selected Agricultural Classifications as of January 2016*. California Department of Insurance, Rate Regulation Branch. <http://www.insurance.ca.gov/0500-about-us/>
- University of California Statewide Integrated Pest Management Program. *UC Pest Management Guidelines, Almonds*. 2015. University of California, Davis, CA. <http://www.ipm.ucdavis.edu>
- Connell, Joe H., John P. Edstrom, Karen Klonsky, Richard Buchner, and Franz Niederholzer. “*Sample Costs to Establish and Produce Almonds, Sacramento Valley*.” University of California, Cooperative Extension. Department of Agricultural and Resource Economics. Davis, CA. Home - Accessed February 23, 2016. <http://coststudies.ucdavis.edu/en/current/>.
- Micke, Warren C. *Almond Production Manual*. 3364, Oakland, Calif: University of California, Division of Agriculture and Natural Resources, 1996.

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. COSTS PER ACRE TO ESTABLISH AN ALMOND ORCHARD
 SACRAMENTO VALLEY-2016

| Year: | Cost Per Acre | | | | | |
|--|---------------|------------|------------|--------------|--------------|--------------|
| | 1st | 2nd | 3rd | 4th | 5th | 6th |
| Meat Pounds Per Acre @\$2.50/lbs. | | | 400 | 800 | 1,400 | 2,000 |
| Pre-Plant: | | | | | | |
| Tree Removal (50%) | 375 | | | | | |
| Rip 4' Depth/Root Removal (50%) | 267 | | | | | |
| Disc & Roll (2x) | 50 | | | | | |
| Laser Leveling | 70 | | | | | |
| Make Berms/Rows | 30 | | | | | |
| Smooth Row Middles | 30 | | | | | |
| Pests: Weeds – Strip Spray | 34 | | | | | |
| TOTAL PRE-PLANT COSTS | 856 | | | | | |
| Plant: | | | | | | |
| Dip Roots/Plant/Top | 1,162 | | | | | |
| Stake/Whitewash/Cartons | 309 | | | | | |
| TOTAL PLANTING COSTS | 1,471 | | | | | |
| 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 | 24 | 24 | 35 | 46 | 54 | 54 |
| Pollination: Hive Rental | | | 90 | 180 | 360 | 450 |
| Fertilize: Hand (15-15-15) (3x) | 112 | | | | | |
| Fertilize: UAN – 32 (3x) | | 17 | 35 | 70 | 93 | 128 |
| Fertilize: Zinc Sulfate (36%) | | 25 | 30 | 39 | 39 | 39 |
| Fertilize: K2SO4 | | 14 | 36 | 64 | 108 | 151 |
| Fertilize: Leaf Sample (1/20 acres) | | | 1 | 1 | 1 | 1 |
| Fertilize: Hull Sample (1/25 acres) | | | 1 | 1 | 1 | 1 |
| Pests: Gophers – Bait (2x) | 7 | 7 | 7 | 7 | 7 | 7 |
| Pests: Squirrels – Traps (6x) | 4 | 4 | 4 | 4 | 4 | 4 |
| Pests: Weeds – Strip Spray | 102 | 20 | 6 | 6 | 6 | 6 |
| Pests: Weeds – Pre-Harvest Spray | | | 42 | 42 | 42 | 42 |
| Pests: Weeds – Mow Middles | 13 | 8 | 21 | 21 | 21 | 21 |
| Pests: Weeds – Dormant Spray | | 22 | 68 | 68 | 68 | 68 |
| Pests: Insects (Yr.1 Hand, Yr.2 50% of ac., Yr.3+ alternate years) | 11 | 32 | | 107 | | 90 |
| Pests: Disease | | | 64 | 136 | 142 | 155 |
| PCA Service Fee | 20 | 20 | 20 | 35 | 35 | 35 |
| Prune: Summer Suckering | 22 | | | | | |
| Prune: Dormant – Hand Crew | | 34 | 34 | 34 | 34 | 34 |
| Prune: Push Prunings | | 17 | 17 | 17 | 17 | 17 |
| Winter Sanitation | | | 104 | 104 | 104 | 104 |
| Pickup Truck Use | 55 | 55 | 55 | 55 | 55 | 55 |
| ATV Use | 21 | 21 | 21 | 21 | 21 | 21 |
| TOTAL CULTURAL COSTS | 545 | 476 | 912 | 1,347 | 1,550 | 1,821 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 1. CONTINUED
SACRAMENTO VALLEY-2016

| Year | Cost per Acre | | | | | |
|--|---------------|-------|--------------|--------------|--------------|--------------|
| | 1st | 2nd | 3rd | 4th | 5th | 6th |
| Meat Pounds Per Acre @\$2.50/lbs. | | | 400 | 800 | 1,400 | 2,000 |
| Harvest: | | | | | | |
| Shake Trees | | | 94 | 100 | 100 | 106 |
| Sweep Nuts | | | 38 | 38 | 38 | 56 |
| Hand Rake/Blow Nuts | | | 8 | 8 | 8 | 8 |
| Pick up/Haul Nuts | | | 38 | 38 | 38 | 56 |
| Hull/Shell Nuts | | | 20 | 40 | 70 | 100 |
| TOTAL HARVEST COSTS | | | 197 | 223 | 253 | 327 |
| Interest On Operating Capital @ 4.25% | 89 | 7 | 7 | 13 | 21 | 27 |
| TOTAL OPERATING COSTS/ACRE | 2,961 | 483 | 1,117 | 1,583 | 1,825 | 2,169 |
| Cash Overhead | | | | | | |
| Liability Insurance | 8 | 8 | 8 | 8 | 8 | 8 |
| Office Expense | 60 | 60 | 60 | 60 | 60 | 60 |
| Sanitation Fees | 8 | 8 | 8 | 8 | 8 | 8 |
| Environmental Fee | 10 | 10 | 10 | 10 | 10 | 10 |
| Property Taxes | 194 | 194 | 194 | 228 | 228 | 228 |
| Property Insurance | 64 | 64 | 64 | 61 | 61 | 61 |
| Investment Repairs | 49 | 49 | 49 | 56 | 56 | 56 |
| TOTAL CASH OVERHEAD COSTS | 394 | 394 | 393 | 431 | 431 | 430 |
| TOTAL CASH COSTS/ACRE | 3,354 | 877 | 1,510 | 2,014 | 2,256 | 2,599 |
| INCOME/ACRE FROM PRODUCTION | | | 1,000 | 2,000 | 3,500 | 5,000 |
| NET CASH COSTS/ACRE FOR THE YEAR | | | 510 | | | |
| PROFIT/ACRE ABOVE CASH COSTS | | | | 14 | 1,244 | 2,401 |
| ACCUMULATED NET CASH COSTS/ACRE | 3,354 | 4,231 | 4,741 | 4,727 | 3,483 | 1,082 |
| NON-CASH OVERHEAD: | | | | | | |
| Pole Barn 2,500 sq. ft. | 33 | 33 | 33 | 33 | 33 | 33 |
| Fuel Tanks 2-1,000Gal | 7 | 7 | 7 | 7 | 7 | 7 |
| Booster Pump 125HP | 13 | 13 | 13 | 13 | 13 | 13 |
| Shop/Field Tools | 8 | 8 | 8 | 8 | 8 | 8 |
| Irrigation System-Micro | 85 | 85 | 85 | 85 | 85 | 85 |
| Land | 585 | 585 | 585 | 585 | 585 | 585 |
| Establishment Costs | | | | 428 | 428 | 428 |
| Equipment | 17 | 20 | 36 | 31 | 29 | 34 |
| TOTAL NON-CASH OVERHEAD COST/ACRE | 747 | 752 | 756 | 1,189 | 1,179 | 1,192 |
| TOTAL COST/ACRE FOR THE YEAR | 4,102 | 1,629 | 2,267 | 3,203 | 3,435 | 3,791 |
| INCOME/ACRE FROM PRODUCTION | | | 1,000 | 2,000 | 3,500 | 5,000 |
| TOTAL NET COST/ACRE FOR THE YEAR | | | 1,267 | 1,203 | | |
| NET PROFIT/ACRE ABOVE TOTAL COSTS | | | | | 65 | 1,209 |
| TOTAL ACCUMULATED NET COST/ACRE | 4,102 | 5,731 | 6,998 | 8,201 | 8,136 | 6,927 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 2. COSTS PER ACRE TO PRODUCE ALMONDS
SACRAMENTO VALLEY-2016

| Operation | Equipment Time (Hrs/A) | Cash and Labor Costs per Acre | | | | | Total Cost | Your Cost |
|--|---------------------------|-------------------------------|-----------|-------------------|------------------|-----------------|--------------|-----------|
| | | Labor Cost | Fuel | Lube & Repairs | Material Cost | Custom/ Rent | | |
| Cultural: | | | | | | | | |
| Pests: Weeds - Dormant Spray | 0.16 | 4 | 0 | 0 | 64 | 0 | 68 | |
| Pests: Weeds - Mow Middles 5x | 0.47 | 11 | 5 | 5 | 0 | 0 | 21 | |
| Pollination | 0.00 | 0 | 0 | 0 | 0 | 450 | 450 | |
| Irrigation: Frost Protection | 0.00 | 3 | 0 | 0 | 17 | 0 | 19 | |
| Irrigation: Pump Test | 0.00 | 0 | 0 | 0 | 0 | 4 | 4 | |
| Irrigation: Water Analysis | 0.00 | 0 | 0 | 0 | 0 | 1 | 1 | |
| Pests: Disease/Insects 3x | 0.75 | 18 | 9 | 6 | 123 | 0 | 155 | |
| Pests: Squirrel - Traps (6x) | 0.15 | 4 | 0 | 0 | 0 | 0 | 4 | |
| Fertilize: UAN-32 3x | 0.00 | 0 | 0 | 0 | 128 | 0 | 128 | |
| Pests: Gophers - Bait (2x) | 0.05 | 1 | 0 | 0 | 6 | 0 | 7 | |
| Irrigate | 0.00 | 51 | 0 | 0 | 317 | 0 | 368 | |
| Pests: Weeds - Strip Spray | 0.16 | 4 | 0 | 0 | 2 | 0 | 6 | |
| Fertilize: Leaf Sample (1/20) | 0.00 | 0 | 0 | 0 | 0 | 1 | 1 | |
| Pests: Insects | 0.25 | 6 | 3 | 2 | 96 | 0 | 107 | |
| Pests: Weeds - Pre-Harvest | 0.16 | 4 | 0 | 0 | 38 | 0 | 42 | |
| Fertilize: Hull Sample (1/25) | 0.00 | 0 | 0 | 0 | 0 | 1 | 1 | |
| Fertilize: K2SO4 | 0.19 | 4 | 1 | 2 | 158 | 0 | 165 | |
| Fertilize: Zinc Sulfate (36%) | 0.25 | 6 | 3 | 2 | 29 | 0 | 39 | |
| Winter Sanitation | 0.09 | 2 | 1 | 1 | 0 | 100 | 104 | |
| Prune: Dormant (Alternate) | 0.00 | 34 | 0 | 0 | 0 | 0 | 34 | |
| Prune: Push Prunings (Alternate) | 0.23 | 14 | 3 | 1 | 0 | 0 | 17 | |
| Pickup Truck Use | 1.67 | 39 | 10 | 5 | 0 | 0 | 55 | |
| ATV Use | 0.83 | 20 | 1 | 1 | 0 | 0 | 21 | |
| PCA Fee-Prod | 0.00 | 0 | 0 | 0 | 0 | 35 | 35 | |
| TOTAL CULTURAL COSTS | 5.42 | 223 | 36 | 25 | 976 | 592 | 1,852 | |
| Harvest: | | | | | | | | |
| Shake-Trees | 0.00 | 0 | 0 | 0 | 0 | 125 | 125 | |
| Hand Rake/Blow Nuts | 0.00 | 8 | 0 | 0 | 0 | 0 | 8 | |
| Sweep Windrows | 0.00 | 0 | 0 | 0 | 0 | 75 | 75 | |
| Pickup/Haul Nuts | 0.00 | 0 | 0 | 0 | 0 | 75 | 75 | |
| Hull/Shell Nuts | 0.00 | 0 | 0 | 0 | 0 | 110 | 110 | |
| TOTAL HARVEST COSTS | 0.00 | 8 | 0 | 0 | 0 | 385 | 393 | |
| Interest on Operating Capital at 4.25% | | | | | | | | 23 |
| TOTAL OPERATING COSTS/ACRE | 5.42 | 232 | 36 | 25 | 976 | 977 | 2,267 | |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 2. CONTINUED
SACRAMENTO VALLEY-2016

| Operation | Equipment Time (Hrs/A) | Cash and Labor Costs per Acre | | | | | Total Cost | Your Cost |
|---------------------------------------|---------------------------|-------------------------------|------|---|------------------|-----------------|--------------|-----------|
| | | Labor Cost | Fuel | Lube& Repairs | Material Cost | Custom/ Rent | | |
| CASH OVERHEAD: | | | | | | | | |
| Environmental Fees | | | | | | | 10 | |
| Liability Insurance | | | | | | | 8 | |
| Office Expense | | | | | | | 60 | |
| Sanitation Fee | | | | | | | 8 | |
| Property Taxes | | | | | | | 228 | |
| Property Insurance | | | | | | | 61 | |
| Investment Repairs | | | | | | | 56 | |
| TOTAL CASH OVERHEAD COSTS/ACRE | | | | | | | 430 | |
| TOTAL CASH COSTS/ACRE | | | | | | | 2,698 | |
| NON-CASH OVERHEAD: | | | | | | | | |
| | | <u>Per Producing Acre</u> | | <u>Annual Cost Capital Recovery</u> | | | | |
| Fuel Tanks 2 – 1,000 gal | | 105 | | 7 | | | 7 | |
| Land SV | | 18,000 | | 585 | | | 585 | |
| Booster Pump 125HP | | 230 | | 13 | | | 13 | |
| Shop/Field Tools | | 143 | | 8 | | | 8 | |
| Irrigation System – Micro SV | | 1,500 | | 85 | | | 85 | |
| Establishment Costs- SV | | 6,648 | | 428 | | | 428 | |
| Pole Barn 2,500 SF | | 476 | | 33 | | | 33 | |
| Equipment | | 324 | | 34 | | | 34 | |
| TOTAL NON-CASH OVERHEAD COSTS | | | | | | | 1,192 | |
| TOTAL COSTS/ACRE | | | | | | | 3,890 | |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 3. COSTS AND RETURNS PER ACRE TO PRODUCE ALMONDS
 SACRAMENTO VALLEY-2016

| | 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 | 2,200 | Lb | | 5,500 | |
| OPERATING COSTS | | | | | |
| Herbicide: | | | | | 104 |
| Matrix SG | 2.00 | Oz | 6.37 | 13 | |
| Alion | 3.50 | FIOz | 13.84 | 48 | |
| Roundup PowerMax | 2.75 | Pint | 2.75 | 8 | |
| Rely 280 | 2.50 | Pint | 13.92 | 35 | |
| Fungicide: | | | | | 101 |
| Vanguard WG | 10.00 | Oz | 5.34 | 53 | |
| Bravo-Weatherstik | 32.00 | FIOz | 0.25 | 8 | |
| Ziram WDG76 | 8.00 | Lb | 5.00 | 40 | |
| Insecticide: | | | | | 117 |
| Dipel Pro DF | 2.00 | Lb | 10.62 | 21 | |
| Altacor | 4.00 | FIOz | 11.25 | 45 | |
| Zeal | 3.00 | Oz | 17.00 | 51 | |
| Rodenticide: | | | | | 6 |
| Vertebrate Pest Bait | 3.00 | Lb | 1.92 | 6 | |
| Custom: | | | | | 977 |
| Pollination Fee | 2.50 | Hive | 180.00 | 450 | |
| Irrigation Pump Test | 0.02 | Each | 200.00 | 4 | |
| Irrigation Water Analysis | 0.02 | Each | 50.00 | 1 | |
| Leaf Analysis | 0.05 | Each | 20.00 | 1 | |
| Shake Trees | 1.50 | Hour | 125.00 | 188 | |
| Sweep | 1.50 | Hour | 75.00 | 113 | |
| Pickup & Haul Nuts SV | 1.00 | Hour | 75.00 | 75 | |
| Hull/Shell Nuts | 2200.00 | Lb | 0.05 | 110 | |
| Hull Analysis | 0.04 | Each | 20.00 | 1 | |
| PCA/CCA Fee (Prod Yrs.) | 1.00 | Acre | 35.00 | 35 | |
| Irrigation: | | | | | 333 |
| Water-Pumped | 40.00 | AcIn | 8.33 | 333 | |
| Fertilizer: | | | | | 315 |
| UAN32 (32-0-0) | 220.00 | Lb N | 0.58 | 128 | |
| Potassium Sulfate-K2SO4 | 440.00 | Lb | 0.36 | 158 | |
| Zinc Sulfate 36% | 30.00 | Lb | 0.95 | 29 | |
| Labor | | | | | 232 |
| Equipment Operator Labor | 6.51 | hrs | 19.60 | 128 | |
| Irrigation Labor | 3.20 | hrs | 16.80 | 54 | |
| Non-Machine Labor | 0.50 | hrs | 16.80 | 8 | |
| Pruning Labor | 2.50 | hrs | 16.80 | 42 | |
| Machinery | | | | | 61 |
| Fuel-Gas | 0.57 | gal | 2.77 | 2 | |
| Fuel-Diesel | 13.89 | gal | 2.49 | 35 | |
| Lube | | | | 5 | |
| Machinery Repair | | | | 20 | |
| Interest on Operating Capital @ 4.25% | | | | | 23 |
| TOTAL OPERATING COSTS/ACRE | | | | 2,267 | |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 4. MONTHLY COSTS PER ACRE TO PRODUCE ALMONDS
 SACRAMENTO VALLEY-2016

| Beginning 01-16 | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---------------------------------------|-----------|------------|------------|------------|------------|-----------|------------|------------|------------|-----------|------------|-----------|--------------|
| Ending 12-16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | |
| Cultural: | | | | | | | | | | | | | |
| Pests: Weeds - Dormant Spray | 68 | | | | | | | | | | | | 68 |
| Pests: Weeds - Mow Middles 5x | | 4 | | 4 | 4 | 4 | | 4 | | | | | 21 |
| Pollination | | 450 | | | | | | | | | | | 450 |
| Irrigation: Frost Protection | | 19 | | | | | | | | | | | 19 |
| Irrigation: Pump Test | | | 4 | | | | | | | | | | 4 |
| Irrigation: Water Analysis | | | 1 | | | | | | | | | | 1 |
| Pests: Disease/Insects 3x | | 75 | 80 | | | | | | | | | | 155 |
| Pests: Squirrel - Traps (6x) | | | 1 | 1 | 1 | 1 | | | 1 | 1 | | | 4 |
| Fertilize: UAN-32 3x | | | 43 | 43 | 43 | | | | | | | | 128 |
| Pests: Gophers - Bait (2x) | | | 4 | | | | | 4 | | | | | 7 |
| Irrigate | | | | 39 | 48 | 68 | 77 | 58 | 48 | 29 | | | 368 |
| Pests: Weeds - Strip Spray | | | | | 6 | | | | | | | | 6 |
| Fertilize: Leaf Sample (1/20) | | | | | | | 1 | | | | | | 1 |
| Pests: Insects | | | | | | | 107 | | | | | | 107 |
| Pests: Weeds - Pre-Harvest | | | | | | | 42 | | | | | | 42 |
| Fertilize: Hull Sample (1/25) | | | | | | | | 1 | | | | | 1 |
| Fertilize: K2SO4 | | | | | | | | | | | 165 | | 165 |
| Fertilize: Zinc Sulfate (36%) | | | | | | | | | | | 39 | | 39 |
| Winter Sanitation | | | | | | | | | | | 104 | | 104 |
| Prune: Dormant (Alternate) | | | | | | | | | | | | 34 | 34 |
| Prune: Push Prunings (Alternate) | | | | | | | | | | | | 17 | 17 |
| Pickup Truck Use | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 |
| ATV Use | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 21 |
| PCA Fee | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 35 |
| TOTAL Cultural COSTS | 78 | 558 | 141 | 95 | 111 | 82 | 236 | 76 | 58 | 39 | 318 | 60 | 1,852 |
| Harvest: | | | | | | | | | | | | | |
| Shake Trees | | | | | | | | 125 | | | | | 125 |
| Hand Rake Nuts | | | | | | | | 8 | | | | | 8 |
| Sweep Nuts | | | | | | | | 75 | | | | | 75 |
| Pickup and Haul Nuts | | | | | | | | 75 | | | | | 75 |
| Hull and Shell Nuts | | | | | | | | 110 | | | | | 110 |
| TOTAL Harvest COSTS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 393 | 0 | 0 | 0 | 0 | 393 |
| Interest on Operating Capital (4.25%) | 0 | 2 | 3 | 3 | 3 | 4 | 5 | 6 | -1 | -1 | -1 | 0 | 23 |
| TOTAL OPERATING COSTS/ACRE | 78 | 560 | 144 | 98 | 115 | 86 | 241 | 475 | 57 | 38 | 317 | 60 | 2,267 |
| CASH OVERHEAD | | | | | | | | | | | | | |
| Environmental Fee | | 10 | | | | | | | | | | | 10 |
| Liability Insurance | | 8 | | | | | | | | | | | 8 |
| Office Expense | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 60 |
| Sanitation Fees | | | | | | | | 8 | | | | | 8 |
| Property Taxes | | 114 | | | | | | | 114 | | | | 228 |
| Property Insurance | | 30 | | | | | | 30 | | | | | 61 |
| Investment Repairs | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 56 |
| TOTAL CASH OVERHEAD COSTS | 10 | 172 | 10 | 10 | 10 | 10 | 10 | 17 | 154 | 10 | 10 | 10 | 430 |
| TOTAL CASH COSTS/ACRE | 88 | 732 | 153 | 108 | 125 | 95 | 251 | 493 | 211 | 47 | 326 | 70 | 2,698 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 5. RANGING ANALYSIS
 SACRAMENTO VALLEY-2016

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ALMONDS

| | YIELD (LBS.) | | | | | | |
|---------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | 1,000.00 | 1,400.00 | 1,800.00 | 2,200.00 | 2,600.00 | 3,000.00 | 3,400.00 |
| OPERATING COSTS/ACRE: | | | | | | | |
| Cultural | 1,852 | 1,852 | 1,852 | 1,852 | 1,852 | 1,852 | 1,852 |
| Harvest | 178 | 251 | 322 | 393 | 464 | 535 | 609 |
| Interest on Operating Capital @ 4.25% | 21.02 | 21.28 | 21.53 | 21.78 | 22.03 | 22.28 | 22.54 |
| TOTAL OPERATING COSTS/ACRE | 2,051 | 2,125 | 2,196 | 2,267 | 2,339 | 2,410 | 2,484 |
| TOTAL OPERATING COSTS/LB | 2.05 | 1.52 | 1.22 | 1.03 | 0.90 | 0.80 | 0.73 |
| CASH OVERHEAD COSTS/ACRE | | | | | | | |
| | 430 | 430 | 430 | 430 | 430 | 430 | 430 |
| TOTAL CASH COSTS/ACRE | 2,481 | 2,555 | 2,626 | 2,698 | 2,769 | 2,840 | 2,914 |
| TOTAL CASH COSTS/LB | 2.48 | 1.83 | 1.46 | 1.23 | 1.06 | 0.95 | 0.86 |
| NON-CASH OVERHEAD COSTS/ACRE | | | | | | | |
| | 1,192 | 1,192 | 1,192 | 1,192 | 1,192 | 1,192 | 1,192 |
| TOTAL COSTS/ACRE | 3,673 | 3,747 | 3,818 | 3,890 | 3,961 | 4,032 | 4,106 |
| TOTAL COSTS/LB | 3.67 | 2.68 | 2.12 | 1.77 | 1.52 | 1.34 | 1.21 |

Net Return per Acre above Operating Costs for Almonds

| PRICE (\$/lb) | YIELD (lbs./acre) | | | | | | |
|-------------------|-------------------|-------|-------|-------|-------|-------|--------|
| | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| Production | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| 1.00 | -1,051 | -725 | -396 | -67 | 261 | 590 | 916 |
| 1.50 | -551 | -25 | 504 | 1,033 | 1,561 | 2,090 | 2,616 |
| 2.00 | -51 | 675 | 1,404 | 2,133 | 2,861 | 3,590 | 4,316 |
| 2.50 | 449 | 1,375 | 2,304 | 3,233 | 4,161 | 5,090 | 6,016 |
| 3.00 | 949 | 2,075 | 3,204 | 4,333 | 5,461 | 6,590 | 7,716 |
| 3.50 | 1,449 | 2,775 | 4,104 | 5,433 | 6,761 | 8,090 | 9,416 |
| 4.00 | 1,949 | 3,475 | 5,004 | 6,533 | 8,061 | 9,590 | 11,116 |

Net Return per Acre above Cash Costs for Almonds

| PRICE (\$/lb) | YIELD (lbs./acre) | | | | | | |
|-------------------|-------------------|--------|-------|-------|-------|-------|--------|
| | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| Production | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| 1.00 | -1,481 | -1,155 | -826 | -498 | -169 | 160 | 486 |
| 1.50 | -981 | -455 | 74 | 602 | 1,131 | 1,660 | 2,186 |
| 2.00 | -481 | 245 | 974 | 1,702 | 2,431 | 3,160 | 3,886 |
| 2.50 | 19 | 945 | 1,874 | 2,802 | 3,731 | 4,660 | 5,586 |
| 3.00 | 519 | 1,645 | 2,774 | 3,902 | 5,031 | 6,160 | 7,286 |
| 3.50 | 1,019 | 2,345 | 3,674 | 5,002 | 6,331 | 7,660 | 8,986 |
| 4.00 | 1,519 | 3,045 | 4,574 | 6,102 | 7,631 | 9,160 | 10,686 |

Net Return per Acre above Total Costs for Almonds

| PRICE (\$/lb) | YIELD (lbs./acre) | | | | | | |
|-------------------|-------------------|--------|--------|--------|--------|--------|-------|
| | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| Production | 1,000 | 1,400 | 1,800 | 2,200 | 2,600 | 3,000 | 3,400 |
| 1.00 | -2,673 | -2,347 | -2,018 | -1,690 | -1,361 | -1,032 | -706 |
| 1.50 | -2,173 | -1,647 | -1,118 | -590 | -61 | 468 | 994 |
| 2.00 | -1,673 | -947 | -218 | 510 | 1,239 | 1,968 | 2,694 |
| 2.50 | -1,173 | -247 | 682 | 1,610 | 2,539 | 3,468 | 4,394 |
| 3.00 | -673 | 453 | 1,582 | 2,710 | 3,839 | 4,968 | 6,094 |
| 3.50 | -173 | 1,153 | 2,482 | 3,810 | 5,139 | 6,468 | 7,794 |
| 4.00 | 327 | 1,853 | 3,382 | 4,910 | 6,439 | 7,968 | 9,494 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 SACRAMENTO VALLEY-2016

ANNUAL EQUIPMENT COSTS

| Yr. | Description | Price | Yrs. Life | Salvage Value | Capital Recovery | Cash Overhead | | Total |
|------------------|-----------------------------|---------|-----------|---------------|------------------|---------------|-------|--------|
| | | | | | | Insurance | Taxes | |
| 16 | ATV-4WD | 8,500 | 10 | 2,511 | 793 | 5 | 55 | 852 |
| 16 | Flail Mower 11' | 12,803 | 10 | 2,264 | 1,325 | 6 | 75 | 1,407 |
| 16 | Air-Blast PTO 500Gal | 25,000 | 8 | 5,645 | 2,970 | 13 | 153 | 3,136 |
| 16 | Pickup Truck 1/2 Ton | 28,000 | 5 | 12,549 | 3,806 | 17 | 203 | 4,026 |
| 16 | Brush Rake 10' | 1,800 | 25 | 51 | 105 | 1 | 9 | 115 |
| 16 | Fertilizer Applicator PTO | 15,000 | 10 | 2,653 | 1,552 | 7 | 88 | 1,648 |
| 16 | 85HP4WD Low-Profile Tractor | 68,100 | 15 | 13,258 | 5,108 | 34 | 407 | 5,549 |
| 16 | 34HP4WD Tractor | 29,452 | 12 | 7,363 | 2,492 | 16 | 184 | 2,691 |
| 16 | ATV Sprayer System 100 Gal | 5,646 | 10 | 998 | 584 | 3 | 33 | 620 |
| TOTAL | | 194,301 | - | 47,292 | 18,735 | 102 | 1,208 | 20,044 |
| 60% of new cost* | | 116,581 | - | 28,375 | 11,241 | 61 | 725 | 12,027 |

*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 2-1,000Gal | 10,975 | 20 | 1,098 | 715 | 0 | 60 | 220 | 995 |
| Land | 1,800,000 | 25 | 1,800,000 | 58,500 | 23 | 18,000 | 0 | 76,523 |
| Booster Pump 125HP | 23,000 | 25 | 1,610 | 1,315 | 5,145 | 123 | 460 | 7,043 |
| Shop/Field Tools | 15,000 | 25 | 1,500 | 846 | 53 | 83 | 300 | 1,281 |
| Irrigation System-Micro | 150,000 | 25 | 15,000 | 8,458 | 525 | 825 | 3,000 | 12,808 |
| Establishment Costs | 664,800 | 22 | 0 | 42,766 | 280 | 3,324 | 665 | 47,035 |
| Pole Barn 2500 SqFt | 50,000 | 20 | 0 | 3,439 | 21 | 250 | 1,000 | 4,710 |
| TOTAL INVESTMENT | 2,713,775 | - | 1,819,208 | 116,039 | 6,047 | 22,665 | 5,645 | 150,395 |

ANNUAL BUSINESS OVERHEAD COSTS

| Description | Farm | Units/ Unit | Price/ Unit | Total Cost |
|---------------------|------|-------------|-------------|------------|
| Environmental Fees | 105 | Acre | 10.00 | 1,050 |
| Liability Insurance | 105 | Acre | 7.92 | 832 |
| Office Expense | 105 | Acre | 60.00 | 6,300 |
| Sanitation Fees | 100 | Acre | 8.00 | 800 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 7. HOURLY EQUIPMENT COSTS
 SACRAMENTO VALLEY-2016

| Yr. | Description | Almonds Hours Used | Total Hours Used | Capital Recovery | Cash Overhead | | Operating | | | Total Costs/Hr. |
|-----|-----------------------------|--------------------|------------------|------------------|---------------|-------|----------------|-------|-------------|-----------------|
| | | | | | Insurance | Taxes | Lube & Repairs | Fuel | Total Oper. | |
| 16 | ATV-4WD | 153 | 200 | 2.38 | 0.01 | 0.17 | 0.78 | 1.04 | 1.82 | 4.38 |
| 16 | Flail Mower 11' | 56 | 200 | 3.97 | 0.02 | 0.23 | 6.40 | 0.00 | 6.40 | 10.62 |
| 16 | Air-Blast PTO 500Gal | 125 | 250 | 7.13 | 0.03 | 0.37 | 4.41 | 0.00 | 4.41 | 11.94 |
| 16 | Pickup Truck 1/2 Ton | 167 | 400 | 5.71 | 0.03 | 0.30 | 3.03 | 6.23 | 9.26 | 15.30 |
| 16 | Brush Rake 10' | 23 | 80 | 0.79 | 0.01 | 0.07 | 0.36 | 0.00 | 0.36 | 1.22 |
| 16 | Fertilizer Applicator PTO | 19 | 120 | 7.76 | 0.04 | 0.44 | 5.86 | 0.00 | 5.86 | 14.10 |
| 16 | 85HP4WD Low-Profile Tractor | 225 | 1066 | 2.88 | 0.02 | 0.23 | 3.36 | 10.39 | 13.76 | 16.88 |
| 16 | 34HP4WD Tractor | 21 | 1000 | 1.49 | 0.01 | 0.11 | 2.01 | 4.16 | 6.17 | 7.79 |
| 16 | ATV Sprayer System 100 Gal | 49 | 150 | 2.34 | 0.01 | 0.13 | 1.54 | 0.00 | 1.54 | 4.02 |

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 8. OPERATIONS WITH EQUIPMENT & MATERIALS
 SACRAMENTO VALLEY-2016

| Operation | Operation Month | Tractor | Labor Type/ Material | Rate/ acre | Unit | |
|----------------------------|---------------------------|----------------------|---------------------------|--------------------------|-----------|------|
| Pests: Weeds - Dormant | Jan | ATV-4WD | Equipment Operator Labor | 0.20 | hour | |
| | | | Matrix SG | 2.00 | Oz | |
| | | | ATV Sprayer System | Alion | 3.50 | FIOz |
| | | | Roundup PowerMax | 1.00 | Pint | |
| Pests: Weeds - Mow | Feb - Aug | 85HP4WD Tractor | Equipment Operator Labor | 0.11 (5x) | hour | |
| Pollination | Feb | | Pollination Fee | 2.50 | Hive | |
| Irrigation: Frost Protect | Feb | | Irrigation Labor | 0.16 | hour | |
| | | | Water-Pumped | 2.00 | AcIn | |
| | | | Irrigation Pump Test | 0.02 | Each | |
| Irrigation: Water Analysis | Mar | | Irrigation Water Analysis | 0.02 | Each | |
| Pests: Disease/Insect | Feb | 85HP4WD Tractor | Equipment Operator Labor | 0.30 | hour | |
| | | | Vanguard WG | 10.00 | Oz | |
| | | | Dipel Pro DF | 1.00 | Lb | |
| | | Mar | 85HP4WD Tractor | Equipment Operator Labor | 0.30 | hour |
| | Bravo-Weatherstik | | | 32.00 | FIOz | |
| | | Mar | 85HP4WD Tractor | Equipment Operator Labor | 0.30 | hour |
| | Ziram WDG76 | | | 8.00 | Lb | |
| | Dipel Pro DF | | | 1.00 | Lb | |
| | Pests: Squirrel - Traps | Mar - Oct | ATV-4WD | Equipment Operator Labor | 0.03 (6x) | hour |
| Fertilize: UAN-32 3x | Mar - May | | UAN32 (32-0-0) | 73.34 (3x) | Lb N | |
| Pests: Gophers - Bait | Mar & Aug | ATV-4WD | Equipment Operator Labor | 0.03 (2x) | hour | |
| | | | Vertebrate Pest Bait | 1.50 (2x) | Lb | |
| Irrigate | Apr | | Irrigation Labor | 0.32 | hour | |
| | | | Water-Pumped | 4.00 | AcIn | |
| | May | | Irrigation Labor | 0.40 | hour | |
| | | | Water-Pumped | 5.00 | AcIn | |
| | June | | Irrigation Labor | 0.56 | hour | |
| | | | Water-Pumped | 7.00 | AcIn | |
| | July | | Irrigation Labor | 0.64 | hour | |
| | | | Water-Pumped | 8.00 | AcIn | |
| | Aug | | Irrigation Labor | 0.48 | hour | |
| | | | Water-Pumped | 6.00 | AcIn | |
| | Sept | | Irrigation Labor | 0.40 | hour | |
| | | | Water-Pumped | 5.00 | AcIn | |
| | Oct | | Irrigation Labor | 0.24 | hour | |
| | | | Water-Pumped | 3.00 | AcIn | |
| | Pests: Weeds, Strip Spray | May | ATV-4WD | Equipment Operator Labor | 0.20 | hour |
| Roundup PowerMax | | | | 0.75 | Pint | |
| Fertilize: Leaf Sample | July | | Leaf Analysis | 0.05 | Each | |
| Pests: Insects | July | 85HP4WD Tractor | Equipment Operator Labor | 0.30 | hour | |
| | | | Altacor | 4.00 | FIOz | |
| | | | Zeal | 3.00 | Oz | |
| Pests: Weeds, Pre-Harvest | July | ATV-4WD | Equipment Operator Labor | 0.20 | hour | |
| | | | Roundup PowerMax | 1.00 | Pint | |
| | | | ATV Sprayer System | Rely 280 | 2.50 | Pint |
| Fertilize: Hull Sample | Aug | | Hull Analysis | 0.04 | Each | |
| Fertilize: K2SO4 | Nov | 34HP4WD Tractor | Equipment Operator Labor | 0.22 | hour | |
| | | | Potassium Sulfate-K2SO4 | 440.00 | Lb | |
| Fertilize: Zinc Sulfate | Nov | 85HP4WD Tractor | Equipment Operator Labor | 0.30 | hour | |
| | | | Zinc Sulfate 36% | 30.00 | Lb | |
| Winter Sanitation | Nov | 85HP4WD Tractor | Equipment Operator Labor | 0.11 | hour | |
| | | | Shake Trees | 0.50 | Hour | |
| | | | Sweep | 0.50 | Hour | |
| Prune: Dormant (Alt.) | Dec | | Pruning Labor | 2.00 | hours | |
| Prune: Push Prunings | Dec | 85HP4WD Tractor | Pruning Labor | 0.50 | hour | |
| Pickup Truck Use | Dec | Pickup Truck 1/2 Ton | Equipment Operator Labor | 2.00 | hours | |
| ATV Use | Dec | ATV-4WD | Equipment Operator Labor | 1.00 | hour | |
| PCA Fee | Dec | | PCA/CCA Fee (Prod Yrs.) | 1.00 | Acre | |
| Harvest-Shake Trees | Aug | | Shake Trees | 1.00 | Hour | |
| Harvest-Hand Rake | Aug | | Non-Machine Labor | 0.50 | hour | |
| Harvest-Sweep Nuts | Aug | | Sweep | 1.00 | Hour | |
| Harvest- Pickup & Haul | Aug | | Pickup & Haul Nuts SV | 1.00 | Hour | |
| Harvest-Hull/Shell | Aug | | Hull/Shell Nuts | 2,200.00 | Lb | |