
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
AGRICULTURE AND NATURAL RESOURCES
AGRICULTURAL ISSUES CENTER

2016

SAMPLE COSTS TO PRODUCE
ORGANIC ALMONDS



SAN JOAQUIN VALLEY - NORTH
SOLID SET SPRINKLER IRRIGATION

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San Joaquin Valley North - 2016
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INTRODUCTION

The sample costs to produce organic almonds under **solid set sprinkler** irrigation in the Northern San Joaquin 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 destewart@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.

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ASSUMPTIONS

The following assumptions refer to tables 1 to 7 and pertain to sample costs to produce organic almonds under solid set sprinkler irrigation in the Northern San Joaquin Valley. Cultural practices and costs for organic almonds production vary considerably among growers within the region; therefore, many of the costs, practices, and materials in this study will not be applicable to every farm. The practices and inputs used in this cost study serve 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.**

Establishment Cultural Practices

Farm. The farm consists of 100 contiguous acres farmed by the owner, to include 95 acres of established almonds and 5 acres of roads, irrigation system and a homestead. Note that non-contiguous parcels may have additional costs for travel time and equipment calibration. Larger farms will have increased efficiencies and thus lower per acre costs. The land is assumed to be well drained and either a class I or II soil. Almonds on 40 acres have been converted to organic production.

Organic Orchard Preparation. The orchard is assumed to have been established as a conventional almond orchard. Changing a farming system from conventional to organic practices requires a three-year transition period. Crops grown in transition years can be sold or labeled transitional, providing the rules and regulations are adhered to. Rules and regulations specific to organic commodities are established under the Organic Food Act of 1990 in the California Department of Food and Agriculture (CDFA) and the United States Department of Agriculture's (USDA) National Organic Program (NOP). The orchard in this report is considered to have begun the transition period and certification as organic after the second year of establishment. Refer to the USDA rules for organic production: <http://www.ams.usda.gov/AMSv1.0/nop>

Trees. Almond orchards will include at least two or more varieties in which bloom periods overlap to insure good pollination, or a self-cultivating variety. In organic farming, the variety is selected by considering insect and disease resistance. For example, while Nonpareil is more susceptible to insect damage than other varieties, it is also more tolerant to springtime diseases. In this study, the orchard is planted with Nonpareil (50%) and Aldrich varieties (50%). Contact the local UCCE advisor or a commercial nursery for varieties and roots stocks that are available. Planting densities may range from 75-180 trees per acre. In this study, 110 trees are planted on a 18' by 22' spacing (tree x row) to allow cross-mowing. The life of the orchard at the time of planting is estimated to be 25 years.

Cover Crop. In this study, the cover crop is planted in the fall of the third year as part of the transition period, although a cover crop can be planted in the first year of orchard establishment. The cover crop serves multiple purposes, including dust mitigation, weed competition and nitrogen supplementation. Coated (nitrogen fixing inoculants) subterranean clover at 20 pounds per acre is planted by a custom operator. Seeding rates are estimates and will vary by grower and seeding mix. The custom operator will start by discing the orchard rows twice— one time with the disc only and one time with the disc and ring roller. The custom operator then broadcasts the seed and finishes the field with a ring roller. A 3 or 4-acre-inch irrigation germinates the crop and is accomplished with the regular irrigation of 3-acre inches in October. Seed set generally occurs in mid-May, but can also occur early June depending upon the species. For this study, the cost of the cover crop is applied to the cost of production; however, because the legumes reseed themselves, they do not require yearly planting.

Production Operating Costs and Material Inputs

Pruning. Hand pruning to remove limbs for equipment access and safety can be done anytime from harvest through the dormant period and is done every other year. In this study, it is done in November or December of every other year (i.e. the 3rd year and 5th year), as such, 50 percent of the cost of pruning is applied to the cost of the production in this study. Prunings are hand stacked in the row middles and shredded by a custom operator.

Winter Sanitation. Winter sanitation in December destroys over-wintering sites for navel orange worm (NOW). The mummy nuts are shaken from the trees, dropped to the orchard floor, blown into the row middles and shredded with a flail mower. Winter sanitation operations except for the shredding are custom hired. Hand poling may be needed in low rainfall years.

Fertilization. Fertilizer such as zinc and boron should be applied only after leaf analysis and discussion with an organic certifier, but before any deficiencies takes place in the orchard. Zinc sulfate at 10 pounds per acre, and a 20 percent boron product at a rate of two pounds per acre, is applied as a foliar spray post-harvest before leaf fall (October). If the hull analysis indicates a boron deficiency, boron can be applied to the soil any time of the year at a rate of 10 to 20 pounds of a 20 percent boron product by spraying it directly on the soil surface or injecting it through the irrigation system. In this study, an additional 10 lbs. per acre of 20 percent boron is applied through the irrigation system in late October. Plant based compost at 10 tons per acre is applied one-half in the spring and one-half post-harvest in the fall to provide approximately 150 pounds of potassium (K) and 200 pounds of nitrogen (N). Compost nutrients vary and rates to obtain the required nutrients will vary, as such, this study includes four compost samples taken at the pile upon delivery in the spring and fall for a total cost of \$600 per year. Many organic growers plant legume cover crops to supplement nitrogen. In general, the fertilizer rates in this study mirror typical tree nutrient requirements, but do not take into account soil and water nitrogen.

Sampling. Tree nutrient status is determined by leaf, hull and soil analysis. Leaf samples at one per 20 acres are taken in July. A hull sample at one per 40 acres is taken from the windrow at harvest to test for boron levels. A water analysis should be done annually to determine nitrate availability and to maintain regulatory records and is included in this study.

In addition, soil samples are taken every other year, as such, 50 percent of the cost is reflected in this study. Samples are taken a rate of three samples per 20 acres to determine salinity, pH and nutrient levels. The samples are taken at three depths (0-1ft, 1-3ft and 3-5ft), to allow for a complete soil profile, from multiple areas in the orchard with specified depths pooled for analysis. The grower uses an ATV to collect the samples, which is assumed to take one hour per 40 acres (0.025 hrs/acre) each time.

Irrigation and Frost Protection. Price per acre-foot of water will vary by grower depending on water source, well characteristics and irrigation system. In this study, the water is pumped from an on-site well and the total pumping cost is estimated at \$100/acre. Irrigation labor is provided as a separate line item. A total of 44 acre-inches of water is applied to the orchard – two-acre inches for frost protection in February and March, and 42 acre-inches during the season (March to October). Application rates are greater than the actual tree water requirement due to application inefficiency; therefore, the water application rate is based on 90 percent efficiency. No assumption is made about effective rainfall, evaporation, and runoff. It is assumed that the season begins with a full soil profile.

Pollination. A commercial beekeeper sets out two hives per acre for pollination. The bee colony strength should be a standard 8 frames per hive and are set in the orchard in February prior to bloom. The cost ranges from \$150-225 per hive; this study charges \$180 per hive.

Pest Management. The approved pesticides and rates mentioned in this cost study are federally defined and are listed in California Certified Organic Farmers (CCOF) handbook, and the Organic Materials Review Institute (OMRI). For more information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. Cultural practices are discussed in the publications UC *Integrated Pest Management Guidelines, Almond*. For information and pesticide use permits, contact the local county agricultural commissioner's office and consult with your organic certification agency. As bees are sensitive to pesticides, grower should practice bee safe applications of pesticides.

Pest Control Adviser (PCA). The PCA monitors the field for agronomic problems including pests and nutrition and writes pesticide recommendations. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. No pest control adviser is hired in this study.

Cover Crop and Weeds. Weeds can be controlled by mechanical or physical means. In this study, a legume cover crop is grown in the middles for weed mitigation, to provide an environment for beneficial predators and as a supplementary nitrogen source. The tree rows can be flamed, hand and/or string trimmer weeded or mowed with a flail mower. In this study, all the row middles are mowed once in the spring using a flail mower and then all rows are flamed every three weeks to keep the middles and rows at less than ½-dollar size of growth.

Insect and Mite. An OMRI approved dormant or delayed dormant oil spray is applied at a rate of 6 gallons/acre in early January before bud swell control San Jose scale (*Quadraspidiotus perniciosus*), brown mite (*Bryobia rubrioculus*) and European red mites (*Panonychus ulmi*). The spray also includes 7 lbs. /acre of copper as an active ingredient to control shot hole (*Stigmina carphphila*). In late March, a biological insecticide is applied at a rate of 1 lb/acre based on peach twig borer (PTB) emergence (around petal fall). Mites can be managed during the season with two OMRI approved light oil sprays: July and August. In July, at the beginning of hull split, a spinosad pesticide is applied to control navel orange worm (NOW). NOW is also managed primarily by winter sanitation and early harvest; additional NOW and PTB controls may be necessary in some orchards.

Disease. The delayed dormant oil and copper spray will also provide some scab (*Cladosporium carpophilum*) control. Scab is typically controlled with two applications of an OMRI approved micronized sulfur at the highest label rate (typically 20 lbs. /acre) at two and five weeks after petal fall. Micronized sulfur may also have efficacy against shot hole (*Stigmina carphphila*), typically at petal fall. Brown rot (*Monilinia laxa*) is controlled with a bio fungicide or micronized sulfur application at early bloom and more importantly at full bloom (February). Hull rot can be controlled with deficit irrigation during initial hull split.

Vertebrate Pest. Trapping is used to control gophers and squirrels at a cost of \$8.50/trap. Gopher traps are set in March and August, while squirrel traps are set from March through October. The grower uses an ATV to set 2.5 traps/acre (100 traps for 40 acres), which is assumed to take one hour per 40 acres (0.025 hrs/acre) each time. Owl boxes may also be used to control vertebrate pests. The cost of the traps is included in shop tools.

Harvest. In this study, a custom operator mechanically harvests the almond crop starting in the third year. Harvest begins in August with the early maturing varieties and continues into October for late maturing varieties. In this study, harvest is in September. An inertia trunk shaker is the most common shaker used for almonds. The shaker head attaches to the tree trunk to shake the nuts from the tree. The nuts fall to the ground and in a separate operation are blown from around the trees and swept into windrows to dry. The grower then furnishes labor for hand raking to move nuts, missed by the sweeper, into the 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 with extended sides for delivery to the huller.

Yields. Typical annual yields for almonds are measured in kernel (meat) pounds per acre. Yields in organic orchards when compared to conventional orchards are subject to potential decreases in yield and quality due to diseases and insects that are not controlled. In this study, the estimated yield is 1,800 pounds. Below is an estimated annual yield table based on the age of the tree comparing yields in organic almond production and conventional almond production.

Annual Yield Estimates		
Year	Organic Kernel lbs.	Conventional Kernel lbs.
3	300	400
4	600	800
5	1,300	1,600
6+	1,800	2,200

Returns. Returns will vary depending on the variety and market. A ranging analysis of yields and returns is provided in Table 4. Currently organic producers receive a premium over conventional markets for their product. For this study, an estimated price of \$3.50 per pound is used to determine potential profits/losses.

Almond Hulls and By-Products. Almond hulls are high in fiber and are sold as a feed additive to the dairy industry. 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 is another potential source of income. For this study, no additional revenue from by-products is added as the price varies significantly based on variety, quality and market.

Assessment. The Almond Board of California 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 min. 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 75 min. 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 (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 (California Department of Insurance). 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 and Biological Engineers (ASABE). Fuel and lubrication costs are also determined by ASABE equations based on maximum power takeoff (PTO) horsepower, and fuel type. Average prices for on-farm delivery of diesel and gasoline based on 2016 data from the Energy Information Administration are \$2.49 and \$2.77 per gallon, respectively. The cost includes a 9.25 percent sales tax, a \$0.13/gal excise tax on diesel fuel, an 8 percent sales tax, and a \$0.30/gal excise tax on

gasoline. It is noted that federal and state excise taxes are refundable for on-farm use when filing the farm income tax return. The fuel, lube, and repair cost per acre for each operation is determined by multiplying the total hourly operating cost 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 the establishment and production of organic almonds should not be minimized. Weather and other risks are a continual concern for conventional growers, but organic growers face additional risks such as pest outbreaks that cannot be adequately controlled with organic methods. 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 the profitability and economic viability of organic almond production.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

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. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

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

Property Insurance. Provides coverage for property loss and is charged at 0.843 percent of the average value of the assets over their useful life.

Liability insurance. Covers expenses resulting from bodily injury claims sustained on your property and damages to another person's property as a result of a covered incident. Common liability expenses covered under your policy include attorney fees and court costs, medical expenses and damage to another's property. In this study, the cost of liability insurance is estimated at \$792 and covers the entire farm.

Crop Insurance. 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, and rain, and wind, damage from birds, drought, earthquakes and fires. Coverage levels are 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 the northern San Joaquin Valley; however, due to the variability in crop insurance coverage, no amount is specified in this study.

Office Expense. Office and business expenses are estimated at \$60 per acre. These expenses include office

supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, and miscellaneous administrative charges.

Regulatory Costs (Environmental Fees). Various environmental fees are collected by the county and state. The fees will vary by county. The grower must also provide safety training, safety equipment, and maintain training records. For this study, a cost of \$10 per producing acre or \$950 for the farm is assumed.

Organic Production Fees. Organic growers must meet certain criteria as defined by the National Organic Act requiring state registration and certification by a USDA accredited certifying agent. For this study, it is assumed the grower has paid the initial application fees; as such, only the one-time transition fee and the annual inspection/certification fees are shown.

California Certified Organic Farmers (CCOF). CCOF is an accredited certifying agency. They charge a transition fee \$40 to add additional acreage to an organic orchard. The annual inspection fee varies and is estimated at \$117.50 (\$72.50/hr. inspection fee plus a \$45/hr. travel fee). The annual certification fee is based on production revenues and is estimated at \$825 for the 40-acre orchard.

California Department of Food and Agriculture (CDFA). State registration is required and the county agricultural commissioner collects the fees. The fee is based on production revenues and is estimated at \$450 annual fee for the 40-acre orchard.

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

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

Non-Cash Overhead Costs

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase 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 ASABE based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASABE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for

equipment and investments are shown in the tables.

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

Interest Rate. The interest rate of 3.25 percent is used to calculate capital recovery. The rate will vary depending upon size of loan and other lending agency conditions, but is a suggested rate by a farm-lending agency in January 2016.

Land. Cropland with irrigation availability plantable to almonds is valued at \$17,000 per acre. For this study, the producing acreage is estimated worth is \$23,000 per acre. It is the crop land value plus the Establishment Cost for the first two years of an almond orchard in the northern San Joaquin Valley, ($\$17,000 + \$6,000 = \$23,000$). Established almond orchards range in value from \$23,000 to \$32,000 per acre in this region, which varies by irrigation availability, age of trees, average yields, soil quality and various other factors. The cost is amortized over the remaining 23 years of orchard production to estimate the annual capital recovery cost.

Establishment Cost. Establishment cost is the sum of the costs for land preparation, planting, trees, cash overhead and production expenses for growing the trees through the first year that almonds are harvested minus any returns from production. Costs to establish the orchard are included in non-cash overhead expenses and capital recovery costs for the production years and is estimated at \$6,000 per planted acre for this study.

Tree Replacement Costs. 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. Tree replacement is calculated as 0.10 percent of the value of the established orchard and is included in investment repairs in cash overhead.

Irrigation System. In this study, the water is pumped from an existing 300 foot deep well with a pumping level at 75-feet. A new 125 horsepower pump is installed to irrigate the 40 acres. An annual pump test is performed in January to monitor pumping level and efficiency (gallons/minute) at a cost of \$200 for the test. This study uses a solid set sprinkler system, but alternative systems could include micro-sprinklers hanging in the tree line or flood irrigation, depending on the soil make-up and access to water sources. The sprinkler system consists of solid set sprinklers with full coverage rotator/impact sprinkler heads on risers. The sprinklers are installed on every row and every other tree in the tree line using black hose that has been placed at a depth of 2 inches in the tree line. The system includes a filtration/injection system located near the pumping plant. The life of the irrigation system is estimated to be 25 years. 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 5.

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 the tables. 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. This includes shop tools and equipment, hand tools, and miscellaneous field tools, including

pruning equipment, bait stations and a frost alarm system. The cost is assumed and not based on any collected data.

Fuel Tanks. Two 500-gallon fuel tanks using gravity feed are on metal stands. The tanks are setup in a cement containment pad that meets federal, state, and county regulations.

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

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Table 1. COST PER ACRE TO PRODUCE ORGANIC ALMONDS

NORTHERN SAN JOAQUIN VALLEY - 2016

Operation	Cash and Labor Costs per Acre							Your Cost
	Equipment Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent	Total Costs	
Cultural:								
Pump Test	0.00	0	0	0	0	5	5	
Pest: Dormant (Oil Spray)	0.25	6	2	2	206	0	216	
Disease: Brown Rot (Regalia)	0.25	6	2	2	94	0	104	
Irrigate: Frost Protection	0.00	3	0	0	17	0	19	
Pollination: Hive Rental	0.00	0	0	0	0	360	360	
Pest: Weed Mow Middles	0.19	4	1	2	0	0	7	
Disease: Brown Rot (Kumulus)	0.25	6	2	2	25	0	35	
Insect; Peach Twig Borer (Dipel)	0.25	6	2	2	20	0	30	
Pest: Gopher Traps 2x	0.05	1	0	0	0	0	1	
Pest: Squirrel Traps 6x	0.15	4	0	0	0	0	4	
Pest: Weed Flame Middles (2x)	0.00	0	0	0	0	360	360	
Water Analysis	0.01	0	0	0	0	1	2	
Irrigate	0.00	52	0	0	325	0	377	
Fertilize: Manure Compost	0.00	0	0	0	300	24	324	
Compost Analysis	0.00	5	0	0	0	15	20	
Disease: Scab (Sulfur) 2x	0.50	12	5	4	13	0	33	
Insect: NOW (Entrust)	0.25	6	2	2	94	0	104	
Leaf Analysis Fee	0.02	0	0	0	0	2	3	
Insect: Mite (Oil Spray)	0.50	12	5	4	127	0	147	
Hull Samples	0.03	1	0	0	0	1	2	
Soil Analysis (50% of cost)	0.03	1	0	0	0	2	3	
Fertilize: Boron & Zinc Foliar	0.25	6	2	2	14	0	24	
Plant Cover Crop	0.00	0	0	0	19	39	58	
Fertigate: Boron	0.00	6	0	0	54	0	61	
Pruning (50% of cost)	0.00	67	0	0	0	0	67	
Stack Brush (50% of cost)	0.00	8	0	0	0	0	8	
Shred Prunings (50% of cost)	0.00	0	0	0	0	27	27	
Winter Sanitation	0.09	2	1	1	0	100	104	
Pickup Truck Use	1.67	39	10	6	0	0	55	
ATV Use	1.25	29	1	1	0	0	32	
TOTAL CULTURAL COSTS	5.98	282	37	27	1,308	936	2,590	
Harvest:								
Shake Trees	0.00	0	0	0	0	94	94	
Sweep Nuts	0.00	0	0	0	0	75	75	
Hand Rake Nuts	0.00	8	0	0	0	0	8	
Pickup and Haul Nuts	0.00	0	0	0	0	75	75	
Hull and Shell Nuts	0.00	0	0	0	0	90	90	
TOTAL HARVEST COSTS	0.00	8	0	0	0	334	342	
Interest on Operating Capital at 4.25%							39	
TOTAL OPERATING COSTS/ACRE	5.98	290	37	27	1,308	1,270	2,971	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 1. COST PER ACRE TO PRODUCE ORGANIC ALMONDS (CONTINUED)
 NORTHERN SAN JOAQUIN VALLEY - 2016

Operation	Cash and Labor Costs per Acre						Total Cost	Your Cost
	Equipment Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
CASH OVERHEAD COSTS								
Environmental Fee							10	
Liability Insurance							6	
Office Expense							60	
Organic Cert Fees (40ac)							36	
Sanitation Fee							20	
Property Taxes							249	
Property Insurance							21	
Investment Repairs							74	
TOTAL CASH OVERHEAD COSTS/ ACRE							476	
TOTAL CASH COSTS/ACRE							3,447	
NON-CASH OVERHEAD:								
		<u>Per Producing Acre</u>		<u>Annual Cost Capital Recovery</u>				
Building 2500sf Pole Barn		526		34			34	
Fuel Tanks 2-500Gal		34		2			2	
Shop/Field Tools		158		13			13	
Solid Set Sprinkler w/ Filter		1,850		85			85	
Land (40 acres)		23,000		748			748	
Equipment		432		44			44	
TOTAL NON-CASH OVERHEAD COSTS		26,000		925			925	
TOTAL COSTS/ACRE							4,373	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

Table 2. COSTS AND RETURNS PER ACRE TO PRODUCE ORGANIC ALMONDS

NORTHERN SAN JOAQUIN VALLEY - 2016

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Almond Production	1,800	Lb	3.50	6,300	
TOTAL GROSS RETURNS	1,800	Lb		6,300	
OPERATING COSTS					
Insecticide:					447
Dormant Oil (440 Spray Oil)	10.00	Gal	31.74	317	
Copper	7.00	Lb	2.27	16	
Dipel DF	1.00	Lb	19.80	20	
Entrust 80wp (Spinosad)	2.50	Oz	37.43	94	
Fungicide:					132
Regalia Bio fungicide	4.00	Qt	23.50	94	
Kumulus DF (Wettable Sulfur)	20.00	Lb	1.27	25	
Micronized Sulfur	20.00	Lb	0.65	13	
Fertilizer:					344
Manure/Compost	10.00	Ton	30.00	300	
Boron Solubor (20%)	12.00	Lb	2.95	35	
Zinc Sulfate (36%)	10.00	Lb	0.82	8	
Custom:					1,270
Pump Test	0.03	Each	200.00	5	
Pollination Fee	2.00	Hive	180.00	360	
Flame Middles	12.00	Acre	30.00	360	
Water Analysis	0.03	Each	50.00	1	
Spread Compost	2.00	Acre	12.00	24	
Compost Analysis	0.20	Each	75.00	15	
Leaf Analysis	0.10	Each	20.00	2	
Hull Analysis	0.05	Each	20.00	1	
Shake Trees	1.25	Hour	125.00	156	
Sweep Nuts	1.50	Hour	75.00	113	
Pickup and Haul Nuts	1.00	Hour	75.00	75	
Hull & Shell Nuts	1800.00	Lb	0.05	90	
Soil Analysis	0.08	Each	30.00	2	
Plant Cover Crops	1.00	Acre	38.80	39	
Shred Prunings	0.10	Hour	270.00	27	
Irrigation:					367
Water - Frost Protection	2.00	Acln	8.33	17	
Water - Pumped	42.00	Acln	8.33	350	
Seed:					19
Clover (Subterranean, Coated)	5.00	Lb	3.74	19	
Labor					290
Equipment Operator Labor	7.18	hrs	19.60	141	
Irrigation Labor	3.64	hrs	16.80	61	
Non-Machine Labor	5.28	hrs	16.80	89	
Machinery					64
Fuel-Gas	0.57	gal	2.77	2	
Fuel-Diesel	14.35	gal	2.49	36	
Lube				6	
Machinery Repair				21	
Interest on Operating Capital @				39	
TOTAL OPERATING COSTS/ACRE				2,971	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 3. MONTHLY PER ACRE CASH COSTS TO PRODUCE ORGANIC ALMONDS
 NORTHERN SAN JOAQUIN 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:													
Pump Test	5												5
Pest: Dormant (Oil Spray)	216												216
Disease: Brown Rot (Regalia)		104											104
Irrigate: Frost Protection		10	10										19
Pollination: Hive Rental		360											360
Pest: Weed Mow Middles		7											7
Disease: Brown Rot (Kumulus)			35										35
Insect; Peach Twig Borer (Dipel)			30										30
Pest: Gopher Traps (2x)			1					1					1
Pest: Squirrel Traps (6x)			1	1	1	1			1	1			4
Pest: Weed Flame Middles (2x)			60	60	60	60	60	60					360
Water Analysis		2											2
Irrigate		10	31	51	70	87	75	53					377
Fertilize: Manure Compost				162						162			324
Compost Analysis				8						12			20
Disease: Scab (Sulfur) 2x				16	16								33
Insect: NOW (Entrust)							104						104
Leaf Analysis Fee							3						3
Insect: Mite (Oil Spray)							73	73					147
Hull Samples									2				2
Soil Analysis (50% of cost)									3				3
Fertilize: Boron & Zinc Foliar										24			24
Plant Cover Crop										58			58
Fertigate: Boron										61			61
Pruning (50% of cost)												67	67
Stack Brush (50% of cost)												8	8
Shred Prunings (50% of cost)												27	27
Winter Sanitation												104	104
Pickup Truck Use	5	5	5	5	5	5	5	5	5	5	5	5	55
ATV Use	3	3	3	3	3	3	3	3	3	3	3	3	32
TOTAL Cultural COSTS	229	488	155	286	135	138	334	216	66	324	7	214	2,590
Harvest:													
Harvest: Shake Trees									94				94
Sweep Nuts									75				75
Hand Rake Nuts									4				4
Pickup and Haul Nuts									75				75
Hull and Shell Nuts									90				90
TOTAL Harvest COSTS	0	0	0	0	0	0	0	0	342	0	0	0	342
Interest on Operating Capital (4.25%)	1	3	3	4	5	5	6	7	8	-2	-1	-1	38
TOTAL OPERATING COSTS/ACRE	229	490	158	290	140	143	340	223	416	322	6	213	2,971
CASH OVERHEAD													
Environmental Fee			10										10
Liability Insurance			6										6
Office Expense	5	5	5	5	5	5	5	5	5	5	5	5	60
Organic Certification Fees (40 acres)				36									36
Sanitation Fees						20							20
Property Taxes			124						124				249
Property Insurance			10						10				21
Investment Repairs	6	6	6	6	6	6	6	6	6	6	6	6	74
TOTAL CASH OVERHEAD COSTS	11	11	163	47	11	31	11	11	146	11	11	11	476
TOTAL CASH COSTS/ACRE	241	502	320	337	151	174	351	235	562	333	18	224	3,447

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 4. RANGING ANALYSIS FOR ORGANIC ALMONDS
 NORTHERN SAN JOAQUIN VALLEY - 2016

COST PER ACRE AND PER LB AT VARYING YIELDS TO PRODUCE ORGANIC ALMONDS

	YIELD (Lbs./acre)						
	300	600	1,300	1,800	1,900	2,000	2,200
OPERATING COSTS:							
Cultural	2,590	2,590	2,590	2,590	2,590	2,590	2,590
Harvest	205	232	296	342	352	360	379
Interest on operating capital @ 4.25%	38	38	38	38	38	38	39
TOTAL OPERATING COSTS/ACRE	2,833	2,860	2,925	2,971	2,981	2,989	3,008
Total Operating Costs/Lb	9.44	4.77	2.25	1.65	1.57	1.49	1.37
CASH OVERHEAD COSTS/ACRE	476	476	476	476	476	476	476
TOTAL CASH COSTS/ACRE	3,310	3,337	3,401	3,447	3,457	3,466	3,484
Total Cash Costs/Lb	11.03	5.56	2.62	1.92	1.82	1.73	1.58
NON-CASH OVERHEAD COSTS/ACRE	925	925	925	925	925	925	925
TOTAL COSTS/ACRE	4,235	4,262	4,327	4,373	4,382	4,391	4,410
Total Costs/Lb	14.75	7.42	3.47	2.53	2.41	2.29	2.09

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/lb	YIELD (lb/acre)						
	300	600	1,300	1,800	1,900	2,000	2,200
2.00	-2,233	-1,660	-325	629	819	1,011	1,392
2.50	-2,083	-1,360	325	1,529	1,769	2,011	2,492
3.00	-1,933	-1,060	975	2,429	2,719	3,011	3,592
3.50	-1,783	-760	1,625	3,329	3,669	4,011	4,692
4.00	-1,633	-460	2,275	4,229	4,619	5,011	5,792
4.50	-1,483	-160	2,925	5,129	5,569	6,011	6,892
5.00	-1,333	140	3,575	6,029	6,519	7,011	7,992

NET RETURN PER ACRE ABOVE CASH COSTS

PRICE \$/lb	YIELD (lb/acre)						
	300	600	1,300	1,800	1,900	2,000	2,200
2.00	-2,710	-2,137	-801	153	343	534	916
2.50	-2,560	-1,837	-151	1,053	1,293	1,534	2,016
3.00	-2,410	-1,537	499	1,953	2,243	2,534	3,116
3.50	-2,260	-1,237	1,149	2,853	3,193	3,534	4,216
4.00	-2,110	-937	1,799	3,753	4,143	4,534	5,316
4.50	-1,960	-637	2,449	4,653	5,093	5,534	6,416
5.00	-1,810	-337	3,099	5,553	6,043	6,534	7,516

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE \$/lb	YIELD (lb/acre)						
	300	600	1,300	1,800	1,900	2,000	2,200
2.00	-3,635	-3,062	-1,727	-773	-582	-391	-10
2.50	-3,485	-2,762	-1,077	127	368	609	1,090
3.00	-3,335	-2,462	-427	1,027	1,318	1,609	2,190
3.50	-3,185	-2,162	223	1,927	2,268	2,609	3,290
4.00	-3,035	-1,862	873	2,827	3,218	3,609	4,390
4.50	-2,885	-1,562	1,523	3,727	4,168	4,609	5,490
5.00	-2,735	-1,262	2,173	4,627	5,118	5,609	6,590

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 5. ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 NORTHERN SAN JOAQUIN VALLEY - 2016

ANNUAL EQUIPMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Insurance	Cash Overhead		Total
						Taxes		
85HP 4WD Tractor	48,321	20	6,200	3,099	23	273		3,394
Air-Blast PTO 500Gal	26,000	8	5,870	3,089	13	159		3,261
50HP 2WD Tractor	19,697	20	2,527	1,263	9	111		1,384
ATV-4WD	8,350	10	2,466	779	5	54		837
Pickup Truck 1/2 Ton	34,000	5	15,238	4,621	21	246		4,888
Flail Mower 11'	12,803	10	2,264	1,325	6	75		1,407
TOTAL	149,171	-	34,566	14,175	77	919		15,171
60% of New Cost*	89,503	-	20,740	8,505	46	551		9,103

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Insurance	Cash Overhead		Total
						Taxes	Repairs	
INVESTMENT								
Building 2500sf Pole Barn	50,000	20	5,000	3,258	23	275	1,000	4,556
Fuel Tanks 2-500Gal	3,224	20	226	214	1	17	64	296
Shop/Field Tools	15,000	15	1,050	1,224	7	80	300	1,611
Solid Set Sprinkler w/ Filter	74,000	25	37,000	3,387	47	555	1,480	5,469
Land (40 acres)	920,000	23	920,000	29,900	776	9,200	920	40,796
TOTAL INVESTMENT	1,062,224	-	963,276	37,982	854	10,128	3,764	52,727

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Environmental Fee	95.00	Acre	10	950
Liability Insurance	100.00	Acre	6.38	638
Office Expense	95.00	Acre	60.00	5,700
Organic Cert Fee 40ac	40.00	Acre	35.81	1,432
Sanitation Fees	40.00	Acre	20.00	800

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 6. HOURLY EQUIPMENT COSTS - ORGANIC ALMONDS
 NORTHERN SAN JOAQUIN VALLEY - 2016

Description	Almond Hours Used	Total Hours Used	Capital Recovery	Cash Overhead		Operating		Total Oper.	Total Costs/Hr.
				Insurance	Taxes	Lube & Repairs	Fuel		
85HP 4WD Tractor	114	600	3.10	0.02	0.27	2.22	8.56	10.78	14.17
Air-Blast PTO 500Gal	100	250	7.41	0.03	0.38	4.59	0.00	4.59	12.42
50HP 2WD Tractor	8	600	1.26	0.01	0.11	1.57	4.52	6.09	7.47
ATV-4WD	61	200	2.34	0.01	0.16	0.77	1.04	1.81	4.32
Pickup Truck 1/2 Ton	67	400	6.93	0.03	0.37	3.48	6.23	9.71	17.04
Flail Mower 11'	11	200	3.97	0.02	0.23	6.40	0.00	6.40	10.62

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
Table 7. ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
 NORTHERN SAN JOAQUIN VALLEY - 2016

Operation	Month	Tractor	Implement	Material	Per Acre	Unit
Pump Test	Jan			Pump Test	0.03	Each
Pest: Dormant Oil Spray	Jan	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Dormant Oil (440 Spray Oil)	6.00	Gal
				Copper	7.00	Lb
Disease: Brown Rot	Feb	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Regalia Bio fungicide	4.00	Qt
Irrigate: Frost Protect	Feb & Mar			Irrigation Labor	0.08 (2x)	hour
				Water - Frost Protection	1.00 (2x)	AcIn
Pollination: Hive Rental	Feb			Pollination Fee	2.00	Hive
Pest: Weed Mow Middles	Feb	50HP 2WD Tractor	Flail Mower 11'	Equipment Operator Labor	0.23	hour
Disease: Brown Rot	Mar	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Kumulus DF (Wettable Sulfur)	20.00	Lb
Insect: Peach Twig Borer	Mar	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Dipel DF	1.00	Lb
Pest: Gopher Traps 2x	Mar & Aug		ATV-4WD	Equipment Operator Labor	0.03 (2x)	hour
Pest: Squirrel Traps (6x)	Mar - Oct		ATV-4WD	Equipment Operator Labor	0.03 (6x)	hour
Pest: Weed Flame	Mar - Aug			Flame Middles	2.00 (7x)	Acre
Water Analysis	Mar		ATV-4WD	Equipment Operator Labor	0.02	hour
				Water Analysis	0.03	Each
Irrigate	Mar			Irrigation Labor	0.08	hour
				Water - Pumped	1.00	AcIn
	Apr			Irrigation Labor	0.26	hour
				Water - Pumped	3.25	AcIn
	May			Irrigation Labor	0.42	hour
				Water - Pumped	5.25	AcIn
	June			Irrigation Labor	0.58	hour
				Water - Pumped	7.25	AcIn
	July			Irrigation Labor	0.72	hour
				Water - Pumped	9.00	AcIn
	Aug			Irrigation Labor	0.62	hour
				Water - Pumped	7.75	AcIn
	Sept			Irrigation Labor	0.44	hour
				Water - Pumped	5.50	AcIn
Fertilize: Compost (2x)	Apr & Oct			Manure/Compost	5.00 (2x)	Ton
				Spread Compost	1.00 (2x)	Acre
Compost Analysis (2x)	Apr & Oct			Non-Machine Labor	0.03 (2x)	hour
				Compost Analysis	0.10 (2x)	Each
Disease: Scab (Sulfur)	Apr & May	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30 (2x)	hour
				Micronized Sulfur	10.00 (2x)	Lb
Insect: NOW	July	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Entrust 80wp (Spinosad)	2.50	Oz
Leaf Analysis Fee	July		ATV-4WD	Equipment Operator Labor	0.03	hour
				Leaf Analysis	0.10	Each
Insect: Mite (Oil Spray)	July & Aug	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30 (2x)	hour
				Dormant Oil (440 Spray Oil)	2.00 (2x)	Gal
Hull Samples	Sept		ATV-4WD	Equipment Operator Labor	0.03	hour
				Hull Analysis	0.05	Each
Soil Analysis	Sept		ATV-4WD	Equipment Operator Labor	0.03	hour
Fertilize: Boron & Zn	Oct	85HP 4WD Tractor	Air-Blast PTO 500Gal	Equipment Operator Labor	0.30	hour
				Boron Solubor (20%)	2.00	Lb
				Zinc Sulfate (36%)	10.00	Lb
Plant Cover Crop	Oct			Clover (Subterranean, Coated)	5.00	Lb
				Plant Cover Crops	1.00	Acre
Fertigate: Boron	Oct			Irrigation Labor	0.36	hour
				Water - Pumped	3.00	AcIn
				Boron Solubor (20%)	10.00	Lb
Pruning	Dec			Non-Machine Labor	4.00	hours
Stack Brush	Dec			Non-Machine Labor	0.50	hour
Shred Prunings	Dec			Shred Prunings	0.10	Hour
Winter Sanitation	Dec	85HP 4WD Tractor	Flail Mower 11'	Equipment Operator Labor	0.11	hour
				Shake Trees	0.50	Hour
				Sweep Nuts	0.50	Hour
Pickup Truck Use	Dec		Pickup Truck 1/2 Ton	Non-Machine Labor		
ATV Use	Dec		ATV-4WD	Equipment Operator Labor	1.50	hours
Shake Trees	Sept			Shake Trees	0.75	Hour
Sweep Nuts	Sept			Sweep Nuts	1.00	Hour
Hand Rake Nuts	Sept			Non-Machine Labor	0.50	hour
Pickup and Haul Nuts	Sept			Pickup and Haul Nuts	1.00	Hour
Hull and Shell Nuts	Sept			Hull & Shell Nuts	1,800.00	Lb