UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2015

SAMPLE COSTS TO ESTABLISH and PRODUCE

PISTACHIOS

SAN JOAQUIN VALLEY - SOUTH

Low-Volume Irrigation

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STUDY CONTENTS

INTRODUCTION

Sample costs to establish a pistachio orchard and produce pistachios in the southern San Joaquin Valley are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. The production practices described in this study are those considered typical for pistachios in the southern San Joaquin Valley, but they will not apply to every situation. Sample costs for labor, materials, equipment, and custom services are based on current figures. A blank column, "Your Cost", in Tables 3 and 4 is provided to enter your farm costs.

The hypothetical farm operation, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of the calculations used in the study, call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-5489, or your local UC Cooperative Extension office.

Sample Cost of Production Studies for many commodities can be downloaded at http://coststudies.ucdavis.edu, requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-1515 or obtained from the local county UC Cooperative Extension offices. Archived studies are also available on the website.

ASSUMPTIONS

The assumptions refer to Tables 1 through 9 and pertain to sample costs to establish an orchard (Tables 1-2) and produce pistachios (Tables 3-9) in the southern San Joaquin Valley under low-volume (drip) irrigation. Pistachio trees have a long production life if well maintained. The economic life used in this cost analysis is 40 years. The cultural practices described and materials used are considered typical for a well-managed orchard in the region. The costs, materials, and practices will not apply to all situations. Establishment and production practices vary by grower and the differences can be significant. 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.**

Land. The hypothetical farm consists of 80 contiguous acres. Orchard establishment and pistachio production are on 76 acres. Roads, irrigation filtration systems, loading and harvest equipment turning areas, and buildings occupy the remaining four acres.

Establishment Cultural Practices and Material Inputs
(Tables 1 & 2)

Land Preparation. The orchard is established on soil whose profile is relatively uniform in texture and previously planted to row crops. Soil profile assessment of individual subject properties by means of backhoe pits is critical prior to planting. An individual competent in evaluating soils for texture stratification or salinity problems is employed. This study uses one pit per 20 acres. Soil samples are also taken at selected and recorded depths for salinity analysis by a soils and water laboratory. Failure to modify any dense subsoil or stratified soil textures may limit root development and water infiltration. Not all fields will require deep tillage. If there is a hardpan or the soil profile is stratified, then deep tillage is required. Ground preparation is done the year prior to planting, but the costs are included in establishment year one (Table 1). In this study, the land is tilled with a slip-plow down the tree row to a depth of four to five feet. The field is then ripped with a one shank ripper in between the slip-plow at the same depth. Currently, in many orchards, the focus of deep tillage has been on the area that will be drip irrigated. Ripping is followed by one pass with a stubble disc. Custom operators do the ripping and stubble discing. The grower then finish-discs and floats the ground twice to smooth the surface. The use of drip irrigation eliminates the need for land leveling. In challenging soils, for example those with high salinity, soil amendments may be applied and incorporated at various stages of land preparation.

Trees. The Verticillium wilt tolerant species, *Pistacia integerrima*, or interspecific hybrids derived from *P. atlantica* and *P. integerrima* are used for rootstock. 'Kerman', the most widely grown cultivar, usually, is field-budded to the rootstocks. However, pre-budded nursery trees are available for planting, as well. Because pistachios are dioecious, male trees ('Peters' cultivar) must be uniformly distributed among the female trees. Currently, the industry buds 1 male tree to every 19 to 24 female trees. This study uses the male: female ratio of 1:24. The sized of unbudded rootstocks can vary considerably. In this study, the unbudded trees are delivered to the grower's site by a custom hauler. The trucking fee ($350 per load) is based on a 60 mile delivery radius from the nursery and 2,016 trees per load. The grower also rents a forklift to unload the trees. Some varieties have a royalty fee with planting, but this cost is not included in this study.

Plant/Bud. In this study, pistachios are planted on 17' x 20' spacing, with 128 trees per acre. Seedling rootstocks, grown one year in the nursery, are planted in February or March. Various clonal or seedling rootstocks may be considered based on grower preference and site-specific characteristics such as freezing hazard. The commercial planting costs include surveying the field, marking the tree sites, digging the holes and planting the unbudded rootstocks. Immediately after planting, a 2-inch x 2-inch x 6-foot wooden stakes are

spread in the field and installed on the downwind side (usually south or east side of the trees in the SJV) by contract labor. In this study, newly planted trees are placed in a plastic protective sleeve which are tied to the stakes.

Tree stakes in this study, are purchased new. Growers may have the option to purchase used stakes and/or the option to sell the stakes after use. Currently, some growers have begun using metal stakes. Stakes are normally removed prior to the first mechanical harvest. In late-July of the first year, the trees are commercially budded 28-32 inches above ground level. Failed buds on surviving rootstock are re-budded with two buds per tree in September. No attempt is made to push the re-budded trees because they are highly susceptible to killing frost in November or early December. In the second year, trees should be rebudded as soon as possible. The budding failure rate used for this study is 5% in the first year and 2% in the second. A rootstock failing to take a bud after two attempts should be replaced. Growers should know the source of the bud wood, and confirm the cultivar is correct.

Replants. In years one and two, replanted tree loss in each year is 1% or less. Nursery budded trees or unbudded trees are replanted as soon as possible so that all trees are budded in the current year. Replants placed in older orchards will have a higher failure rate due to irrigation and gopher damage.

Train, Sucker, and Prune. The preferred time of planting in the southern San Joaquin Valley is February through early April. During spring of the first year, a suckering crew removes any growth from the rootstock that is within 8 inches of the ground, and makes the first tie of the rootstock to the stake. A second pass is made in June to tip or eliminate shoots competing with the one being tied to the stake. Five to seven days after budding, the crew partially girdles (notches) the rootstock directly above the 'Kerman' bud. Simultaneously, 50% to 70% of the rootstock growth is also removed using heading cuts. Both operations encourage uniform and vigorous growth of the 'Kerman' bud. Three weeks later (August), or when 6-8 inches of 'Kerman' growth is achieved, a fourth pass is made to begin training the 'Kerman' shoot up the stake (use 4 mm, half-inch green tape) and continue suppression of new rootstock growth by pinching off its terminals. The crew makes three more tree-training passes at 14-day intervals during August and September. This results in a total of six passes through the orchard by the end of September (2 suckering and tying, notching and heading after budding, and 4 training). Dormant pruning occurs in January of the second calendar year when dormant 'Kerman' shoots are headed to 42 inches and the rootstock lateral branches are removed. Both the rootstock and the dormant 'Kerman' shoot are then tied to the stake. In the second growing season, training to develop the primary, secondary, and possibly tertiary scaffolds takes four passes at 14-day intervals during May, June, and July. Dormant pruning in the second year involves removal of rootstock laterals, heading of the secondary or tertiary branches, and cross-tying selected trees that have poorly positioned scaffolds. In the third and fourth years, training during May, June, and July is limited to rootstock sucker removal and cross tying of flat scaffold limbs. In this study, it takes four passes in the third year and three passes in the fourth. The costs vary for each pass through the field, and are dependent upon the tasks required. Dormant pruning continues in the third and subsequent years.

Irrigation. The irrigation costs include water at $14.58 per acre-inch ($175 per acre foot), costs for pressurizing the irrigation system at $1.73 per acre-inch ($20.76 per acre-foot) and irrigation labor at 0.10 hours per acre per irrigation. A large percentage of the present pistachio acreage receives surface water from state or federal canal systems, when available. The water districts which distribute this water to the growers have per acre assessment costs in addition to the "operational" water price. These costs vary widely depending upon water district overhead. The price of district water in the pistachio growing areas of the southern San Joaquin Valley during normal water years ranges from $30 to $600 per acre-foot depending on the irrigation district. The cost of

Table A. Total Applied Water

Year	Acre-Inches
1	7
2	11
3	16
4	22
5	31
6	38
7+	45

irrigation water obtained from on-site wells is dependent on energy costs, well characteristics, and other irrigation factors. A single line drip irrigation system is usually installed prior to planting. For many orchards planted to fine-textured soils this is sufficient to provide for an adequate wetted root zone. However, in recent years many orchards at the end of the fifth year have a second line installed. In the first year, the trees are irrigated in February, immediately after planting, and periodically throughout the growing season until early September. In the following years, irrigation is from mid-April to mid-September. In marginal water and soil quality areas it may be necessary to apply a winter "pre-irrigation" for leaching and recharge. Costs for the drip line and its installation are shown in the Non-Cash Overhead. The amount of water applied to the orchard during establishment is much less than at maturity. Table A shows the **applied water** for each year in this study. Applied depth of water is only an estimate (and most appropriate to the southern San Joaquin Valley) and will vary according to the size of the tree canopy achieved at a given age, surrounding environment, and weather-related variables such as rainfall and evaporative demand. Final applied water will vary depending upon the irrigation efficiency of the system. Values in Table A are based on an irrigation efficiency of 90%. Irrigation values in Table A for years 1 and 2 assume the irrigation emitter is a dripper or capped fan jet. Effective rainfall has not been considered in this study because it is too variable and the applied water values do not include any water applied to leach salts.

Fertilize. **Nitrogen (N), the major nutrient required for proper tree growth and optimum yields, is applied as UAN32 (32-0-0) though the drip system with the rate increased each year during the establishment years (Table B)**. **N applications should be adjusted based on residual N in the soil, N concentrations in the irrigation water and, once bearing begins, N leaf tissue concentrations and the amount of N removed in nuts at harvest.** Multiple applications are applied per year, and this study assumes N is applied in May and July for the first two years. In subsequent years, N fertilization begins in May and is applied into August. The frequency of micronutrient application strongly depends upon soil type and cropping history. For example, boron uptake efficiency varies greatly by soil texture and pH. Based on soil and plant analysis, boron, zinc, and copper are applied during the establishment years (Table 2). Boron (Solubor at 15 lbs. per acre) is applied through the drip system through the first year. In the following years, boron is foliar applied (3 lbs. Solubor per acre) after bloom, in early May in combination with Copper EDTA (1/2 lb. per acre), and zinc (2 lbs. Zinc 36% per acre) at 50% leaf expansion. In many area of the southern San Joaquin Valley, soils are naturally high in boron and boron fertilization is not necessary.

Table B. Applied N

Year	Lbs. of N/Acre
1	15
2	40
3	40
4	40
5	135
6	135
7	135
8+	200

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials available are listed in *UC Integrated Pest Management Guidelines, Pistachios* available online at www.imp.ucdavis.edu. Pesticides mentioned in the study are commonly used, but are not official recommendations.

Weeds. The pistachio industry is fortunate in having a variety of pre- and post-emergence herbicides available for weed control in bearing and/or non-bearing trees. In this study, prior to planting, the pre-emergence herbicides, Prowl and Goal 2XL, are sprayed in the tree row (6 ft. wide berm or 32% of the acres). Hand weeding by a contract labor crew is done around the base of the trees in the first year (May). After the first year, Prowl and Goal 2XL are applied in the fall (November/December) in the tree row as a winter strip spray. In-season spot treatments using a post-emergent herbicide, Shark or Rely 280, are made three times (April, June, July) during the spring and summer of the first two years. A Roundup and Goal 2XL combination is applied as spot sprays during the same period from the third to sixth year. The total area sprayed with spot sprays will vary with each application. In this study 11% of the total acres are spot sprayed. The herbicide sprays are applied with an All-Terrain Vehicle (ATV) and ATV pull-type sprayer or a skid sprayer attached to the back of the ATV. The row middles are disced three times (June, July, August) beginning in the first year.

Insects and Mites. Newly planted rootstock is monitored for aphids and false chinch bugs. After budding, aphids, ants, katydids, darkling ground beetles, or false chinch bugs may require treatment to prevent loss of the emerging 'Kerman' bud. Pounce, Brigade, Sevin, or Acephate 97UP may be required to control a specific pest. These pests and others may require treatment during the first three years between May and August. Brigade is applied in August of the first year. Acephate 97UP is applied for false chinch bugs in June during years two and three. During the sixth year, when the first commercial crop is expected, insecticide treatments to control plant bugs (lygus, leaf footed bug, stinkbug) may be necessary between April and August. In this study, plant bugs are controlled with Brigade applied in April. Citrus flat mites may also require treatment and are controlled with wettable sulfur applied in July. All treatments are applied with a grower-owned sprayer.

Diseases. Botrytis Blossom and Shoot Blight (Botrytis), Botryosphaeria Panicle and Shoot Blight (Botryosphaeria), and Alternaria Late Blight (Alternaria) do not typically occur at treatable levels during the establishment years. However, treatment for one or more of these diseases during April or July may be necessary in the event of severe, early season wet weather.

Vertebrate. Gophers, squirrels and even voles on land not previously farmed are a serious threat to young pistachio trees. Poison bait, fumigation and/or trapping are used to control these vertebrate pests. Poison bait is placed either in a bait station for squirrels or in the gopher's burrow using a probe. Gophers and voles are baited in April and November during the first five years. Beginning in the sixth year, squirrels are the primary pest and are baited in the spring (May). Trapping may also be required and is recommended if infestation is localized.

Harvest. Commercial yields normally begin in the fifth or sixth year after the orchard is planted and may be bulk or bin harvested. In this study, harvest begins in the sixth year and the crop is bulk harvested. See *Harvest* in the next section. Pistachios are generally delivered to processors using bulk trailers.

Production Cultural Practices and Material Inputs

(Tables 3 to 10)

Prune. Contract labor hand prunes the trees during the dormant season, usually from mid-November through February. Tipping cuts on long, one-year-old fruitwood are made in combination with thinning cuts on older branches. In older orchards, mechanical topping and hedging can be used to help maintain canopy size and reduce alternate bearing. In addition to mechanical hedging, contract labor also selectively hand prunes the trees to maintain a properly shaped canopy that can be effectively shook. The goal is to distribute fruitwood and allow sufficient light into the canopy center. A mechanical pruning company is hired to top and hedge the trees every other year, with one-half the cost applied to each year. The prunings are hand stacked in alternate row middles and shredded commercially, leaving the residue/debris on the orchard floor. The residue is later incorporated into the soil during the winter (February) sanitation discing.

Winter Sanitation. Mechanical trunk shaking is first done to remove the overwintering nuts (mummies) not removed during pruning. A hand poling crew may be sent through to remove the remaining nuts. The berms are blown free of mummy nuts and debris using a tractor-mounted blower. The row centers are then disced to incorporate the mummies and shredded prunings.

Fertilization. Since pistachios are alternate bearing, nitrogen use in the "on" or high production years is greater than in the "off" or low production years. The nitrogen rate used in this study is assumed to be the average of the "on" and "off" years and is based on research indicating 28 pounds of actual nitrogen use per 1000 pounds of dry in-shell nuts. Nitrogen is applied through the drip system beginning in late April during the establishment years, and continues into nut development. Nitrogen (UAN32) is applied alone in April and in liquid blends (10-0-10 & 15-0-05) combined with potassium (K). A total of 200 pounds of N and 125 pounds of K are applied annually due to the high potassium requirement of pistachios (see Table C for monthly rates). Zinc (Zinc Sulfate 36%) and boron are foliar applied at 50% leaf expansion (typically mid-April). Boron (Solubor) is also applied through the drip system in June or July in orchards with chronically low tissue levels.

Table C. Pistachio Production Nitrogen & Potassium Fertilization Program

Fertilizer	lbs. per Gallon of product	Gallons per Ton Product	lbs. Nutrient/Gallon of Product	
			Nitrogen	Potassium
UAN32	11.06	181	3.54	0
10-0-10	9.70	206	0.97	0.97
15-0-5	9.70	206	1.46	0.49
Application Date	Fertilizer Source	Gallons (lbs.) Per Acre	lbs. Nitrogen per Acre	lbs. Potassium per Acre
April	UAN32	7.0 (77)	25	0
May	10-0-10	51.5 (500)	50	50
June	10-0-10	51.5 (500)	50	50
July	15-0-5	51.5 (500)	75	25
Total			200	125

Leaf Samples. In this study, leaf tissue sampling is done annually beginning in Year 1 to determine needed adjustments in the nutritional program. Leaf samples are taken from non-fruiting spurs in August. Although not used in this general study, U.C. researchers Drs. Brown and Siddiqui have developed a protocol for May leaf tissue sampling to improve nitrogen and potassium application efficiency in individual bearing orchards. The PCA collects one sample per 20 acres or 4 samples for this block and sends to a lab for analysis.

Irrigation. Irrigation costs include water at $14.58 per acre-inch ($175 per acre-foot), costs for pressurizing the irrigation system at $1.73 per acre-inch ($20.76 per acre-foot), and irrigation labor at 0.10 hours per acre per irrigation, except where additional time is required during the March irrigation. ATV use for all irrigations except the first is included in the ATV use operation. The first irrigation in March replenishes the water in the root zone and prepares the system for use during the season. That irrigation includes costs for use of the ATV, labor for cleaning the filters, repairing the lines and monitoring all the emitters. The irrigation in April is primarily for applying fertilizer. The study assumes that 45 acre-inches are applied annually in production years. A two-line system is employed, but there is no research available comparing single versus two-line systems. A properly designed, single-line system will meet the water requirements of mature trees. The selected system should be designed for 0.4 to 0.5 inches of water per acre per day.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Pistachios*. 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 also discussed in the *Pistachio Production Manual*. For information and pesticide use permits, contact your local county agricultural commissioner's office. Adjuvants may be required for some pesticides are an added cost. The adjuvants in this study are not included as a cost in the applications. Pesticide costs may vary by location and grower volume.

Pest Control Adviser/Certified Crop Advisor (PCA/CCA). Licensed pest control advisers provide the written recommendations required for many pesticides. In addition, the PCA monitors the orchard for pest, disease, and nutritional problems. Growers may hire private PCAs or receive the service as part of an agreement with an agricultural chemical and fertilizer company. In this study, the grower contracts with a private PCA. The PCA

also hangs the navel orange worm (NOW) traps and monitors them on a weekly basis. The trap cost is included in the PCA monitoring fee.

Weeds. Pre-emergent and post-emergent herbicides, Prowl, Goal 2XL, and Roundup (glyphosate) are applied as a winter strip spray to the tree row (6 ft. berm) in February following winter sanitation. Weeds in the tree rows during the growing season are controlled with two spot sprays (May, July) with Rely herbicide. Each application is assumed to be applied to 33% of the berm or 11% of the total acres.

Insects and Mites. In mid-March, the PCA hangs navel orange worm (NOW) pheromone traps in the trees at 5 traps over the 76 acres. The PCA monitors the traps weekly from mid-March through September. Additionally, growers use NOW egg traps in the spring in the tree at 5 traps over the 76 acres. The PCA monitors the egg traps weekly from mid-March through May. From July to late-August, the field is monitored for NOW damage by observing early split nuts. During harvest, NOW egg-laying activity is monitored in split nuts and maturing hull tissue. In mid-August, Intrepid insecticide is applied as a NOW cover spray, timed at early splits. A second and third pyrethoid application is applied at nut-split and two weeks post nut-split. The block's harvest is timed to avoid applying a fourth pyrethoid application. This study assumes Altacor is applied for the second NOW treatment, and then Brigade for the third NOW treatment. Wettable sulfur is applied in July to control citrus flat mite. In April and July, Warrior is applied to control plant bugs (stink bug, lygus, leaf footed bug, *phytocoris spp.*, etc.). The July citrus flat mite and plant bug sprays are combined in this study, and can assist in NOW control, depending on the time of application. Winter sanitation should remove all mummies from the tree and crotch, and should be mowed and disced before March.

Disease. Two foliar fungicide applications are targeted for Botryosphaeria Panicle and Shoot Blight (Botryosphaeria or 'Bot'), and Alternaria Late Blight (Alternaria). Treatment timing is dependent on the disease or diseases most prevalent. Rain during bloom may cause Botryosphaeria or Botrytis infection. In this study, the grower applies Quash fungicide in June for Botryosphaeria and/or Botrytis and Switch in July for Alternaria control. See next paragraph for further 'Bot' control. In a wet year, an additional spray may be needed for 'Bot' or Botrytis, but is not included in this study.

Disease-Botryosphaeria. Botryosphaeria Panicle and Shoot Blight can be a serious problem in some areas and/or years. It is a panicle (nut cluster) and shoot disease. The cost to control 'Bot' with fungicides and pruning can range from $200 to $1,000 per acre. Pruning out infected clusters and one-year-old branches during the winter is tedious and expensive, but critical to controlling the disease. Topsin fungicide sprayed (sometimes applied as two sprays at one-half the top label rate) at bloom for Botrytis control reduces the primary 'Bot' inoculum. In addition to removing infected rachises during pruning, orchards with 'Bot' may require several fungicide applications beginning in early May to mid- or late-July. Costs for treating severe infections are shown in Table 9. Growers treating for 'Bot' should add these costs to the cultural practices and overhead in Table 3. For fungicide efficacy information, refer to the UC IPM publication, *Fungicides, Bactericides, and Biologicals for Deciduous Tree Fruit, Nut, Strawberry, and Vine Crops 2013*, at: http://www.ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf.

Aflatoxins. Aflatoxins are potent toxins and carcinogens, and are primarily produced by two fungi: *Aspergillus flavus* and *A. parasiticus*. These fungi grow at low levels in pistachios. Aflatoxins are controlled using the atoxigenic *Aspergillus flavus* strain AF36. AF36 is applied in late June at 10 pounds per acre, every other year. The material is custom spread with an ant-bait spreader. One-half of the cost is applied to the budget. Application timing can range between early-June to mid-July, based on soil temperatures.

Vertebrate Pest. Gophers are baited year-round – April, August, and November in this study – and squirrels in May. The grower-supplied worker uses the ATV to move around the field for baiting purposes. Baiting can

sometimes be incorporated with weed spot spraying. Trapping may also be required and is recommended if vertebrate infestation is localized, but is not included in this study. Bird damage to the maturing crop can be a major problem in some areas, but control costs are not shown because they are highly variable. The presence of endangered species may limit vertebrate pest control options.

Harvest. Pistachio trees typically reach full production by the 12th or 13th year. Commercial harvest is done by either the "bulk" or "bin" method. The "bulk" method has become more common in recent years, and is used in this study. The costs are approximately the same for both methods. Pistachios are harvested mechanically using a shaker with tarpaulins supported above the horizontal shaker head. The shaker travels down one side of the tree in unison with a catch frame harvester (receiver) on the opposite side. The shaker hydraulically clamps and vibrates the tree trunk, dislodging the nuts onto the tarpaulins and receiver. The "bin" harvest system employs 4 foot x 4 foot x 3 foot wooden or plastic bins that are distributed throughout the field and carried four at a time on the receiver. Full bins are dropped back in the row and picked up six at a time by a bin carrier. The bins are delivered to a loading area where they are dumped into large bottom-dump trailers using a specialized forklift which picks up, clamps the bins, and then rotates the nuts into the trailers. The "bulk" harvest system utilizes a large trailer attached to the receiver which continuously conveys harvested nuts into the trailer until it approaches capacity. A mobile bankout wagon then butts up to the back of the receiver trailer, and actuates a lever which transfers the nuts into the bankout wagon by way of a cleated conveyor belt incorporated into the floor of the trailer. This eliminates the need for the harvesting equipment to stop for unloading. The bankout wagon then travels to a loading area. The nuts are dumped onto elevators which deposit the crop into large, bottom-dump type trailers for hauling to the processor. Upon arrival at the processor, the nuts are weighed, hulled, dried, graded, and packed.

Yields. Pistachios are an alternate bearing crop, having a high yield one year and a low yield the next year. Although an economic yield usually begins the sixth year, the alternate bearing cycle begins when the trees are between 9 to 12 years old. An average of the high-low yield cycle is used for calculating grower returns in this study and these values are shown in Tables D. 'Kerman' variety yields in the study are divided into three categories: 80% split in-shell (unstained and light-stained split in-shell), 5% shelling stock (dark-stained split nuts, nuts with adhering hull, loose kernels-and-shells, undersized, shell-damaged nuts, as well as loose kernels), and 15% closed shells. Each category makes up a percentage of the total yields shown in Table D. Blanks and other unmarketable nuts (such as insect and vertebrate damage) are not included in the total yield. Shelling stock yields as they appear in Table D, include the weight of the kernel (i.e. nutmeat) and the shell. However, growers should be aware that processors pay only for the kernel in the shelling stock and closed shell categories. Typically for payment, the yields are reduced by 50% to represent the kernel only.

Table D. Annual Yields

		Pounds/Acre		
Year	Total Yield	Split shell In-shell	Shelling Stock In-shell	Closed Shell
6	600	480	30	90
7	1,300	1,040	65	195
8	2,200	1,760	110	330
9+	2,800	2,240	140	420

Returns. Prices received by growers for their marketable products vary by category. Usually, there are not enough loose kernels (<0.5%) to affect a grower's return. Loose kernels are normally grouped with the shelling stock and are included as such in Table D. The split in-shell payment is for the shell plus kernel weight. The closed shell and shelling stock payment is based on the kernel price. For shelling stock and closed shell, the kernel weight is assumed to be 50% of the total nut weight

Table E. Prices Paid to Growers by Grade

Grades	Split In-shell	Shelling Stock	Closed shell	In-shell Weighted Average
$/lb	$2.87*	$1.44†	$1.44	$2.58

*Split In shell price derived from USDA NASS, 2012-2014 average return per lb.
† Price is converted to kernel (nutmeat) weight of shelling stock and closed shell.

(shell + kernel). Therefore, the actual price received by the growers for closed shell and shelling stock is 50% of the split in-shell price. Increasingly, the price growers are paid for nuts is tied to a sliding scale, based on the degree of navel orange worm damage. Prices in our study assume less than 2% of the edible weight is insect damaged. The in-shell weighted average price per pound of total yield (Table D, 80% split in shell + 20% shelling stock and closed shell) shown in Table E, is used to calculate returns.

Assessments. Under a state marketing order, mandatory assessment fees are collected and administered by the California Pistachio Research Board. Growers are charged the assessment to pay for industry research programs. The current assessment rate is $0.025 per pound based on total production.

Pickup/ATV. The study assumes business use mileage of 4,500 miles per year for the pickup. The ATV is used for spot spraying and rodent baiting and is included in those specific costs. Use of the ATV for monitoring the orchard and checking the irrigation system is shown under the ATV operation and assumes a use of 3 hours per acre. ATV use is also included in the first irrigation, where it is used to monitor, check and repair the drip system for the season.

Labor, Equipment, and Interest Costs

Labor. Labor rates of $17.00 per hour for machine operators and $13.60 for general labor includes payroll overhead of 36%. The basic hourly wages are $12.50 for machine operators and $10.00 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for orchard/nuts (code 0045), and a percentage for other possible benefits. Workers' compensation costs will vary among growers, but for this study the cost is based upon the average industry final rate as of March 1, 2014 (personal email from California Department of Insurance, March 2015, unreferenced). Labor for operations involving machinery are 20% higher than the operation time given in Table 3 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

Wages for management are not included as a cash cost. Any return above total costs is considered a return to management and risk. However, growers wanting to account for management may wish to add a fee. Commonly, pistachio growers hire professional management services. The manager makes most of the production decisions, including cultural practices, action to be taken on pest management recommendations, labor, and approval of invoices payable by the grower.

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 take off (PTO) horsepower, and fuel type. Prices for on-farm delivery of red dye diesel and gasoline are $3.17 (excludes excise tax) and $3.41 per gallon, respectively. Fuel costs are derived from the Energy Information Administration, June 2015 fuel prices. The cost includes a 2% local sales tax on diesel fuel and 8% 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 3 is determined by multiplying the total hourly operating cost in Table 8 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% 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 5.75% 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 interest rate will vary depending upon various factors. The rate is this study is considered a typical lending rate by a farm lending agency as of January 2015.

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. Crop insurance is a risk management tool available to growers, none is shown in this study.

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.

American Pistachio Growers. The American Pistachio Growers Association represents pistachio growers, processors, and other industry partners and assists in pistachio nutrition research, government affairs, product development and market development. Membership rates for the 2014 cropping season were $5.00 per acre for non-bearing acres, or $0.025 per pound of dry in-shell nuts for bearing acres. This study assumes the grower pays $59.50 ($0.025 x 2,380 lbs.) per acre, annually for the membership.

Property Taxes. Counties charge a base property tax rate of 1% on the assessed value of the property. In some counties, special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% of the average value of the property. Average value equals new cost plus salvage value divided by 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% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $638 for the entire farm.

Office Expense. Office and business expenses are estimated at $75 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, and miscellaneous administrative charges. The cost is a general estimate and not based on any actual data.

Governmental Regulation Compliance Costs. Compliance costs are estimated by a study conducted for California Citrus Mutual examining compliance costs for citrus production across California. The study estimates total compliance cost per acre at $356.20, which includes education and training, air quality compliance, water quality compliance, pesticide regulation, labor regulation, and capital expenditures. Compliance costs for pistachio production are assumed to be the same.

Sanitation Services. Sanitation services provide double portable toilets, washbasins, soap, and towels for the orchard and cost the farm $268 per month. The monthly service charge is an average of three California sanitation companies and locations. The cost includes delivery and 12 months of weekly service. California regulations require one toilet and hand washing facility for every 20 employees of each sex, located within a quarter-mile walk or if not feasible, at the closest point of vehicular access.

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 2% 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 price 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; ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x Interest Rate).

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its 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 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. An interest rate of 4.75% 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 2015.

Establishment Cost. Costs to establish the orchard are used to determine capital recovery expenses, depreciation, and interest on investment for the production years. Establishment cost is the sum of the costs for land preparation, planting, trees, cash overhead and production expenses for growing the trees through the first year that pistachios are harvested minus any returns from production. In Table 1, the total Accumulated Net Cash Cost in the sixth year represents the establishment cost. For this study, the cost is $11,207 per acre or $851,732 for the 76-acre orchard. The establishment cost is spread over the remaining 34 producing years of the 40-year orchard life.

Drip Lines. Single drip lines are laid out prior to planting. The labor cost for laying out the line is included in the irrigation system cost. A second line is installed during the fifth year and the materials and labor are included in the overall costs. The cost for the drip line layout is calculated from basic information provided by an irrigation company, and does not represent any specific system. Presently, no research has been conducted to evaluate single versus double-line drip on pistachio tree performance. Inclusion of double-line drip in this study is for budgeting purposes only, and does not constitute a recommendation.

Irrigation System. The water is delivered from an irrigation district. The system cost includes a booster pump, filtration, fertilizer injector, and main lines. Costs are a general estimate for the system and not for any specific layout.

Land. Open crop land values range from $8,000 to $20,000 per acre. Land in this study is valued at $12,000 per acre for the 80 acre farm, or $12,632 over each of the 76 planted acres.

Building. The building(s) total 2,400 square feet and are metal building(s) on a cement slab.

Tools. This includes shop tools, hand tools, and miscellaneous field tools such as pruning tools.

Fuel Tanks. Two 250-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.

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% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in the Whole Farm Annual Equipment, Investment, and Business Overhead Costs table. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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

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UC COOPERATIVE EXTENSION

Table 1. COSTS PER ACRE TO ESTABLISH A PISTACHIO ORCHARD

SAN JOAQUIN VALLEY SOUTH - 2015

	Cost Per Acre					
Year:	1st	2nd	3rd	4th	5th	6th
Total Yield: Dry, In-Shell Pounds Per Acre						600
Land Preparation/Planting Costs:						
Land Prep: Backhoe (custom)	150					
Fertilize: Soil Analysis (samples from holes dug)	3					
Land Prep: Rip 5 ft & Stubble Disc (custom)	280					
Land Prep: Disc & Float 2X	20					
Weed: Pre-plant on berms (Prowl, Goal 2XL)	37					
Plant: Survey, Mark, & Plant Trees	179	4				
Trees: 128 Per Acre (trees plus delivery) (1% replant in Year 2)	921	46				
Plant: Spread Stakes & Stake Trees	229					
Plant: Field Bud Trees	109					
Plant: Re-bud (5% in 1st Year & 2% in 2nd Year)	5	3				
TOTAL LAND PREP/PLANTING COSTS	1,932	53				
Cultural :						
Irrigate: Water & Labor	135	200	283	381	533	648
Weed: Spot Spray 3X (Shark, Yr. 1-2. Roundup, Goal 2XL, Yr. 3+)	15	15	25	25	25	25
Train/Sucker: 6X Yr. 1, 4X Yr. 2-3, 3X Yr. 4	24	32	57	27		
Vertebrate: Gophers Yr. 1+ (Bait), Squirrel Yr. 6+ (Bait)	29	29	29	29	29	29
Fertilize: Nitrogen injected through dripline (UAN32)	13	28	55	84	113	113
Weed: Disc Middles 3X	27	27	27	27	27	27
Fertilize: Zinc (Zn 36%) Nutrition & Defoliation	54	54	54	54	54	54
Weed: Hand (contract)	95					
Insect: Ant, Aphid, Katydid (Brigade)	54					
Fertilize: Boron (Solubor) injected through dripline	29					
Fertilize: Boron (Solubor), Zinc (Zn 36%), Copper (Cu Chelate 14%)		30	30	30	30	30
Prune: Dormant & Season		50	75	100	125	150
Fertilize: Boron (Solubor), Zinc (Zn 36%) Foliar 2X		27	27	27	27	27
Insect: Chinch Bug/Aphid (Acephate 97UP)		26	26			
Weed: Winter Strip Spray (Prowl Goal 2XL)		33	33	33	33	33
Prune: Shred Prunings (custom)					28	28
Plant: Remove & Stack Tree Stakes					84	
Insect: Plant Bugs (Brigade)						54
Insect: Citrus Flat Mites (Wettable Sulfur)						30
Fertilize: Leaf Analysis (custom)	2	2	2	2	2	2
PCA/Consultant Service	35	35	35	35	35	35
Pickup Truck Use	78	78	78	78	78	78
ATV Use	69	69	69	69	69	69
TOTAL CULTURAL COSTS	657	734	905	1,000	1,292	1,449
Harvest:						
Bulk Harvest: Shake & Catch						256
Haul by processor						0
California Pistachio Research Board Assessment						15
TOTAL HARVEST COSTS						271
Interest On Operating Capital @ 5.75%	127	22	24	27	39	28
TOTAL OPERATING COSTS/ACRE	2,716	808	929	1,028	1,331	1,748

UC COOPERATIVE EXTENSION

Table 1. CONTINUED

SAN JOAQUIN VALLEY SOUTH - 2015

	Cost Per Acre					
Year:	1st	2nd	3rd	4th	5th	6th
Total Yield: Dry, In-Shell Pounds Per Acre						600
Cash Overhead:						
Office Expense	75	75	75	75	75	75
Liability Insurance	8	8	8	8	8	8
Sanitation Fees	42	42	42	42	42	42
Compliance Cost	356	356	356	356	356	356
APG Membership	5	5	5	5	5	13
Property Taxes	136	136	137	136	138	138
Property Insurance	11	12	12	12	12	12
Investment Repairs	61	61	61	61	68	68
TOTAL CASH OVERHEAD COSTS	695	695	695	695	704	712
TOTAL CASH COSTS/ACRE	3,411	1,503	1,624	1,722	2,035	2,460
INCOME/ACRE FROM PRODUCTION						**1,548**
NET CASH COSTS/ACRE FOR THE YEAR	3,411	1,503	1,624	1,722	2,035	912
PROFIT/ACRE ABOVE CASH COSTS						
ACCUMULATED NET CASH COSTS/ACRE	3,411	4,914	6,538	8,260	10,295	**11,207**
Non-Cash Overhead (Capital Recovery Costs):						
Buildings (shop & other)	66	66	66	66	66	66
Fuel Tanks	6	6	6	6	6	6
Shop Tools	17	17	18	17	17	17
Irrigation Drip Lines (1line Yrs. 1-4, 2 lines Yr. 5+)	38	38	38	38	76	76
Irrigation System (Booster Pump/Filtration System)	61	61	61	61	61	61
Land	570	570	570	570	570	570
Equipment	47	50	50	45	48	56
TOTAL INTEREST ON INVESTMENTS (Non-Cash Overhead)	806	809	810	804	845	853
TOTAL COSTS/ACRE FOR THE YEAR	4,217	2,312	2,434	2,526	2,880	3,313
INCOME/ACRE FROM PRODUCTION						**1,548**
TOTAL NET COSTS/ACRE FOR THE YEAR	4,217	2,312	2,434	2,526	2,880	1,765
NET PROFIT/ACRE ABOVE TOTAL COSTS						
TOTAL ACCUMULATED NET COST/ACRE	4,217	6,532	8,966	11,492	14,372	**16,137**

UC COOPERATIVE EXTENSION

Table 2. MATERIALS AND CUSTOM WORK COSTS PER ACRE - ESTABLISHMENT YEARS

SAN JOAQUIN VALLEY SOUTH - 2015

			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
			Total Per Acre											
	Unit	$/Unit	units	$	units	$	units	$	units	$	units	$	units	$
OPERATING COSTS														
Custom:														
Backhoe	acre	150.00	1.00	150										
Soil Analysis	each	55.00	0.05	3										
Rip 3' & Stubble Disc	acre	280.00	1.00	280										
Mark, Spread Trees, Plant	tree	1.40	128.00	179	3.00	4								
Stake Trees	tree	0.35	128.00	45										
Sucker Trees	acre	4.00	3.00	12										
Hand Weed	acre	95.00	1.00	95										
Leaf Analysis	each	55.00	0.04	2	0.04	2	0.04	2	0.04	2	0.04	2	0.04	2
Train Tree	acre	Various	3.00	12	4.00	32	3.00	27	3.00	27				
Prune	acre	Various			1.00	50	1.00	75	1.00	100	1.00	125	1.00	150
PCA/Consultant Fee	acre	35.00	1.00	35	1.00	35	1.00	35	1.00	35	1.00	35	1.00	35
Shred Prunings	acre	Various									1.00	28	1.00	28
Harvest-Shake, Pickup	tree	2.00											128.00	256
Deliver Trees (60 mile radius)	load	350.00	0.06	21	0.06	21								
Rent:														
Forklift (Unloading trees)	day	180.00	0.01	2	0.01	2								
Forklift (Delivery & pickup)	day	170.00	0.01	2	0.01	2								
Tree/Tree Aids:														
Tree Unbudded	tree	7.00	128.00	896	3.00	21								
Bud Tree	tree	0.85	134.00	114	3.00	3								
Tree Stakes 2" x 2" x 6'	each	1.35	128.00	173										
Irrigation:														
Water - District	acin	14.58	6.00	87	10.00	160	16.00	233	20.00	292	28.00	408	36.00	554
Water - Pressurize System	acin	1.73	6.00	10	10.00	19	16.00	28	20.00	35	28.00	48	36.00	66
Fertilizer:														
Zinc Sulfate 36%	lb	0.86	40.00	34	44.00	38	44.00	38	44.00	38	44.00	38	44.00	38
Solubor (Boron)	lb	1.94	15.00	29	6.00	12	6.00	12	6.00	12	6.00	12	6.00	12
Copper Chelate 14%	lb	5.87			0.50	3	0.50	3	0.50	3	0.50	3	0.50	3
UAN32 (N)	lb N	0.84	15.00	13	33.00	28	66.00	55	100.00	84	135.00	113	135.00	113

Table 2. CONTINUED

SAN JOAQUIN VALLEY SOUTH - 2015

			Year 1		Year 2		Year 3		Year 4		Year 5		Year 6	
			Total Per Acre											
	Unit	$/Unit	units	$	units	$	units	$	units	$	units	$	units	$
Herbicide:														
Prowl H2O	pint	4.87	2.56	12	2.56	12	2.56	12	2.56	12	2.56	12	2.56	12
Goal 2 XL	pint	11.20	1.28	22	1.28	14	2.54	28	2.54	28	2.54	28	2.54	28
Shark EW	floz	10.58	0.60	6	0.60	6								
Roundup Power Max	pint	3.50					0.63	2	0.63	2	0.63	2	0.63	2
Insecticide:														
Traps NOW (Free)	acre													
Acephate 97UP	lb	8.43			0.75	6	0.75	6						
Brigade WSB	oz	1.72	20.00	34									20.00	34
Wettable Sulfur 92%	lb	0.50											20.00	10
Intrepid 2F	pint													
Fungicide:														
Topsin M	lb													
Abound 2EC	floz													
Rodenticide:														
Gopher Bait Wilco	lb	5.58	1.00	6	1.00	6	1.00	6	1.00	6	1.00	6	1.00	6
Squirrel Wilco	lb	6.20											1.00	6
Assessments:														
California Pistachio Research Board	lb												600.00	15
Labor (Machine)	hrs	17.00	10.98	187	10.92	186	10.92	186	10.37	176	13.13	223	12.07	205
Labor (Non-machine)	hrs	13.60									2.30	31		
Labor (Irrigation)	hrs	13.60	1.50	20	1.50	20	1.65	22	1.65	22	2.05	28	2.10	29
Fuel - Gas	gal	3.41	10.77	37	10.64	36	10.65	36	10.64	36	11.79	40	10.89	37
Fuel - Diesel	gal	3.17	10.42	33	11.31	36	11.32	36	9.20	29	9.20	29	13.41	43
Lube				10		11		11		11		10		12
Machinery Repair				19		21		21		18		19		24
Operating Interest @ 5.75%				126		22		24		26		39		28
TOTAL OPERATING COSTS				2,699		808		929		1,028		1,331		1,748

UC COOPERATIVE EXTENSION

Table 3. COSTS PER ACRE TO PRODUCE PISTACHIOS

SAN JOAQUIN VALLEY SOUTH - 2015

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre						
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural/Contract:								
Prune: Mechanical Pruning (Topping & Hedging) 1X/2Yrs	0	0	0	0	0	60	60	
Prune: Hand Prune & Stack	0.00	0	0	0	0	250	250	
Prune: Shred Prunings (Custom)	0.00	0	0	0	0	30	30	
Winter Sanitation: Shake, Rake, Blow, Chop	0.37	35	5	1	0	71	113	
Winter Sanitation: Disc (Mummies & Shred Prunings)	0.21	4	3	1	0	0	9	
Weed: Winter Strip (Goal 2XL, Prowl, Roundup)	0.25	5	4	1	29	0	39	
Fertilize: Zn ($ZincSO_4$), Boron (Solubor)	0.46	9	7	4	30	0	49	
Irrigate: (Water, Labor)	0.50	38	1	0	734	0	773	
Insect: NOW Pheromone Traps (PCA Hangs Traps)	0.00	0	0	0	0	0	0	
Insect: NOW Egg Traps (PCA Hangs Traps)	0.00	0	0	0	0	0	0	
Fertilize: N Injected through Drip System (UAN32)	0.00	0	0	0	21	0	21	
Insect: Plant Bugs (Warrior)	0.46	9	7	4	8	0	28	
Vertebrate: Gopher (Gopher Bait)	1.50	31	3	1	8	0	43	
Vertebrate: Squirrel (Squirrel Bait)	0.50	10	1	0	6	0	18	
Fertilize: N & K Injected through Irrigation System (10-0-10)	0.00	0	0	0	156	0	156	
Weed: Spot Spray Tree Row 2X (Rely)	0.25	5	0	0	16	0	22	
Disease: Bot (Quash)	0.46	9	7	4	48	0	67	
Aflatoxin: AF36	0.00	0	0	0	5	6	11	
Fertilize: N & K Injected through Irrigation System (15-0-05)	0.00	0	0	0	80	0	80	
Disease: Alternaria (Switch)	0.00	0	0	0	98	0	98	
Insect: Citrus Flat Mite (Sulfur) /Plant Bug (Warrior)	0.46	9	7	4	18	0	38	
Insect: NOW (Intrepid)	0.46	9	7	4	22	0	42	
Insect: NOW (Altacor)	0.00	0	0	0	34	0	34	
Fertilize: Leaf Sampling (Collected by PCA) & Analysis	0.00	0	0	0	0	3	3	
Insect: NOW (Brigade)	0.00	0	0	0	34	0	34	
Pickup (General Farm Use)	2.00	41	28	8	0	0	78	
ATV Field Use (Irrigation and Miscellaneous)	3.00	61	5	2	0	0	69	
PCA/Consultant Service	0.00	0	0	0	0	35	35	
TOTAL CULTURAL COSTS	10.88	277	84	35	1,346	455	2,198	
Harvest:								
Harvest: Bulk (Shaker, Receiver, Bankout Wagon)	0.00	0	0	0	0	320	320	
Assessments: CA Pistachio Research Board	0.00	0	0	0	70	0	70	
TOTAL HARVEST COSTS	0.00	0	0	0	70	320	390	
Interest on operating capital @ 5.75%							53	
TOTAL OPERATING COSTS/ACRE	11	277	84	35	1,416	775	2,641	
Cash Overhead:								
Sanitation							42	
Office Expense							75	
Compliance Cost							356	
APG Membership							60	
Liability Insurance							8	
Property Taxes							194	
Property Insurance							16	
Investment Repairs							68	
TOTAL CASH OVERHEAD COSTS							820	
TOTAL CASH COSTS/ACRE							3,461	

UC COOPERATIVE EXTENSION

Table 3. CONTINUED

SAN JOAQUIN VALLEY SOUTH - 2015

Operation			Total Cost	Your Cost
Non-Cash Overhead (Capital Recovery):	Per producing Acre	Annual Cost Capital Recovery		
Buildings (2,400 Sqft.)	1,050	66	66	
Drip Lines	592	76	76	
Pistachio Establishment Cost	9,307	557	671	
Fuel Tanks	81	6	6	
Irrigation System (Filter/Booster Pump)	1,092	61	61	
Land	12,000	570	570	
Shop Tools	188	17	17	
Equipment	501	55	55	
TOTAL NON-CASH OVERHEAD COSTS	24,811	1,409	1,523	
TOTAL COSTS/ACRE			4,984	

UC COOPERATIVE EXTENSION

Table 4. COSTS AND RETURNS PER ACRE TO PRODUCE PISTACHIOS

SAN JOAQUIN VALLEY SOUTH - 2015

	Quantity Total/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Pistachios (Split-in shell, Shelling Stock, Closed Shell)	2,800	lb	2.58	7,224	
OPERATING COSTS					
Custom/Contract:				**775**	
Prune: Mechanical Topping	0.5	acre	60.00	30	
Prune: Mechanical Hedging	0.5	acre	60.00	30	
Prune: Hand (Prune & stack)	1.00	acre	250.00	250	
Shred Prunings	0.11	hour	275.00	30	
Winter Sanitation (Shake trees)	0.75	hour	95.00	71	
AF36 Application	0.50	acre	12.00	6	
Leaf Analysis	0.05	each	55.00	3	
Harvest-Bulk	128.00	tree	2.50	320	
PCA/Consultant Fee	1.00	acre	35.00	35	
Herbicide:				**45**	
Goal 2 XL	1.28	pint	11.20	14	
Prowl H20	2.56	pint	4.87	12	
Roundup Power Max	1.58	pint	3.50	6	
Rely 280	0.94	pint	13.92	13	
Fertilizer:				**286**	
Zinc Sulfate 36%	40.00	Lb	0.50	20	
Solubor (Boron)	5.00	Lb	1.94	10	
UN-32 (N)	25.00	Lb N	0.84	21	
10-0-10	103.00	gal	1.51	156	
15-0-05	51.50	gal	1.55	80	
Irrigation:				**734**	
Water - District	42.00	acin	14.58	656	
Water - Pressurize System	42.00	acin	1.73	78	
Insecticide:				**116**	
Pheromone NOW Traps (Free)	0.07	acre	0.00	0	
Egg NOW Traps (Free)	1.07	acre	0.00	0	
Warrior II	10.00	Oz	1.60	16	
Wettable Sulfur 92%	20.00	Lb	0.50	10	
Intrepid 2F	1.00	Pint	21.88	22	
Altacor	3.00	Oz	14.46	34	
Brigade WSB	20.00	Oz	1.53	34	
Fungicide:				**145**	
Quash	4.00	Oz	11.90	48	
Switch	0.88	lb	111.68	98	
Rodenticide:				**15**	
Gopher Bait Ag Wilco	1.50	lb	5.58	8	
Squirrel Wilco	1.00	lb	6.20	6	
Assessment:				**70**	
CA Pistachio Research Board ($0.0025/lb)	2,800.00	lb	0.03	70	
Aflatoxins:				**5**	
AF36	5.00	lb	1.00	5	
Labor:				**280**	
Labor (Machine)	13.05	hrs	17.00	222	
Labor (Non-machine)	4.27	hrs	13.60	58	
Labor (Irrigation)					
Machinery:				**119**	
Fuel - Gas	11.21	gal	3.41	38	
Fuel - Diesel	14.34	gal	3.17	45	
Lube				13	
Machinery repair				23	
Interest on operating capital @ 5.75%				52	
TOTAL OPERATING COSTS/ACRE				2,641	
NET RETURNS ABOVE OPERATING COSTS				4,583	

UC COOPERATIVE EXTENSION

Table 4. CONTINUED

SAN JOAQUIN VALLEY SOUTH – 2015

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
Cash Overhead:					
Sanitation				42	
Office Expense				75	
Compliance Cost				356	
APG Membership				60	
Liability Insurance				8	
Property Taxes				194	
Property Insurance				16	
Investment Repairs				68	
TOTAL CASH OVERHEAD COSTS/ACRE				820	
TOTAL CASH COSTS/ACRE				3,461	
Non-Cash Overhead (Capital Recovery)					
Buildings (2,400 Sqft.)				66	
Drip Lines				76	
Pistachio Establishment Cost				671	
Fuel Tanks				6	
Irrigation System (Filter/Booster Pump)				61	
Land				570	
Shop Tools				17	
Equipment				55	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				1,523	
TOTAL COSTS/ACRE				4,984	
NET RETURNS ABOVE TOTAL COSTS				2,240	

UC COOPERATIVE EXTENSION

Table 5. MONTHLY CASH COSTS PER ACRE TO PRODUCE PISTACHIOS

SAN JOAQUIN VALLEY SOUTH - 2015

Beginning JAN 15 Ending NOV 15	JAN 15	FEB 15	MAR 15	APR 15	MAY 15	JUN 15	JUL 15	AUG 15	SEP 15	OCT 15	NOV 15	TOTAL 15
Cultural:												
Prune: Mechanical Pruning (Topping & Hedging) 1X/2Yrs	60											60
Prune: Hand Prune & Stack	250											250
Prune: Shred Prunings (Custom)	30											30
Winter Sanitation: Shake, Rake, Blow, Chop	113											113
Winter Sanitation: Disc (Mummies & Shred Prunings)		9										9
Weed: Winter Strip (Goal, Prowl, Roundup)		39										39
Fertilize: Zn ($ZincSO_4$), Boron (Solubor)		49										49
Irrigate: (Water, Labor)			62	34	92	161	194	161	43	27		773
Insect: NOW Pheromone Traps (PCA Hangs Traps)			0									0
Insect: NOW Egg Traps (PCA Hangs Traps)			0									0
Fertilize: N Injected through Drip System (UAN32)				21								21
Insect: Plant Bugs (Warrior)				28								28
Vertebrate: Gopher (Gopher Bait)				14				14			14	43
Vertebrate: Squirrel (Squirrel Bait)					18							18
Fertilize: N & K Injected through Irrigation System (10-0-10)					78	78						156
Weed: Spot Spray Tree Row 2X (Rely)					16		6					22
Disease: Bot (Quash)						67						67
Aflatoxin: AF36						11						11
Fertilize: N & K Injected through Irrigation System (15-0-05)							80					80
Disease: Alternaria (Switch)							98					98
Insect: Citrus Flat Mite (Sulfur) /Plant Bug (Warrior)							38					38
Insect: NOW (Intrepid)								42				42
Insect: NOW (Altacor)								34				34
Fertilize: Leaf Sampling (Collected by PCA) & Analysis								3				3
Insect: NOW (Brigade)									34			34
Pickup (General Farm Use)	7	7	7	7	7	7	7	7	7	7	7	78
ATV Field Use (Irrigation and Miscellaneous)	6	6	6	6	6	6	6	6	6	6	6	69
PCA/Consultant Service	3	3	3	3	3	3	3	3	3	3	3	35
TOTAL CULTURAL COSTS	469	114	77	114	211	325	425	264	86	35	31	2,152
Harvest:												
Harvest: Bulk (Shaker, Receiver, Bankout Wagon)									320			320
Harvest: Haul (hauled by processor)												
Assessments: CA Pistachio Research Board									70			70
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	0	390	0	0	390
Interest on operating capital @ 5.75%	2	3	3	4	5	6	8	10	12	0	0	53
TOTAL OPERATING COSTS/ACRE	472	117	82	117	225	340	440	280	496	43	31	2,641
TOTAL OPERATING COSTS/LB (based on 2,800 lbs.)	0.17	0.04	0.03	0.04	0.08	0.12	0.16	0.10	0.18	0.01	0.01	0.93

UC COOPERATIVE EXTENSION

Table 5. CONTINUED

SAN JOAQUIN VALLEY SOUTH - 2015

Beginning JAN 15	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
Ending NOV 15	15	15	15	15	15	15	15	15	15	15	15	15
Cash Overhead:												
Sanitation	4	4	4	4	4	4	4	4	4	4	4	42
Office Expense												75
Compliance Cost												356
APG Membership												60
Liability Insurance												8
Property Taxes	92						92					194
Property Insurance	8						8					16
Investment Repairs	6	6	6	6	6	6	6	6	6	6	6	68
TOTAL CASH OVERHEAD COSTS	110	10	10	10	10	10	18	10	10	10	10	820
TOTAL CASH COSTS/ACRE	582	127	90	128	226	342	544	283	497	45	41	3,461
TOTAL CASH COSTS/LB (based on 2,800 lbs.)	0.21	0.05	0.03	0.05	0.08	0.12	0.19	0.10	0.18	0.02	0.01	1.24

UC COOPERATIVE EXTENSION

Table 6. RANGING ANALYSIS

SAN JOAQUIN VALLEY SOUTH - 2015

COSTS PER ACRE at VARYING YIELDS TO PRODUCE PISTACHIOS

	YIELD (Total lbs./acre)						
	2,200	2,400	2,600	2,800	3,000	3,200	3,400
OPERATING COSTS/ACRE:							
Cultural Cost	2,198	2,198	2,198	2,198	2,198	2,198	2,198
Harvest Cost	375	380	385	390	395	400	405
Interest on operating capital @ 6.75%	53	53	53	53	53	53	53
TOTAL OPERATING COSTS/ACRE	2,626	2,631	2,636	2,641	2,646	2,651	2,656
TOTAL Operating Costs/lb	1.19	1.10	1.01	0.94	0.88	0.83	0.78
CASH OVERHEAD COSTS/ACRE	820	820	820	820	820	820	820
TOTAL CASH COSTS/ACRE	3,446	3,451	3,456	3,461	3,466	3,471	3,476
TOTAL Cash Costs/lb	1.57	1.44	1.33	1.24	1.16	1.08	1.02
NON-CASH OVERHEAD COSTS/ACRE	1,523	1,523	1,523	1,523	1,523	1,523	1,523
TOTAL COSTS/ACRE	4,969	4,974	4,979	4,984	4,989	4,994	4,999
TOTAL Costs/lb	2.00	2.00	2.00	2.00	2.00	2.00	1.00

NET RETURNS PER ACRE ABOVE OPERATING COSTS

*In shell Weighted Average	YIELD (lbs./acre)						
PRICE ($/lb)	2,200	2,400	2,600	2,800	3,000	3,200	3,400
1.02	-382	-183	16	215	414	613	812
1.54	762	1,065	1,368	1,671	1,974	2,277	2,580
2.06	1,906	2,313	2,720	3,127	3,534	3,941	4,348
2.58	3,050	3,561	4,072	4,583	5,094	5,605	6,116
3.10	4,194	4,809	5,424	6,039	6,654	7,269	7,884
3.62	5,338	6,057	6,776	7,495	8,214	8,933	9,652
4.14	6,482	7,305	8,128	8,951	9,774	10,597	11,420

NET RETURNS PER ACRE ABOVE CASH COSTS

*In shell Weighted Average	YIELD (lbs./acre)						
PRICE ($/lb)	2,200	2,400	2,600	2,800	3,000	3,200	3,400
1.02	-1,202	-1,003	-804	-605	-406	-207	-8
1.54	-58	245	548	851	1,154	1,457	1,760
2.06	1,086	1,493	1,900	2,307	2,714	3,121	3,528
2.58	2,230	2,741	3,252	3,763	4,274	4,785	5,296
3.10	3,374	3,989	4,604	5,219	5,834	6,449	7,064
3.62	4,518	5,237	5,956	6,675	7,394	8,113	8,832
4.14	5,662	6,485	7,308	8,131	8,954	9,777	10,600

NET RETURNS PER ACRE ABOVE TOTAL COSTS

*In shell Weighted Average	YIELD (lbs./acre)						
PRICE ($/lb)	2,200	2,400	2,600	2,800	3,000	3,200	3,400
1.02	-2,725	-2,526	-2,327	-2,128	-1,929	-1,730	-1,531
1.54	-1,581	-1,278	-975	-672	-369	-66	237
2.06	-437	-30	377	784	1,191	1,598	2,005
2.58	707	1,218	1,729	2,240	2,751	3,262	3,773
3.10	1,851	2,466	3,081	3,696	4,311	4,926	5,541
3.62	2,995	3,714	4,433	5,152	5,871	6,590	7,309
4.14	4,139	4,962	5,785	6,608	7,431	8,254	9,077

*based on average of 80% in shell-splits + 20% shelling stock & closed shell

UC COOPERATIVE EXTENSION

Table 7. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY SOUTH - 2015

ANNUAL EQUIPMENT COSTS

						Cash Overhead		
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
15	85 HP 4WD Tractor	55,000	25	4,651	3,704	25	298	4,027
15	ATV	7,500	3	3,971	1,478	5	57	1,540
15	Blower - Flory 2500	6,000	10	1,061	682	3	35	721
15	Disc Tandem 14'	21,025	12	2,912	2,153	10	120	2,283
15	Orchard Sprayer 500 Gal	25,000	8	5,645	3,233	13	153	3,399
15	Pickup Truck 1/2 Ton	28,000	7	10,621	3,481	16	193	3,690
15	ATV Spot Sprayer 20 Gal	511	10	90	58	0	3	61
15	Weed Sprayer 100 Gal	5,200	10	920	591	3	31	624
	TOTAL	148,236		29,872	15,381	74	891	16,347
	60% of New Cost *	88,942		17,923	9,229	45	534	9,808

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

					Cash Overhead			
Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Repairs	Total
Buildings 2,400 sqft	84,000	30	0	5,310	35	420	1,680	7,445
Drip Lines (2 lines)	45,000	10	0	5,757	19	225	1,140	7,141
Orchard Establishment Cost	851,732	34	0	50,981	359	4,259	0	55,599
Fuel Tanks 2-250 gal	6,514	20	651	491	3	36	130	660
Irrigation System (booster pumps, filters, etc.)	83,000	40	0	4,673	35	415	2,090	7,213
Land	960,000	40	960,000	45,600	809	9,600	0	56,009
Shop/Field Tools	15,000	15	1,250	1,362	7	81	250	1,700
TOTAL INVESTMENT	2,045,246		961,901	114,174	1,268	15,036	5,290	135,767

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Sanitation	76	Acre	42.32	3,216
Office Expense	80	Acre	75.00	6,000
Compliance Cost	76	Acre	356.20	27,071
APG Membership	76	Acre	59.50	4,522
Liability Insurance	80	Acre	7.98	638

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Table 8. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY SOUTH - 2015

				COSTS PER HOUR						
					Cash Overhead		Operating			
Yr.	Description	Pistachio Hours Used	Total Hours Used	Capital Recovery	Insur-ance	Taxes	Lube & Repairs	Fuel	Total Oper.	Total Costs/hr
15	85 HP 4WD Tractor	275	640	3.47	0.02	0.28	3.27	13.23	16.50	20.28
15	ATV	460	666	1.33	0.00	0.05	0.82	1.71	2.52	3.91
15	Blower - Flory 2500	32	200	2.05	0.01	0.11	0.00	0.00	0.00	2.16
15	Disc Tandem 14'	17	166	7.78	0.04	0.43	3.41	0.00	3.41	11.67
15	Orchard Sprayer 500 Gal	183	250	7.76	0.03	0.37	4.36	0.00	4.36	12.51
15	Pickup Truck 1/2 T	160	285	7.33	0.03	0.41	4.20	14.21	18.41	26.18
15	ATV Spot Sprayer 20 Gal	20	150	0.23	0.00	0.01	0.14	0.00	0.14	0.38
15	Weed Sprayer 100 Gal	20	150	2.37	0.01	0.12	1.40	0.00	1.40	3.90

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Table 9. OPERATIONS WITH EQUIPMENT and MATERIALS

SAN JOAQUIN VALLEY 2015

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ Acre	Unit
Prune: Mechanical Pruning (1X/2Yr.)	Jan			Mechanical Topping	0.50	Acre
				Mechanical Hedging	0.50	Acre
Prune: Hand Prune & Stack	Jan			Non-Machine Labor		
				Prune	1.00	Acre
Prune: Shred Prunings (Custom)	Jan			Non-Machine Labor		
				Shred Pruning	0.11	Hour
Winter Sanitation: Shake, Rake, Blow, Chop	Jan	85HP 4WD Tractor	Blower Flory 2500	Non-Machine Labor	2.00	hours
				Shake Trees	0.75	Hour
Winter Sanitation: Disc (Mummies & Shred Prunings)	Feb	85HP 4WD Tractor	Disc Tandem 14'	Equipment Operator Labor	0.25	hour
Weed: Winter Strip (Goal, Prowl, Roundup)	Feb	85HP 4WD Tractor	Weed Sprayer 100 G	Equipment Operator Labor	0.30	hour
				Goal 2 XL	1.28	Pint
				Prowl H2O	2.56	Pint
				Roundup Power Max	0.64	Pint
Fertilize: Zn (ZincSO4), Boron (Solubor)	Feb	85HP 4WD Tractor	Orch.Sprayer 500 G	Equipment Operator Labor	0.55	hour
				Zinc Sulfate - 36%	40.00	Lb
				Boron (Solubor)	5.00	Lb
Irrigate: (Water, Labor)	Mar		ATV 4WD	Non-Machine Labor	0.10	hour
				Water - District	3.00	AcIn
				Water - Pressurize	3.00	AcIn
	Apr			Non-Machine Labor	0.10	hour
				Water - District	2.00	AcIn
				Water - Pressurize	2.00	AcIn
	May			Non-Machine Labor	0.20	hour
				Water - District	5.50	AcIn
				Water - Pressurize	5.50	AcIn
	June			Non-Machine Labor	0.45	hour
				Water - District	9.50	AcIn
				Water - Pressurize	9.50	AcIn
	July			Non-Machine Labor	0.45	hour
				Water - District	11.50	AcIn
				Water - Pressurize	11.50	AcIn
	Aug			Non-Machine Labor	0.45	hour
				Water - District	9.50	AcIn
				Water - Pressurize	9.50	AcIn
	Sept			Non-Machine Labor	0.15	hour
				Water - District	2.50	AcIn
				Water - Pressurize	2.50	AcIn
	Oct			Non-Machine Labor	0.15	hour
				Water - District	1.50	AcIn
				Water - Pressurize	1.50	AcIn
Insect: NOW (PCA Hang Egg & Pheromone Traps)	Mar			Non-Machine Labor	0.01	hour
				Pheromone Traps NOW (Free)	0.07	Acre
				Egg Traps NOW (Free)	0.07	Acre
Fertilize: N Injected through Drip System (UN32)	Apr			UN-32	25.00	Lb N
Insect: Plant Bugs (Warrior)	Apr	85HP 4WD Tractor	Orch.Sprayer 500 G	Equipment Operator Labor	0.55	hour
				Warrior II	5.00	Oz

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Table 9. Continued

SAN JOAQUIN VALLEY 2015

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ Acre	Unit
Vertebrate: Gopher (Gopher Bait)	Apr		ATV 4WD	Non-Machine Labor		
				GopherBaitWilcoAG	0.50	Lb
	Aug		ATV 4WD	Non-Machine Labor		
				GopherBaitWilcoAG	0.50	Lb
	Nov		ATV 4WD	Non-Machine Labor		
				GopherBaitWilcoAG	0.50	Lb
Vertebrate: Squirrel (Squirrel Bait)	May		ATV 4WD	Non-Machine Labor		
				Squirrel Wilco	1.00	Lb
Fertilize: N & K Injected through Irrigation System (10-0-10)	May			10-0-10	51.50	Gal
	June			10-0-10	51.50	Gal
Weed: Spot Spray Tree Row 2X (Rely)	May		ATV 4WD	Equipment Operator Labor	0.15	hour
			Spot Spray ATV 20G	Rely 200	0.94	Pint
	July		ATV 4WD	Equipment Operator Labor	0.15	hour
			Spot Spray ATV 20G	Roundup Power Max	0.94	Pint
Disease: Bot (Quash)	June	85HP 4WD Tractor	Orch.Sprayer 500 G	Equipment Operator Labor	0.55	hour
				Quash	4.00	Oz
Aflatoxin: AF36	June			AF36	5.00	Lb
				AF36 Application	0.50	Acre
Fertilize: N & K Injected through Irrigation System (15-0-05)	July			15-0-05	51.50	Gal
Disease: Alternaria (Switch)	July			Switch	0.88	Lb
Insect: Citrus Flat Mite (Sulfur) /Plant Bug (Brigade)	July	85HP 4WD Tractor	Orch.Sprayer 500 G	Equipment Operator Labor	0.55	hour
				WettableSulfur92%	20.00	Lb
				Warrior II	5.00	Oz
Insect: NOW (Intrepid)	Aug	85HP 4WD Tractor	Orch.Sprayer 500 G	Equipment Operator Labor	0.55	hour
				Intrepid 2F	1.00	Pint
Insect: NOW (Altacor)	Aug			Altacore	3.00	Oz
Fertilize: Leaf Sampling (Collected by PCA) & Analysis	Aug			Non-Machine Labor		
				Leaf Analysis	0.05	Each
Insect: NOW (Brigade)	Sept			Brigade WSB	20.00	Oz
Pickup (General Farm Use)	Sept		Pickup Truck 1/2 T	Equipment Operator Labor	2.40	hours
ATV Field Use (Irrigation and Miscellaneous)	Sept		ATV 4WD		3.60	
PCA/Consultant Service	Sept			PCA Yrs. 7	1.00	Acre
Harvest: Bulk (Shaker, Receiver, Bankout Wagon)	Sept			Harvest-Bulk	128.00	Tree
Assessments: CA Pistachio Research Board	Sept			Pistachio Research	2800.00	Lb