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

**2018**

**SAMPLE COSTS TO ESTABLISH AND PRODUCE**

**ENGLISH WALNUTS**



**In the Sacramento Valley**

**Micro Sprinkler Irrigated**

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UC AGRICULTURE AND NATURAL RESOURCES  
COOPERATIVE EXTENSION  
AGRICULTURAL ISSUES CENTER  
UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

**SAMPLE COSTS TO ESTABLISH AND PRODUCE WALNUTS**  
Sacramento Valley – 2018

**CONTENTS**

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INTRODUCTION	2
ASSUMPTIONS	3
Establishment Cultural Practices and Material Inputs	3
Production Cultural Practices and Material Inputs	6
Labor, Interest and Equipment	8
Cash Overhead	9
Non-Cash Overhead	10
REFERENCES	12
Table 1. SAMPLE COSTS PER ACRE TO ESTABLISH A WALNUT ORCHARD	13
Table 2. COSTS PER ACRE TO PRODUCE WALNUTS	15
Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE WALNUTS	17
Table 4. MONTHLY CASH COSTS – WALNUTS	19
Table 5. RANGING ANALYSIS	20
Table 6. WHOLE FARM EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS	21
Table 7. HOURLY EQUIPMENT COSTS	22
Table 8. OPERATIONS WITH EQUIPMENT & MATERIAL INPUTS	23

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**INTRODUCTION**

Sample costs to establish a walnut orchard and produce walnuts under micro-sprinkler irrigation in the Sacramento Valley are presented in this study. The study is intended as a guide only. It can be used to 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 January 2018 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 Jeremy Murdock; University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, at 530-752-4651 or [jmmurdock@ucdavis.edu](mailto:jmmurdock@ucdavis.edu). You can contact the local UCCE Advisor through the county offices: [http://ucanr.edu/County\\_Offices/](http://ucanr.edu/County_Offices/)

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

**Costs and Returns Study Program/Acknowledgements.** A costs and returns study is a compilation of specific crop data collected from meetings with professionals working in production agriculture from the area the study is based. The authors thank the cooperators, UC Cooperative Extension, and other industry representatives who provided information, assistance, and expert advice. **The use of trade names and farming practices in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of other similar products or cultural practices.** *The University is an affirmative action/equal opportunity employer.*

## ASSUMPTIONS

The assumptions refer to Tables 1 through 8 and pertain to sample costs to establish an orchard and produce walnuts under micro-sprinkler or low-volume irrigation in the Sacramento Valley. The cultural practices described represent production operations and materials considered typical for a well-managed farm in the Sacramento Valley. For consistency, the authors selected Chandler as the cost study variety. Costs, materials, and practices will not apply to all farms and should be adjusted to apply to specific varieties and locations. Cultural practices will vary by location and by season depending upon weather, soil, and insect and disease pressure. The study is intended as a guide only.

**Farm.** The hypothetical farm consists of 105 contiguous acres farmed by the owner. Smaller non-contiguous parcels may have additional costs for travel time and equipment re-calibration. Walnuts are established on 100 acres; roads, irrigation systems and farmstead occupy five acres.

### Establishment Cultural Practices and Material Inputs

**Site Preparation.** This orchard is established on ground previously planted to walnuts. A custom service removes the old orchard. The soil is ripped five feet deep in two directions to break up underlying hardpan and pull up old roots. The roots are removed by hand. The cost of root removal can vary greatly depending on tree variety and the associated size and volume of the root system. The orchard site is disced and rolled twice to break up clods. The new orchard site is laser leveled to reduce or eliminate the possibility of standing water. Then the rows to be planted are fumigated, untarped, with Telone and Chloropicrin. Berms in the tree row are formed with a ridger, the row middles are smoothed/floated once to fill in borrow pits, and the irrigation system is installed underground. A contact herbicide strip spray is applied prior to planting in early spring. All operations that prepare the orchard for planting are done in the year prior to planting, but costs are shown in the first year.

**Trees.** The Chandler variety of English walnut is planted in this study. Cost adjustments may be necessary for other cultivars. Isolated orchards often include 2 to 3 percent of a second variety for pollination. Cisco and/or Franquette are typical Chandler pollinizers. Seedling or clonal Paradox are the typical rootstocks in the Sacramento Valley; clonal Paradox rootstock continues to gain popularity. Many variables determine spacing, including soil, rootstock and variety planted. In this study, 1/2" June-budded bare root Chandler trees on clonal Paradox rootstock are planted at 26 X 26 foot spacing, resulting in 64 trees per acre. The economic life of the orchard is assumed to be 30 years. Trees cost \$20.00 each and some clonal Paradox rootstocks have a \$1.00 royalty, which is not included as a cost in this study.

Because of the cost and/or limited availability of budded or grafted finished trees, many growers plant potted clonal Paradox rootstock in the fall or spring. These rootstocks grow during the summer and are field budded in August/September or grafted the following spring. The potted trees cost \$16.00 each (\$1024/acre). The in-field budding service performed at the end of the first season after planting is included in the \$16 tree cost. After adding planting labor the total cost per acre is approximately \$1200 compared to \$1600 per acre for planting bare root stock.

**Planting.** Planting in the spring (February/March) starts by surveying and marking tree sites with a small stake, digging holes, planting, staking the trees, and heading trees back to 3 to 6 buds. Research has shown trees that are left unheaded after planting grow as well or better than those that are cut back at planting. Trees are painted white to prevent sunburn and tree protectors are placed around the trees to protect them from contact herbicides. Then a float is used down the row middles to smooth the surface. In the second year, 4 percent of the orchard or about 2 trees per acre are replanted.

**Training/Pruning.** Training and pruning begin in the spring after planting. One shoot that forms the main trunk is selected and tied loosely up the tree stake. Summer training in the first leaf consists of tying the main trunk, tipping back competing shoots and suckering. Using the minimum pruning method, the trunk is headed at 7 to 8 feet at the first dormant pruning in a standard spaced orchard. Dormant pruning and training during the second and third years develops primary and secondary scaffolds (respectively) and encourages the central leader. Heading cuts are made to tip or remove up to one-quarter of the current year's growth on scaffold branches until trees fill in their spaces. During the first three establishment years, the brush is placed in the row middles and chopped during mowing.

Walnut trees can be grown with no pruning (unheaded with pruning limited to lower branches) in years 1-6 which often results in larger tree size and early yield based on 14 years of research in Colusa and other counties. Some growers have adopted this method for the labor savings and early yields. Brush removal costs are limited to the lower branches removed in years 1 through 3 primarily. There may be an additional cost if stake extensions are needed after the first year to support tall leaders through the second leaf. The no prune, unheaded method costs are not included in this study.

**Fertilization.** Nitrogen is the major nutrient required for tree growth and production. Some locations will require additional nutrients. For the first two years, two split applications of granular nitrogen (15-15-15) are hand-applied in May and July when roots are active, placed approximately 18 inches from the base of the tree. Beginning in the third year, liquid nitrogen fertilizer (UAN-32) is injected through the irrigation system. (See Table A).

*Leaf Sampling.* Nutrition is determined by leaf analysis. Beginning in year four, leaf samples are collected in the first week of July at two samples per 100 acres. If soil conditions vary throughout the block, additional samples may be necessary. The samples are collected by a PCA and the costs shown are for the lab analysis.

Table A. Applied N		Table B. Evapotranspiration(ET)		Table C. Applied Water	
Year	Lbs N/Ac	Year	AcIn/Yr	Year	AcIn/Yr
1	20	1	14	1	8
2	45	2	21	2	15
3	60	3	38	3	32
4	75	4	42	4	36
5	90	5	42	5	36
6	105	6	42	6	36
7+	150	7+	42	7+	36

**Irrigation.** Tables B & C, above show the difference in applied water and the ET requirement of the orchard per year. Applied water is less depending upon the contribution from stored soil moisture and any rainfall. This study assumes six acre-inches of stored soil moisture and no effective rainfall during the growing season. Pressure chambers are used to measure stem water potential and verify irrigation adequacy. All irrigations are with the micro-sprinkler irrigation system.

*Water Costs.* In this study, water is pumped from a well assuming a cost of \$90 per acre-foot (\$7.50/acre-inch). Water charges will vary depending on the irrigation district, power source, well characteristics, and irrigation setup. Applied water for each year is estimated in Table C.

*Well Test/Water Analysis.* An annual well test is performed during the winter to monitor pumping level and efficiency (gallons/minute). A water analysis should be done annually to determine nitrate availability and to maintain regulatory records. A water sample is taken and analyzed for nitrogen and other minerals. Costs for these tests are allocated over the entire acreage the pump can service.

*Chemical Buildup/Acid Flush.* The drip system requires chemical flushing to retard chemical buildup and emitter clogging. The flushing is performed after harvest with N-pHuric acid applied through the drip system with 0.10 acre-inches of water.

**Pest Management.** The pesticides and rates mentioned are listed in UC Integrated Pest Management Guidelines, Walnuts. For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at [ipm.ucanr.edu](http://ipm.ucanr.edu). For information and pesticide use permits, contact the local county agricultural commissioner's office.

*Pest Control Adviser/Certified Crop Advisor (PCA/CCA).* Written recommendations are required for many pesticides and are available from licensed pest control or certified crop advisers. In addition, the PCA/CCA or an independent consultant will monitor the field for agronomic problems including irrigation and nutrition; they may take leaf samples in July for fertilizer recommendations. Growers may hire a private PCA/CCA or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. For this study, a PCA monitors the orchard for disease and insect pests weekly for nine months annually. The PCA fee of \$10 per acre during establishment and \$35 per acre during production (Year 4+) is included as an operating cost.

*Application Methods.* Pesticide and fertilizer applications are made by either chemigation (pesticides and/or fertilizers applied through the irrigation water), by ATV mounted ground or spot sprayer or foliar-broadcast by tractor pulled air-blast sprayer. Check individual pesticide labels for compatibility, mixing and usage. Adjuvants are recommended for effective control of many pesticides and are an added cost. Adjuvants are not included as a cost in this study.

*Nematodes/Fumigation.* Prior to land preparation, the area is sampled (1 sample/20 acres) for nematodes injurious to walnuts to help make pre-plant soil fumigation decisions. Pre-plant fumigation may not be necessary on bare or row crop ground but is usually necessary where orchards follow orchards. Telone plus Chloropicrin are applied by a custom applicator down the tree rows (10 ft. strip) at 44 gallons per acre. Application costs including materials are approximately \$1,500 per acre. The above rates are effective on light textured soils when the soils are properly ripped and dried prior to fumigation. Heavier textured soils may need additional efforts to dry and prepare the soil if the fumigation is to be effective.

See <http://ipm.ucanr.edu/PMG/r881200111.html>

*Vegetation Management.* Weed pressure, materials and application timing will vary by orchard and season. A contact herbicide (Roundup PowerMAX) is applied pre-plant in February and a pre-emergence herbicide (Prowl H2O) is applied in April. Beginning in the first year, row middles are mowed five times, once in April, May, June, July, and August. During the late fall, (November) of the first two years, strip sprays using Prowl H2O and Goal 2XL are applied. In-season spot-sprays using Roundup PowerMAX or Rely 280 are applied to tree rows in July of the first year and in June of years two and three.

*Diseases.* During the establishment years, trees usually do not have enough crop to protect from walnut blight until the fourth or fifth year. In this study, no disease control costs are included during the establishment years because Chandler is late leafing and less susceptible to walnut blight.

*Insects and Mites.* In the first through third year, infestation of red humped caterpillars and other insects and mites is possible. For this study, it is assumed that on average, only one of these pests will occur in any one year. Under that assumption, insect and mite control begins in year three, with a Zeal application in July for mite control. The cost is assumed to be equivalent to the average cost of controlling many other insects.

*Vertebrate Pests.* Beginning in the first year, gophers are managed in the spring (March) using poison bait placed underground by a mechanical bait applicator. It is assumed that gophers are under control by the end of the third year and in subsequent years only spot treatments are necessary.

**Harvest.** Depending upon variety and orchard management, harvest usually starts in the fourth or fifth year. In this study, economical harvest starts in the fourth year. A custom operator mechanically shakes, sweeps, collects and hauls walnuts to a facility for hulling and drying. Mature yield is reached in the eighth year. Refer to harvest section under the production assumptions.

### **Production Cultural Practices and Material Inputs**

**Pruning.** In mature orchards, pruning is done mainly to maintain light for healthy buds, and remove dead and undesired limbs. Although mechanical hedging is effectively used in the Sacramento Valley this cost study orchard is not a hedgerow configuration and predicts costs based on a standard planting configuration. Hand pruning is done each year in the summer to remove low, broken, and dead limbs. Pruning towers are used to make cuts higher in the tree canopy. Pruning for light penetration and to maintain nut size is done every three years. Pruning should be done when no rain is predicted or when temperatures are below 50 degrees Fahrenheit to reduce the possibility of *Botryosphaeria* infection. Prunings are placed in the row middles and are pushed to the orchard edge for burning. The brush removal crew includes the tractor driver and one person on the ground.

**Fertilization.** Nitrogen (N) is applied through the irrigation system as described in Table A. Nitrogen (N) as (UAN 32) is injected through the drip irrigation system in equal amounts, three times between May and July for a seasonal total of 150 pounds of N per acre. Adjustments for nitrogen contributions from groundwater, manure, compost and cover crops should be accounted for in the season total. Labor for the fertilizer application is included in the irrigation labor. Since the major exporter of nitrogen is the crop, another way to estimate the nitrogen requirement is to figure 35 - 40 pounds of nitrogen per dry ton of production and target a 70 percent application efficiency. Potassium levels are maintained by banding sulfate of potash (SOP) in the fall. Sixty pounds of SOP are needed annually to support a 6,000 lb. walnut crop.

*Leaf/Tissue Samples.* Nutrition is determined by leaf analysis. Leaf sampling begins in the fourth year. Leaf samples, two per 100 acres, are taken in July for nutrient analysis. If soil conditions vary throughout the block, additional samples may be necessary. The samples are collected by the PCA. The cost shown is for the lab analysis.

**Irrigation.** In the Sacramento Valley, annual ET is estimated at 42-acre inches of water per acre for full canopy walnuts (See Table B). Beginning in year six, we assume a soil moisture contribution of six acre-inches and no effective rainfall during the growing season, therefore 36 acre-inches of irrigation water is applied from May to September (See Table C). Irrigation costs include the water pumping costs and assumed labor. Tree water status is monitored throughout the season using a pressure chamber to measure stem water potential and verify first irrigation timing. By verifying mild water stress with the pressure chamber before the first irrigation, irrigation may actually begin in June.

**Pest Management.** See the statements above, under the Pest Management section.

*Vegetation Management.* During the production years, weeds are controlled in the row middles with mechanical mowing. The weeds within the tree rows are controlled with winter and in-season strip sprays using pre-emergent and post-emergent contact herbicides. Alion, Matrix and Roundup Powermax are applied in November as a winter strip spray. This operation is charged on the previous year's budgets. Rely 280 is applied during the growing season in July or August as a strip spray.

*Disease.* *Botryosphaeria* canker and blight (*Botryosphaeria* spp., known simply as "Bot") causes blighted spurs, shoots, and branches and sometimes brown to black nuts appearing around harvest. Research has yet to show value to applying a postharvest spray. In orchards with less Bot pressure, one spray applied in mid-June to early July has been effective. This study assumes a two fungicide spray program for Bot beginning in the fourth year

with a May application of Merivon and a June spray of Quadris Top. Utilizing the leaf wetness model for Botryosphaeria risk may indicate more, or fewer sprays.

See [http://ipm.ucanr.edu/PMG/FIG/Leaf\\_wetness\\_model.html](http://ipm.ucanr.edu/PMG/FIG/Leaf_wetness_model.html).

Walnut blight (*Xanthomonas arboricola pv juglandis*), is a spring disease that affects all green tissue including nutlets. Depending on rainfall, earlier leafing varieties typically require more sprays than later leafing varieties like Chandler used in this study. Starting in year four, the first treatment is applied in mid-April using a copper compound, Kocide 3000 tank mixed with Manzate Prostick and a second treatment is applied 7-10 days later. The second spray can be rotated with the antibiotic Kasumin for resistance management. Additional sprays are triggered depending on rainfall and orchard history and are not included in these costs.

*Insects and Mites.* Insects and mites are typical problems for Sacramento Valley walnut production. Each particular pest is not a problem in every year. The cost study assumes the most likely pest encountered.

Aphids and mites generally do not occur every year in every orchard. In this study, it is assumed that on average, only one of these pests will appear in any given year and the costs reflect one treatment per year. Starting in year three and continuing, Zeal is applied in July for mite control.

Codling moth (CM), a major pest, can cause damage resulting in off-grade nuts. CM is assumed to reach treatment levels by the fifth year. Three generations usually occur and are monitored using pheromone traps and insect degree days. See <http://www.ipm.ucanr.edu/WEATHER/index.html>. The pheromone traps are furnished, installed and serviced by the PCA, therefore no cost is shown. One treatment for codling moth is assumed for the second flight, and Altacor is applied in July. A May spray is often applied for earlier leafing varieties. Codling Moth mating disruption using pheromone puffers or dispensers is an option particularly for larger contiguous walnut orchards. This cost study assumes a spray program for Codling moth.

Naval Orangeworm (NOW), is not a new pest of walnuts, but damage potential has been an increasing concern in recent years. One treatment for NOW timed to protect the majority of the period between hull split through harvest is assumed. Winter sanitation activities (mowing, disking, or shredding ground mummies and blowing berms) are assumed. Naval Orangeworm treatment and sanitation begins in year 5.

Starting in year six, Seize 35WP is applied in March for scale insect control. Scale should be monitored to determine if annual sprays are needed. Walnut husk fly (WHF) is a problem in most orchards and is monitored using yellow sticky traps with ammonium carbonate superchargers. Also in the sixth year, WHF first spray is applied in July using Brigade plus Nu-Lure and again in August with Assail plus Nu-Lure. This cost study assumes a two-spray program for WHF. More WHF sprays may be needed in certain years depending on WHF trap catch information.

*Vertebrate Pests.* Gophers require control and maintenance treatments are necessary. Spot treatments with gopher bait are made in March of each year. Squirrels are managed using anti-coagulant bait stations on the field perimeter beginning in the fourth year and are maintained during May, June, September and October. See [http://ucanr.org/sites/Ground\\_Squirrel\\_BMP/](http://ucanr.org/sites/Ground_Squirrel_BMP/).

**Promoting Early Harvest.** Ethephon, a growth regulator that enhances hull-split, is applied at packing tissue brown (an indicator of kernel maturity), to promote early harvest. In this study, Ethephon is applied to one-half of the orchard in September to stagger the Chandler harvest for more efficient huller and dryer management. Ethephon can also be used to promote one shake harvest by applying it 10 days before the normal harvest date.

**Harvest.** Custom harvesters shake, sweep, collect, and truck the walnuts to a facility for hulling and drying. Labor for hand raking to collect walnuts missed by the sweeper is supplied by the grower. Hulling and drying

costs are charged on a per-pound of dry-weight basis. Custom harvest operators may charge by the hour, acre or yield, but most have a minimum per-acre charge.

*Yields.* Annual yields for walnut varieties are measured as clean, dry, in-shell pounds per acre. The average yield over the remaining life of the orchard is assumed to be 6,000 pounds per acre. Yields can vary widely from year to year, site to site and grower to grower. See Table 5 for a range analysis of returns based on different yields.

*Returns.* Actual price depends on a number of factors such as demand, size of the state crop, variety, nut size, and quality. For this study, a projected price of \$1.00 per pound is used in the tables. This price reflects long term expected price. It does not reflect a price forecast for any specific year. Refer to the ranging analysis (Table 5) for guidance on price variability.

*Assessments.* Under a state marketing order, the California Walnut Commission (CWC) collects mandatory assessment fees. The 2018 CWC assessment fee is \$0.01 per pound of dry in-shell nuts. The assessment fee from the California Walnut Assessment Board, (CWAB), and Federal marketing order is paid by handlers, not growers, so it is not included in this study.

**Pickup/ATV.** The study assumes the pickup is for general farm use only, moving laborers, picking up supplies and parts. The ATV is used for weed spraying and baiting squirrels and gophers, and is included in those costs. Additional ATV uses for checking the orchard, diseases, and irrigation system are shown as a line item. The travel and time are estimated and not taken from any specific data.

### **Labor, Equipment, and Interest**

**Labor.** Hourly wages for workers are \$14.50 for machine operators and \$12.50 per hour non-machine labor. Adding 42 percent for the employer's share of federal and state payroll taxes, workers compensation insurance, for nut crops and other possible benefits gives the labor rates shown of \$20.59 and \$17.75 per hour for machine labor and non-machine labor, respectively. Workers' compensation costs will vary among growers. The cost is based upon the average industry final rate as of January 2018. Labor for operations involving machinery are 20 percent higher than the actual operation time given to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

**California Minimum Wage and Overtime Rules.** In 2016, The California State Government passed new legislation concerning overtime and minimum wage rates that may affect farm labor costs. The California minimum wage rate for 2018 is \$11.00 per hour for companies with more than 25 employees and will rise each year by \$1.00 per hour until it reaches \$15.00 per hour in 2022. Businesses with 25 or fewer employees are given an additional year to comply with the changes. For businesses with 25 or fewer employees, the minimum wage rate is \$10.50 per hour for 2018 and increases to \$11.00 per hour in 2019; thereafter, their minimum wage rate increases by \$1.00 per hour each year from \$11.00 per hour in 2019 to \$15.00 per hour in 2023.

Recent California regulations also decrease the overtime threshold—the number of hours required to be worked before overtime benefits are received—for agricultural workers. The regulations decrease the overtime threshold for agricultural workers from 60 hours per week and 10 hours per day by 5.0 hours per week and 0.5 hours per day each year until it reaches 40 hours per week and 8.0 hours per day in 2022. Businesses with 25 or fewer employees are given an additional three years to comply with the regulation's changes. By January 1st, 2019 (2022 for employers with 25 or fewer employees) employees will also be entitled to overtime for 8 hours on the seventh consecutive day of work.



These regulations cause increased cost of labor used on farms, whether as direct hires, as farm labor contractor employees or as a component of custom services.

For more information and to view the California minimum wage and overtime phase-in schedules visit <http://aic.ucdavis.edu/>

**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. Prices for on-farm delivery of diesel and gasoline are \$2.92 and \$3.46 per gallon, respectively. The cost includes a 13.0 percent local sales tax on diesel fuel and 10.17 percent sales tax on gasoline. Gasoline also includes federal and state excise tax, which are refundable for on-farm use when filing your income tax.

*Fuel/Lube/Repair.* The fuel, lube, and repair cost per acre for each operation in Table 2 is determined by multiplying the total hourly operating cost in Table 7 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10 percent higher than implement time for a given operation to account for setup, travel and down time.

**Interest on Operating Capital.** Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 5.0 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 2018.

**Risk.** The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability of tree nut production. Because of so many potential risk factors, effective risk management must combine specific tactics in a detailed manner, in various combinations for a sustainable operation. Moreover, Table 5 of this study reflects a ranging analysis of returns based on various assumptions which is therefore hypothetical in nature. It is important to realize that actual results may differ from the returns contained in this study. Any returns above total costs are considered returns on risk and investment to management (or owners).

### **Cash Overhead**

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs can 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.

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

*Property Insurance.* This provides coverage for property loss and is charged at 0.846 percent of the average value of the assets over their useful life.

*Liability Insurance.* A standard farm liability insurance policy will help cover the expenses for which you become legally obligated to pay for bodily injury claims on your property and damages to another person's property as a result of a covered accident. Common liability expenses covered under your policy include attorney fees and court costs, medical expenses for people injured on your property, injury or damage to another's property. In this study, \$810 is charged and covers the entire farm.

*Crop Insurance.* A significant number of growers purchase federal crop insurance in this region. Crop insurance is available to walnut growers for unavoidable loss of production, damage or poor quality resulting from adverse weather conditions such as excessive heat, cool wet weather, freeze, frost, hail, rain, wind and damage from birds, drought, earthquakes and fire. Coverage levels are from 50-85 percent of the approved average yield as established by verifiable production records from the farm. Actual insurance coverage is by unit, not by acre. <http://www.rma.usda.gov/policies/2017policy.html>. We assume no crop insurance is purchased in this study.

**Office Expense.** Office and business expenses are estimated at \$100 per acre annually. These expenses include office supplies, communication, bookkeeping, accounting and miscellaneous administrative costs.

**Sanitation Services.** Sanitation services provide portable toilets with wash basins for the orchard and cost the farm \$875 annually. This cost includes delivery and five months of weekly service.

**Supervisor/Management Salaries.** Wages for management are not included as a cash cost. Any returns above total costs are considered returns to management.

**Investment Repairs.** Annual repairs on investment or capital recovery items that require maintenance are calculated as 2 percent of the purchase price on investments listed in Table 6.

### **Non-Cash Overhead**

Non-cash overhead, shown on an annual per acre basis is calculated as the capital recovery cost for equipment and other farm investments.

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

*Salvage Value.* Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (e.g., 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 and Biological Engineers (ASABE) based on equipment type and years of life. The life in years is estimated by dividing the wear-out life, as given by ASABE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for equipment and investments are shown in Table 6.

**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 5.50 percent is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions, but is the basic suggested rate by a farm lending agency as of January 2018.

**Building.** The 2,400 sq. ft. metal shop building is on a cement slab with an attached pole barn that is used for equipment storage.

**Land.** Land values range from \$18,000 to \$40,000. The orchard site is assumed to be on previously farmed orchard ground. The bare land value in this study is \$25,000 per acre.

**Irrigation System.** The pumping cost is based on two 75-horsepower electric motors pumping from a depth of 125 feet. Price per acre-foot of water will vary by grower depending on power source, well characteristics, and irrigation district. In this study, electrical costs for pumping groundwater are calculated to cost \$90.00 per acre-foot or \$7.50 per acre-inch. Water is pumped through a filtration system, into the buried main lateral lines, and out into the orchard and micro-sprinklers. The well and pump already exist, so the cost of the irrigation system is for the new well casing, refurbishing the pump and motor, and installing a new, automated filtration system. The main laterals and micro-sprinklers are installed separately, after the orchard has been laid out and prior to planting. The life of the irrigation system is estimated to be 30 years.

**Fuel Tanks.** Two 500-gallon fuel tanks, one for diesel and one for gasoline, are placed on stands in a cement containment meeting federal, state, and local regulations.

**Tools.** Includes shop tools/equipment, hand tools, and field tools such as pruning equipment, rakes, shovels, etc.

**Pressure Chamber Instrument.** The instrument produces pressure in the chamber to take water potential readings. This provides data to determine timing of irrigation events. A separate pressure chamber monitoring cost has been included as an operating expense.

**Establishment Cost.** Costs to establish the orchard are used to determine the non-cash overhead expenses, capital recovery, and interest on investment for the production years. The establishment cost is the sum of cash costs for land preparation, planting, trees, production expenses, and cash overhead for growing walnut trees through the first year nuts are harvested less returns from production. The *Accumulated Net Cash Cost* in the fourth year shown in Table 1 represents the establishment cost per acre. For this study, this cost is \$10,075 per acre or \$1,007,500 for the 100-acre orchard. Establishment cost is amortized beginning in the fifth year over the remaining 30 years of production.

**Equipment.** Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60 percent to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in Table 6. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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

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UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**TABLE 1. COSTS PER ACRE TO ESTABLISH AN ENGLISH WALNUT ORCHARD, OVER YEARS**  
 SACRAMENTO VALLEY - 2018

Codling Moth (CM), Walnut Husk Fly (WHF), Naval Orange Worm (NOW)		Cost Per Acre						
	Year:	Est/1st	2nd	3rd	4th	5th	6th	7th
Price: \$1.00/Lb.	Yield: Dry, In-Shell Pounds Per Acre:	500	1,500	3,000	5,000			
<b>Pre-Plant:</b>								
Nematode Sampling		1						
Orchard Removal/Cleanup		800						
Root Removal 2X		600						
Rip 4 ft. 2X		400						
Disc & Roll 2X		50						
Laser Leveling		100						
Fumigate- 8' Strip (Telone & Chloropicrin)		1500						
Pull Berms-Tree Rows		30						
Float-Between Rows		30						
Weeds-Pre-Plant Strip Spray (RU PowerMax)		10						
<b>TOTAL PRE-PLANT COSTS</b>		<b>3,521</b>						
<b>Planting:</b>								
Survey/Mark/Plant-64 Trees/Ac		1,479	44					
Head/Paint/Stake/Wrap Trees		174	4					
<b>TOTAL PLANTING COSTS</b>		<b>1,653</b>	<b>48</b>					
<b>Cultural:</b>								
Well Test/Water Analysis		6	6	6	6	6	6	6
Sanitation- NOW						13	13	13
Prune: (Sucker & Train Trees 5X-1 <sup>st</sup> Yr.)		178						
Prune (Tipping)/Stack/Alt-Rows			30	30	40			
Fertilize By Hand- 15-15-15 2X		100	180					
Fertilize: Fertigate UAN-322X				35	44	52	61	87
Fertilize: Leaf Analysis					1	1	1	1
Irrigate 10X		60	113	240	270	270	270	270
Irrigation Labor		53	53	53	53	53	53	53
Monitoring with Pressure Chamber		15	15	15	15	15	15	15
Weeds-Pre-emergent Strip Spray (Prowl H20)		35	35	35				
Weeds-Mow Middles 5X		36	36	36	36	36	36	36
Weeds-Spot Spray 25% Ac (RU PowerMax)		2	2	2				
Weeds-In-season Strip Spray (Rely 280)					11	11	11	11
Weeds-Winter Strip Spray (Yr. 1 & 2 - Prowl H20 & Goal XL, Yr. 3+ - Alion, Matrix & RU)		38	38	84	84	84	84	84
Pests-Diseases-Walnut Blight 2X					263	263	263	263
Pests-Diseases-Bot 2X					96	96	96	96
Pests-Scale							69	69
Pests-Mites (Zeal)				67	67			
Pests-Insects-CM/WHF/Mites (5 <sup>th</sup> Yr.- CM/Mites)						131	157	157
Pests-Insects-WHF							85	85
Pests-Insects-NOW						35	35	35
Pests-Gophers		8	8	8	8	8	8	8
Pests-Squirrels (Bait) 4X					46	46	46	46
PCA/CCA Fee		10	10	10	35	35	35	35
Pickup Truck-Farm Use		27	27	27	27	27	27	27
ATV-Farm Use		9	9	9	9	9	9	9
<b>TOTAL CULTURAL COSTS</b>		<b>576</b>	<b>561</b>	<b>656</b>	<b>1,108</b>	<b>1,190</b>	<b>1,379</b>	<b>1,405</b>
<b>Harvest Costs:</b>								
Shake/Sweep/Pickup/Haul					35	105	210	350
Harvest Aid-Ethephon 50% Ac							28	28
Hull & Dry					40	120	240	400
California Walnut Commission Assessment					5	15	30	50
<b>TOTAL HARVEST COSTS</b>					<b>80</b>	<b>240</b>	<b>508</b>	<b>828</b>
Interest On Operating Capital @ 5.00%		273	16	14	22	24	29	31
<b>TOTAL OPERATING COSTS/ACRE</b>		<b>6022</b>	<b>624</b>	<b>670</b>	<b>1,210</b>	<b>1,454</b>	<b>1,916</b>	<b>2,264</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**TABLE 1. CONTINUED**  
SACRAMENTO VALLEY - 2018

	Costs per Acre							
	Year:	Est/1st	2nd	3rd	4th	5th	6th	7th
	Yield: Dry, In Shell - Pounds Per Acre				500	1,500	3,000	5,000
<b>Cash Overhead Costs:</b>								
Office Expense		100	100	100	100	100	100	100
Liability Insurance		8	8	8	8	8	8	8
Sanitation Costs		9	9	9	9	9	9	9
Property Taxes		276	276	276	276	325	325	325
Property Insurance		23	23	23	23	27	27	27
Investment Repairs		98	97	97	97	97	97	97
<b>TOTAL CASH OVERHEAD COSTS</b>		<b>513</b>	<b>512</b>	<b>512</b>	<b>512</b>	<b>566</b>	<b>566</b>	<b>566</b>
<b>TOTAL CASH COSTS/ACRE</b>		<b>6,535</b>	<b>1,136</b>	<b>1,182</b>	<b>1,722</b>	<b>2,020</b>	<b>2,482</b>	<b>2,830</b>
<b>INCOME/ACRE FROM PRODUCTION</b>					<b>500</b>	<b>1,500</b>	<b>3,000</b>	<b>5,000</b>
<b>NET CASH COSTS/ACRE FOR THE YEAR</b>		<b>6,535</b>	<b>1,136</b>	<b>1,182</b>	<b>1,222</b>	<b>520</b>		
<b>NET PROFIT/ACRE ABOVE CASH COSTS</b>							<b>518</b>	<b>2,170</b>
<b>ACCUMULATED NET CASH COSTS/ACRE</b>		<b>6,535</b>	<b>7,671</b>	<b>8,853</b>	<b>10,075</b>	<b>10,595</b>	<b>10,077</b>	<b>7,907</b>
<b>Non-Cash Overhead (Capital Recovery):</b>								
Buildings		39	39	39	39	39	39	39
Fuel Tanks 2-500 gal		6	6	6	6	6	6	6
Shop/Field Tools		13	13	13	13	13	13	13
Micro-Sprinkler Irrigation		124	124	124	124	124	124	124
Well/Pumps/Filters 100Ac		151	151	151	151	151	151	151
Land-Walnuts 100 Acres		1,375	1,375	1,375	1,375	1,375	1,375	1,375
Orchard Establishment						693	693	693
Pressure Chamber Instrument		1	1	1	1	1	1	1
Equipment		17	16	16	16	20	20	20
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>1,727</b>	<b>1,725</b>	<b>1,725</b>	<b>1,725</b>	<b>2,422</b>	<b>2,422</b>	<b>2,422</b>
<b>TOTAL COST/ACRE FOR THE YEAR</b>		<b>8,262</b>	<b>2,861</b>	<b>2,907</b>	<b>3,447</b>	<b>4,442</b>	<b>4,904</b>	<b>5,252</b>
<b>INCOME/ACRE FROM PRODUCTION</b>					<b>500</b>	<b>1,500</b>	<b>3,000</b>	<b>5,000</b>
<b>TOTAL NET COST/ACRE FOR THE YEAR</b>		<b>8,262</b>	<b>2,861</b>	<b>2,907</b>	<b>2,947</b>	<b>2,942</b>	<b>1,904</b>	
<b>NET PROFIT/ACRE ABOVE TOTAL COST</b>								<b>252</b>
<b>TOTAL ACCUMULATED NET COST/ACRE</b>		<b>8,262</b>	<b>11,123</b>	<b>14,030</b>	<b>16,977</b>	<b>19,919</b>	<b>21,823</b>	<b>21,571</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**TABLE 2. COSTS PER ACRE TO PRODUCE WALNUTS**  
 SACRAMENTO VALLEY – 2018

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre					Total Cost	Your Cost
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:								
Sanitation- NOW	0.29	7	3	2	0	0	13	
Replant 1% of Orchard	0.00	0	0	0	0	26	26	
Well Test/Water Analysis	0.00	0	0	0	0	6	6	
Pests- Gophers	0.11	3	1	0	4	0	8	
Pests- Insects/Scale	0.00	0	0	0	44	25	69	
Weeds-Mow Middles 5X	0.74	18	10	8	0	0	36	
Disease-Walnut Blight 2X	0.00	0	0	0	213	50	263	
Pests-Squirrels (Bait) 4X	0.00	14	0	0	32	0	47	
Disease-Bot 2X	0.00	0	0	0	46	50	96	
Pressure Chamber Monitoring	0.00	0	0	0	0	15	15	
Irrigate 10X	0.00	0	0	0	270	0	270	
Fertigate UAN-32 3X	0.00	0	0	0	87	0	87	
Leaf Analysis (1 per 50/acres)	0.00	0	0	0	0	1	1	
Pests-Insects-CM/WHF/Mites	0.00	0	0	0	132	25	157	
Prune/Dead Limb Removal/Push Brush	0.65	51	6	2	0	0	59	
Pests-Insects/WHF	0.00	0	0	0	60	25	85	
Weeds- In-Season Strip Spray	0.16	4	0	1	6	0	11	
Pests-Insects/NOW	0.00	0	0	0	10	25	35	
Irrigation Labor	0.00	53	0	0	0	0	53	
Weeds- Winter Strip Spray	0.16	4	0	1	79	0	84	
Fertilize- Band Potassium (SOP)	0.06	2	1	1	23	0	26	
PCA/CCA Fee	0.00	0	0	0	0	35	35	
Pickup Truck-Farm Use	0.75	19	5	3	0	0	27	
ATV-Farm Use	0.33	8	0	0	0	0	9	
<b>TOTAL CULTURAL COSTS</b>	<b>3.26</b>	<b>183</b>	<b>28</b>	<b>16</b>	<b>1,006</b>	<b>283</b>	<b>1,517</b>	
Harvest:								
Harvest Aid-Ethephon 50% Ac	0.00	0	0	0	15	13	28	
Shake/Sweep/Pickup/Haul	0.00	0	0	0	0	420	420	
Hull & Dry	0.00	0	0	0	0	480	480	
Assessment Fees	0.00	0	0	0	60	0	60	
<b>TOTAL HARVEST COSTS</b>	<b>0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>75</b>	<b>913</b>	<b>988</b>	
Interest on Operating Capital at 5.00%							32	
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>3</b>	<b>183</b>	<b>28</b>	<b>16</b>	<b>1,081</b>	<b>1,195</b>	<b>2,537</b>	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**TABLE 2. CONTINUED**  
SACRAMENTO VALLEY – 2018

Operation	Operation		Cash and Labor Costs per Acre				Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent		
<b>CASH OVERHEAD:</b>								
Liability Insurance							8	
Office Expense							100	
Sanitation Services							9	
Property Taxes							326	
Property Insurance							27	
Investment Repairs							97	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>							<b>567</b>	
<b>TOTAL CASH COSTS/ACRE</b>							<b>3,104</b>	
<b>NON-CASH OVERHEAD:</b>								
		<u>Per Producing Acre</u>		<u>Annual Cost</u>				
				<u>Capital Recovery</u>				
Buildings 2400 sq. ft.		571		39			39	
Fuel Tanks 2-500gal		85		6			6	
Shop/Field Tools		190		13			13	
Micro-Sprinkler Irrigation		1,800		124			124	
Well/Pumps/Filters 100Ac		2,200		151			151	
Land Walnuts		25,000		1,375			1,375	
Orchard Establishment		10,075		693			693	
Pressure Chamber Instrument		16		1			1	
Equipment		231		25			25	
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>40,169</b>		<b>2,427</b>			<b>2,427</b>	
<b>TOTAL COSTS/ACRE</b>							<b>5,531</b>	



UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**TABLE 3. COSTS AND RETURNS PER ACRE TO PRODUCE WALNUTS**  
 SACRAMENTO VALLEY – 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>GROSS RETURNS</b>					
Year 8	6,000	Lb	1.00	6,000	
<b>TOTAL GROSS RETURNS</b>				6,000	
<b>OPERATING COSTS</b>					
<b>Custom:</b>				<b>1,195</b>	
Replant 1 Tree (Yr. 8+)	0.64	tree	40.00	26	
Well Test/Water Analysis	1.00	acre	6.00	6	
Spray Ground - Air Blast Sprayer	8.50	acre	25.00	213	
Pressure Chamber Monitoring	1.00	acre	15.00	15	
Leaf Analysis	0.02	each	50.00	1	
Shake Sweep Pickup Haul	6000.00	lb	0.07	420	
Dry/Hull	6000.00	lb	0.08	480	
PCA/CCA Fee (YR4-8+)	1.00	acre	35.00	35	
<b>Rodenticide:</b>				<b>36</b>	
Vertebrate Pest Bait	10.00	lb	1.92	19	
Bait Stations	2.00	each	8.50	17	
<b>Insecticide:</b>				<b>246</b>	
Seize 35 WP	4.00	floz	11.05	44	
Zeal	2.00	oz	21.00	42	
Nu-Lure Bait	6.00	pt	6.95	42	
Altacor	4.50	floz	14.27	64	
Brigade WSB	3.20	oz	1.57	5	
Assail 30 SG	8.00	oz	4.95	40	
Bifenture EC	12.00	floz	0.80	10	
<b>Fungicide:</b>				<b>143</b>	
Manzate Pro Stick	4.80	lb	7.58	36	
Kocide 3000	10.00	lb	6.14	61	
Merivon	4.00	floz	7.27	29	
Quadris Top	12.00	floz	1.37	16	
<b>Bactericide:</b>				<b>115</b>	
Kasumin	1.00	gal	115.22	115	
<b>Irrigation:</b>				<b>270</b>	
Water-Pumped	36.00	acin	7.50	270	
<b>Fertilizer:</b>				<b>110</b>	
UAN-32	150.00	lb N	0.58	87	
Sulfate of Potash	60.00	lb	0.38	23	
<b>Herbicide:</b>				<b>85</b>	
Rely 280	12.00	floz	0.53	6	
Alion	3.50	floz	13.84	48	
Matrix SG	4.00	oz	6.37	25	
Roundup PowerMax	2.00	pt	2.45	5	
<b>Tree Aids:</b>				<b>15</b>	
Ethephon 2SL	2.00	pt	7.71	15	
<b>Assessment:</b>				<b>60</b>	
CWC	6000.00	lb	0.01	60	
<b>Labor</b>				<b>183</b>	
Equipment Operator Labor	3.91	hrs	20.59	81	
Non-Machine Labor	2.80	hrs	17.75	50	
Irrigation Labor	3.00	hrs	17.75	53	
<b>Machinery</b>				<b>44</b>	
Fuel-Gas	1.16	gal	3.46	4	
Fuel-Diesel	8.28	gal	2.92	24	
Lube				4	
Machinery Repair				12	
Interest on Operating Capital @ 5.00%				32	
<b>TOTAL OPERATING COSTS/ACRE</b>				2,537	
<b>NET RETURNS ABOVE OPERATING COSTS</b>				3,463	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**TABLE 3. CONTINUED**  
SACRAMENTO VALLEY – 2018

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>CASH OVERHEAD COSTS</b>					
Liability Insurance				8	
Office Expense				100	
Sanitation Services				9	
Property Taxes				326	
Property Insurance				27	
Investment Repairs				97	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>				<b>567</b>	
<b>TOTAL CASH COSTS/ACRE</b>				<b>3,104</b>	
<b>NET RETURNS ABOVE CASH COSTS</b>				<b>2,896</b>	
<b>NON-CASH OVERHEAD COSTS (Capital Recovery)</b>					
Buildings 2400 sq. ft.				39	
Fuel Tanks 2-500gal				6	
Shop/Field Tools				13	
Micro-Sprinkler Irrigation				124	
Well/Pumps/Filters 100Ac				151	
Land Walnuts				1,375	
Orchard Establishment				693	
Pressure Chamber Instrument				1	
Equipment				25	
<b>TOTAL NON-CASH OVERHEAD COSTS/ACRE</b>				<b>2,427</b>	
<b>TOTAL COST/ACRE</b>				<b>5,531</b>	
<b>NET RETURNS ABOVE TOTAL COST</b>				<b>469</b>	

**Cost per Pound to Produce Walnuts**

<b>TOTAL OPERATING COSTS/LB</b>	<b>42 cents</b>
<b>TOTAL CASH OVERHEAD COSTS/LB</b>	<b>10 cents</b>
<b>TOTAL CASH COSTS/LB</b>	<b>52 cents</b>
<b>TOTAL NON-CASH OVERHEAD COSTS/LB</b>	<b>40 cents</b>
<b>TOTAL COST/LB</b>	<b>92 cents</b>

**UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER**  
**TABLE 4. MONTHLY COSTS PER ACRE TO PRODUCE WALNUTS**  
**SACRAMENTO VALLEY – 2018**

	JAN 18	FEB 18	MAR 18	APR 18	MAY 18	JUN 18	JUL 18	AUG 18	SEP 18	OCT 18	NOV 18	Total
<b>Cultural:</b>												
Sanitation- NOW	13											13
Replant 1% of Orchard		26										26
Well Test/Water Analysis			6									6
Pests- Gophers			8									8
Pests- Insects/Scale			69									69
Weeds-Mow Middles 5X				7	7	7	7	7				36
Disease-Walnut Blight 2X				132	132							263
Pests-Squirrels (Bait) 4X					24	7			7	7		47
Disease-Bot 2X					54	41						96
Pressure Chamber Monitoring					3	3	3	3	3			15
Irrigate 10X					53	53	60	68	38			270
Fertigate UAN-32 3X					29	29	29					87
Leaf Analysis (1 per 50/acres)							1					1
Pests-Insects-CM/WHF/Mites							157					157
Prune/Dead Limb Removal/Push Brush								45				45
Pruning Tower								14				14
Pests-Insects/WHF								85				85
Weeds- In-Season Strip Spray								11				11
Pests-Insects/NOW									35			35
Irrigation Labor									53			53
Weeds- Winter Strip Spray											84	84
Fertilize- Band Potassium (SOP)											26	26
PCA/CCA Fee	3	3	3	3	3	3	3	3	3	3	3	35
Pickup Truck-Farm Use	2	2	2	2	2	2	2	2	2	2	2	27
ATV-Farm Use	1	1	1	1	1	1	1	1	1	1	1	9
<b>TOTAL CULTURAL COSTS</b>	<b>19</b>	<b>32</b>	<b>89</b>	<b>145</b>	<b>308</b>	<b>147</b>	<b>264</b>	<b>240</b>	<b>142</b>	<b>14</b>	<b>116</b>	<b>1,517</b>
<b>Harvest:</b>												
Harvest Aid-Ethephon 50% Ac									28			28
Shake/Sweep/Pickup/Haul										420		420
Hull & Dry										480		480
Assessment Fees										60		60
<b>TOTAL HARVEST COSTS</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>960</b>	<b>0</b>	<b>988</b>
Interest on Operating Capital @ 5.00%	0	0	1	1	2	3	4	5	6	10	0	32
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>19</b>	<b>32</b>	<b>90</b>	<b>146</b>	<b>311</b>	<b>150</b>	<b>268</b>	<b>246</b>	<b>176</b>	<b>984</b>	<b>115</b>	<b>2,537</b>
<b>CASH OVERHEAD</b>												
Liability Insurance			8									8
Office Expense	9	9	9	9	9	9	9	9	9	9	9	100
Sanitation Services	1	1	1	1	1	1	1	1	1	1	1	9
Property Taxes		163					163					326
Property Insurance		13					13					27
Investment Repairs	9	9	9	9	9	9	9	9	9	9	9	97
<b>TOTAL CASH OVERHEAD COSTS</b>	<b>19</b>	<b>195</b>	<b>26</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>195</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>567</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>38</b>	<b>228</b>	<b>116</b>	<b>165</b>	<b>329</b>	<b>169</b>	<b>463</b>	<b>264</b>	<b>195</b>	<b>1,002</b>	<b>134</b>	<b>3,104</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**TABLE 5. RANGING ANALYSIS - WALNUTS**  
 SACRAMENTO VALLEY – 2018

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

	YIELD (LB)						
	4,500.00	5,000.00	5,500.00	6,000.00	6,500.00	7,000.00	7,500.00
<b>OPERATING COSTS/ACRE:</b>							
Cultural	1,517	1,517	1,517	1,517	1,517	1,517	1,517
Harvest	741	823	906	988	1,070	1,152	1,235
Interest on Operating Capital @ 5.00%	31	32	32	32	33	33	33
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>2,289</b>	<b>2,372</b>	<b>2,454</b>	<b>2,537</b>	<b>2,620</b>	<b>2,702</b>	<b>2,785</b>
<b>TOTAL OPERATING COSTS/LB</b>	<b>0.51</b>	<b>0.47</b>	<b>0.45</b>	<b>0.42</b>	<b>0.40</b>	<b>0.39</b>	<b>0.37</b>
<b>CASH OVERHEAD COSTS/ACRE</b>							
CASH OVERHEAD COSTS/ACRE	567	567	567	567	567	567	567
<b>TOTAL CASH COSTS/ACRE</b>	<b>2,856</b>	<b>2,939</b>	<b>3,021</b>	<b>3,104</b>	<b>3,186</b>	<b>3,269</b>	<b>3,352</b>
<b>TOTAL CASH COSTS/LB</b>	<b>0.63</b>	<b>0.59</b>	<b>0.55</b>	<b>0.52</b>	<b>0.49</b>	<b>0.47</b>	<b>0.45</b>
<b>NON-CASH OVERHEAD COSTS/ACRE</b>							
NON-CASH OVERHEAD COSTS/ACRE	2,427	2,427	2,427	2,427	2,427	2,427	2,427
<b>TOTAL COSTS/ACRE</b>	<b>5,283</b>	<b>5,365</b>	<b>5,448</b>	<b>5,531</b>	<b>5,613</b>	<b>5,696</b>	<b>5,779</b>
<b>TOTAL COSTS/LB</b>	<b>1.17</b>	<b>1.07</b>	<b>0.99</b>	<b>0.92</b>	<b>0.86</b>	<b>0.81</b>	<b>0.77</b>
Net Return per Acre above Operating Costs for Walnuts							
PRICE (\$/lb)	YIELD (lb/acre)						
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.55	186	378	571	763	955	1,148	1,340
0.70	861	1,128	1,396	1,663	1,930	2,198	2,465
0.85	1,536	1,878	2,221	2,563	2,905	3,248	3,590
1.00	2,211	2,628	3,046	3,463	3,880	4,298	4,715
1.15	2,886	3,378	3,871	4,363	4,855	5,348	5,840
1.30	3,561	4,128	4,696	5,263	5,830	6,398	6,965
1.45	4,236	4,878	5,521	6,163	6,805	7,448	8,090
Net Return per Acre above Cash Costs for Walnuts							
PRICE (\$/lb)	YIELD (lb/acre)						
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.55	-381	-189	4	196	389	581	773
0.70	294	561	829	1,096	1,364	1,631	1,898
0.85	969	1,311	1,654	1,996	2,339	2,681	3,023
1.00	1,644	2,061	2,479	2,896	3,314	3,731	4,148
1.15	2,319	2,811	3,304	3,796	4,289	4,781	5,273
1.30	2,994	3,561	4,129	4,696	5,264	5,831	6,398
1.45	3,669	4,311	4,954	5,596	6,239	6,881	7,523
Net Return per Acre above Total Costs for Walnuts							
PRICE (\$/lb)	YIELD (lb/acre)						
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.55	-2,808	-2,615	-2,423	-2,231	-2,038	-1,846	-1,654
0.70	-2,133	-1,865	-1,598	-1,331	-1,063	-796	-529
0.85	-1,458	-1,115	-773	-431	-88	254	596
1.00	-783	-365	52	469	887	1,304	1,721
1.15	-108	385	877	1,369	1,862	2,354	2,846
1.30	567	1,135	1,702	2,269	2,837	3,404	3,971
1.45	1,242	1,885	2,527	3,169	3,812	4,454	5,096

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER  
**TABLE 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS**  
 SACRAMENTO VALLEY – 2018

ANNUAL EQUIPMENT COSTS

Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
18	90 HP 4WD Tractor	76,839	15	14,959	6,988	39	459	7,485
18	Pickup Truck 1/2 Ton	32,000	5	14,342	4,924	20	232	5,175
18	Flail Mower 14'	12,790	10	2,262	1,521	6	75	1,603
18	ATV-4WD	8,500	12	2,125	857	4	53	914
18	Bait Applicator	2,473	10	437	294	1	15	310
18	34HP2WD Tractor	21,261	12	5,316	2,142	11	133	2,287
18	ATV sprayer 200 gal 26'	9,700	10	1,715	1,154	5	57	1,216
18	Brush Rake 9'	1,800	25	51	133	1	9	143
18	Sweeper/Blower	62,000	15	5,952	5,911	29	340	6,280
18	Pruning Tower	26,900	20	1,402	2,211	12	142	2,364
18	Fertilizer spreader PTO	15,000	12	2,078	1,614	7	85	1,706
TOTAL		269,263	-	50,639	27,748	135	1,600	29,483
60% of New Cost*		161,558	-	30,383	16,649	81	960	17,690

\*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Buildings 2400sqft	60,000	30	4,200	4,070	27	321	1,200	5,619
Fuel Tanks 2-500gal	8,900	30	623	604	4	48	178	833
Shop/Field Tools	20,000	30	1,400	1,357	9	107	400	1,873
Irrigation System-Micro	180,000	30	0	12,385	0	900	3,600	16,885
Well/Pumps/Filters 100Ac	220,000	30	0	15,137	93	1,100	4,400	20,730
Land Walnuts	2,625,000	30	2,625,000	144,375	2,221	26,250	0	172,846
Orchard Establishment	1,007,500	30	0	69,321	426	5,038	0	74,785
Pressure Chamber Instrument	1,600	20	112	131	1	9	32	172
TOTAL INVESTMENT	4,123,000	-	2,631,335	247,380	2,781	33,772	9,810	293,743

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	100	acre	7.71	771
Office Expense	100	acre	100.00	10,000
Sanitation Services	100	acre	8.75	875

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER

**TABLE 7. HOURLY EQUIPMENT COSTS**

SACRAMENTO VALLEY – 2018

Yr.	Description	Walnuts	Total	Cash Overhead			Operating		Total Oper.	Total Costs/Hr.
		Hours Used	Hours Used	Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel		
18	90 HP 4WD Tractor	130	1066	3.93	0.02	0.26	3.86	12.91	16.76	20.97
18	Pickup Truck 1/2 Ton	75	400	7.39	0.03	0.35	3.48	7.30	10.78	18.54
18	Flail Mower 14'	88	200	4.56	0.02	0.23	6.16	0.00	6.16	10.97
18	ATV-4WD	66	166	3.10	0.02	0.19	0.80	1.30	2.10	5.41
18	Bait Applicator	11	120	1.47	0.01	0.07	0.95	0.00	0.95	2.50
18	34HP2WD Tractor	12	1000	1.29	0.01	0.08	1.69	4.88	6.57	7.94
18	ATV sprayer 200 gal 26'	33	150	4.61	0.02	0.23	2.60	0.00	2.60	7.46
18	Brush Rake 9'	23	80	1.00	0.01	0.07	0.32	0.00	0.32	1.39
18	Sweeper/Blower	16	250	14.19	0.07	0.82	2.49	8.76	11.25	26.32
18	Pruning Tower	46	200	6.63	0.04	0.42	1.55	6.92	8.47	15.56
18	Fertilizer spreader PTO	6	100	9.68	0.04	0.51	5.74	0.00	5.74	15.97

UC COOPERATIVE EXTENSION  
**TABLE 8. OPERATIONS WITH EQUIPMENT & MATERIALS**  
 SACRAMENTO VALLEY – 2015

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Sanitation- NOW	Jan	90 HP 4WD Tractor	Flail Mower 14' Sweeper/Blower	Equipment Operator Labor	0.18	hour
				Equipment Operator Labor	0.17	hour
Replant 1% of Orchard	Feb			Replant 1 Tree (Yr. 8+)	0.64	tree
Well Test/Water Analysis	Mar			Well Test/Water Analysis	1.00	acre
Pests- Gophers	Mar	34HP2WD Tractor	Bait Applicator	Equipment Operator Labor	0.14	hour
				Vertebrate Pest Bait	2.00	lb
Pests- Insects/Scale	Mar			Spray Ground - Air Blast Sprayer	1.00	acre
				Seize 35 WP	4.00	floz
Weeds-Mow Middles 5X	Apr	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour
	May	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour
	June	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour
	July	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour
	Aug	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour
Disease-Walnut Blight	Apr			Spray Ground - Air Blast Sprayer	1.00	acre
				Manzate Pro Stick	2.40	lb
				Kocide 3000	5.00	lb
				Kasumin	0.50	gal
	May			Kocide 3000	5.00	lb
				Manzate Pro Stick	2.40	lb
				Kasumin	0.50	gal
				Spray Ground - Air Blast Sprayer	1.00	acre
Pests-Squirrels (Bait)	May			Non-Machine Labor	0.20	hour
				Vertebrate Pest Bait	2.00	lb
				Bait Stations	2.00	each
	June			Non-Machine Labor	0.20	hour
				Vertebrate Pest Bait	2.00	lb
	Sept			Non-Machine Labor	0.20	hour
				Vertebrate Pest Bait	2.00	lb
	Oct			Non-Machine Labor	0.20	hour
				Vertebrate Pest Bait	2.00	lb
Disease-Bot 2X	May			Spray Ground - Air Blast Sprayer	1.00	acre
				Merivon	4.00	floz
	June			Spray Ground - Air Blast Sprayer	1.00	acre
				Quadris Top	12.00	floz
Pressure Chamber	May- Sept			Pressure Chamber Monitoring	1.00	acre
Irrigate 10X	May			Water-Pumped	7.00	acin
	June			Water-Pumped	7.00	acin
	July			Water-Pumped	8.00	acin
	Aug			Water-Pumped	9.00	acin
	Sept			Water-Pumped	5.00	acin
Fertigate UAN-32 3X	May			UAN-32	50.00	lb N
	June			UAN-32	50.00	lb N
	July			UAN-32	50.00	lb N
Leaf Analysis (1 per 50 Ac)	July			Leaf Analysis	0.02	each
Pests-Insects-CM/WHF	July			Spray Ground - Air Blast Sprayer	1.00	acre
				Zeal	2.00	oz
				Nu-Lure Bait	3.00	pt
				Altacor	4.50	floz
				Brigade WSB	3.20	oz
Prune/Dead Limb Removal	Aug	90 HP 4WD Tractor	Brush Rake 9' Pruning Tower	Non-Machine Labor	2.00	hours
				Equipment Operator Labor	0.50	hour
Pests-Insects/WHF	Aug			Nu-Lure Bait	3.00	pt
				Assail 30 SG	8.00	oz
				Spray Ground - Air Blast Sprayer	1.00	acre
Weeds- In-Season Strip	Aug		ATV-4WD	Equipment Operator Labor	0.20	hour
				Rely 280	12.00	floz
			ATV sprayer 200 gal 26'			
Pests-Insects/NOW	Sept			Spray Ground - Air Blast Sprayer	1.00	acre
				Bifenture EC	12.00	floz
Irrigation Labor	Sept			Irrigation Labor	3.00	hours
Weeds- Winter Strip	Nov		ATV-4WD	Equipment Operator Labor	0.20	hour
				Alion	3.50	floz
			ATV sprayer 200 gal 26'			
				Matrix SG	4.00	oz
				Roundup PowerMax	2.00	pt
Fertilize- Band Potassium	Nov	90 HP 4WD Tractor	Fertilizer spreader PTO	Equipment Operator Labor	0.08	hour
				Sulfate of Potash	60.00	lb
PCA/CCA Fee	Nov			PCA/CCA Fee (YR4-8)	1.00	acre
Pickup Truck-Farm	Nov		Pickup Truck 1/2 Ton	Equipment Operator Labor	0.90	hour
ATV-Farm Use	Nov		ATV-4WD	Equipment Operator Labor	0.40	hour
Harvest Aid-Ethephon	Sept			Spray Ground - Air Blast	0.50	acre
				Ethephon 2SL	2.00	pt
Shake/Sweep/Pickup/ Hull & Dry	Oct			Shake Sweep Pickup Haul	6,000.00	lb
	Oct			Dry/Hull	6,000.00	lb
Assessment Fees	Oct			CWC	6,000.00	lb

