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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION  
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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  
UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

**SAMPLE COSTS TO ESTABLISH AND PRODUCE WALNUTS**

Sacramento Valley – 2022

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**INTRODUCTION**

Sample costs to establish a walnut orchard and produce walnuts using 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 September 2022 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 2 and 3 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, Davis, Department of Agricultural and Resource Economics, at 530-752-4651 or [jimmurdock@ucdavis.edu](mailto:jimmurdock@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, [coststudies.ucdavis.edu](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, the California Walnut Board, 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 walnut 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 four 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 triplaned four times to break up clods. The new orchard site is laser leveled to reduce or eliminate the possibility of standing water. Then the entire orchard is fumigated with Telone, and the tree rows to be planted are fumigated, untarped, with 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 1 to 2 percent of a second variety for pollination. Cisco is the typical Chandler pollinizer. Clonal or seedling 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 \$24.50 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. For comparative costs to the June bud trees used in this study, potted trees cost \$14.00 each (\$896/acre). The in-field budding service performed at the end of the first season after planting is included in the \$14 tree cost. After adding planting labor, the total cost per acre is approximately \$1,250 compared to \$1,914 per acre for planting bare root stock. Planting potted rootstock and fall budding or grafting the following spring adds an additional year in the training process, compared with finished trees. An even longer delay in the training process relative to planting finished trees occurs if there is the need for a second round of budding or grafting – for example because of deer browse or a sudden autumn freeze.

**Planting.** Planting in the spring (February/March) starts by surveying and marking tree sites with a small stake, digging holes, planting, staking the trees. The stakes are 10 feet long sucker rod. 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. Some growers need plastic mesh tree protectors for deer, but the cost is not included in the study. 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 finished trees begin the same spring as 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. In this study, the no heading method (unheaded with pruning limited to thinning cuts on lower branches) is used in years 1-4. This method often results in larger early tree size and earlier yield based on research in several counties over the last 18 years. Several growers have adopted this method because of the labor savings and early yields. Growers using this training approach usually start machine harvest in the third year, but harvest cost is not included until the fourth year in this study. Pruning and brush shredding costs are limited to the lower branches removed in years 2 and 3 primarily. The brush is placed in the row middles and chopped during mowing. There may be an additional cost if stake extensions are needed after the first year and applied in the dormant season to support tall leaders through the second leaf. They are not included in the costs. Five-foot-long 1-1 1/2 inch PVC extensions are used at a cost of \$3.50 each. A small hole is drilled in the PVC and a zip tie and green tape are used to secure it to the sucker rod stake. You can learn more about the no heading method at:

[sacvalleyorchards.com/walnuts/horticulture-walnuts/training-young-walnut-trees-minimum-pruning-vs-no-pruning-compared/](http://sacvalleyorchards.com/walnuts/horticulture-walnuts/training-young-walnut-trees-minimum-pruning-vs-no-pruning-compared/)

Many growers may still prefer the more expensive minimum pruning method. Using this method in a standard spaced orchard, the trunk is headed at 7 to 8 feet at the first dormant pruning. 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 in the second and third year to tip or remove up to one-quarter of the current year's growth on scaffold branches. During the first three establishment years, the brush is placed in the row middles and chopped during mowing. The accumulated costs through year 4 for this pruning method (including first year sucker removal) are \$360 per acre compared to \$180 per acre for the no heading method used 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 one sample 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	15
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. A pressure chamber is 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 \$200 per acre-foot (\$16.67/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. Chloride and/or boron should also be tested in areas with elevated levels, but these additional testing costs are not included in this study. 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 \$25 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 \$2,100 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 foliar 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 typically are mowed five times, once in April, May, June, July, and August. During the late fall, (December) 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 weeds within 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 third or fourth year. In this study, blight control begins in year three.

*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.** Several variables influence when machine harvest begins including tree spacing, pruning method, variety, rootstock, soil type, and orchard management. Closer tree spacing and/or using the no pruning/no heading method are particularly important for earlier yields. Growers often can expect a machine harvestable crop in the third leaf in unheaded orchards, but 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 seventh 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 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, four times between May and August 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 use 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. One hundred and fifty pounds of SOP (75 pounds of K) 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, one 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 begin in May or even June.



**Pest Management.** See the statements above, under the Pest Management section for establishment years.

*Vegetation Management.* During the production years, weeds are controlled in the row middles with mechanical mowing. The weeds within the tree rows typically are controlled with winter and in-season strip sprays using pre-emergent and post-emergent herbicides. Alion, Matrix and Roundup PowerMAX is a common program that is applied in December 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.* 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 three, 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. See [sacvalleyorchards.com/walnuts/diseases/walnut-blight-management](http://sacvalleyorchards.com/walnuts/diseases/walnut-blight-management).

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. In orchards with less Bot pressure, one spray applied in mid-June to early July has been effective. Research has yet to show value to applying a postharvest spray. 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).

*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 [ipm.ucanr.edu/WEATHER/index.html](http://ipm.ucanr.edu/WEATHER/index.html). The pheromone traps are furnished, installed and serviced by the PCA, therefore no cost is shown. One treatment of Altacor for codling moth is assumed for the second flight, and 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 using Bifenture EC and sanitation begins in year 5.

Scale can be a serious problem and can predispose limbs to Botryosphaeria infection. 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. Often when using an insect growth regulator like Seize35WP, control will last two years or more.

Walnut husk fly (WHF) is a problem in most mature orchards and is monitored using yellow sticky traps with ammonium carbonate superchargers. This cost study assumes a low- to moderate-population and a 3-week interval between sprays. Using a short-residual insecticide plus bait will generally kill walnut husk fly for 7 to

10 days and with the egg development period added to this time, there is about 3 weeks of protection after an application. A spray plus bait is applied to alternate rows after an increase in trap catches occurs. In this study, sprays are applied in June, July, and August using Brigade, Assail, and Delegate respectively.

*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 [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, starting in year 5, 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 ranging analysis of returns based on different yields.

*Returns.* The actual price of walnuts depends on a number of factors such as demand, supply, variety, nut size, and quality. For this study, a price of \$0.50 per pound is used in the tables. It does not reflect a price forecast for any specific year, and may not represent actual prices received in 2022 due to issues affecting walnut quality (See <https://www.sacvalleyorchards.com/blog/walnuts-blog/2022-nut-quality-what-happened/>). See Table 5 for a ranging analysis of returns based on different prices.

*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 \$18.00 for machine operators and \$15.50 per hour non-machine labor. Adding 45 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 \$26.10 and \$22.48 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 September 2022. 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. For businesses with 25 or fewer employees, the minimum wage rate is \$15.00 per hour in 2023 and \$15.50 for businesses with more than 25 employees.

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. 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.

**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 \$5.85 and \$5.45 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 7.0 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 September 2022.

**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 0.886 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, \$833 is charged and covers the entire farm.

*Crop Insurance.* A significant number of growers purchase federal crop insurance in this region. Due to variability in coverages, none is purchased in this study. 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% of the approved average yield as established by verifiable production records from the farm. <https://www.rma.usda.gov/Fact-Sheets/Davis-Regional-Office-Fact-Sheets/Walnuts-2017-CA>.

**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 6.50 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 September 2022.

**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.

**Well and Irrigation System.** The pumping cost is based on two 100-horsepower electric motors pumping from a depth of 250 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 \$200.00 per acre-foot or \$16.67 per acre-inch. Water is pumped through a filtration system, into the buried main lateral lines, and out into the orchard and solid-set sprinkler irrigation. The well is 500 feet deep and is equipped with filters. The main laterals and solid set 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 \$18,667 per acre or \$1,866,700 for the 100-acre orchard. Establishment cost is amortized beginning in the fifth year over the remaining 26 years of production. Annual irrigation repairs are calculated at 2 percent of the irrigation system cost. The irrigation system repair cost of \$72 per acre is included in the establishment costs.

**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 AND RESOURCE ECONOMICS, UC DAVIS**  
**TABLE 1. COSTS PER ACRE TO ESTABLISH AN ENGLISH WALNUT ORCHARD, OVER YEARS**  
**SACRAMENTO VALLEY - 2022**

Codling Moth (CM), Walnut Husk Fly (WHF), Naval Orange Worm (NOW)		Cost Per Acre			
	Year:	Est/1st	2nd	3rd	4th
Price: \$0.50/Lb.	Yield: Dry, In-Shell Pounds Per Acre:	1000			
<b>Pre-Plant:</b>					
Nematode Sampling		1			
Orchard Removal/Cleanup		1,500			
Root Removal 2X		1,000			
Rip 4 ft. 2X		700			
Disc & Triplane 4X		200			
Laser Leveling		400			
Fumigate- (Telone Full Coverage & Chloropicrin 10' Strip)		2100			
Pull Berms-Tree Rows		95			
Float-Between Rows		50			
Weeds-Pre-Plant Strip Spray (RU PowerMax)		23			
Micro-Sprinkler Irrigation System: Materials & Installation		3,600			
<b>TOTAL PRE-PLANT COSTS</b>		<b>9,669</b>			
<b>Planting:</b>					
Survey/Mark/Plant-64 Trees/Ac		1,914	57		
Paint/Stake/Wrap Trees		276	6		
<b>TOTAL PLANTING COSTS</b>		<b>2,190</b>	<b>63</b>		
<b>Cultural:</b>					
Well Test/Water Analysis		6	6	6	6
Train Trunk (Sucker 2X-1 <sup>st</sup> Yr.)		112			
Prune (Lower Limbs)			34	34	
Fertilize By Hand- 15-15-15 2X		114	201		
Fertilize: Fertigate UAN-32 2X				73	92
Fertilize: Leaf Analysis					1
Irrigate 14X		250	250	533	600
Irrigation Labor		67	67	67	67
Monitoring with Pressure Chamber		15	15	15	15
Weeds-Pre-emergent Strip Spray (Prowl H20)		36	36	36	
Weeds-Mow Middles 5X		55	55	55	55
Weeds-Spot Spray 25% Ac (RU PowerMax)		6	6	6	
Weeds-In-season Strip Spray (Rely 280)					16
Weeds-Winter Strip Spray (Yr. 1 & 2 - Prowl H20 & Goal XL, Yr. 3+ - Alion, Matrix & RU)		39	39	99	99
Pests-Diseases-Walnut Blight 2X				205	205
Pests-Diseases-Bot 2X					107
Pests-Mites (Zeal)				60	60
Pests-Gophers		9	9	9	9
Pests-Squirrels (Bait) 4X					48
PCA/CCA Fee		25	25	25	35
Pickup Truck-Farm Use		38	38	38	38
ATV-Farm Use		11	11	11	11
<b>TOTAL CULTURAL COSTS</b>		<b>784</b>	<b>792</b>	<b>1,273</b>	<b>1,465</b>
<b>Harvest Costs:</b>					
Shake/Sweep/Pickup/Load					45
Haul, Hull & Dry					45
California Walnut Commission Assessment					5
<b>TOTAL HARVEST COSTS</b>					<b>95</b>
Interest On Operating Capital @ 7.00%		825	29	41	38
<b>TOTAL OPERATING COSTS/ACRE</b>		<b>13,468</b>	<b>885</b>	<b>1,314</b>	<b>1,598</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS

**TABLE 1. CONTINUED**  
SACRAMENTO VALLEY - 2022

	Costs per Acre				
	Year:	Est/1st	2nd	3rd	4th
	Yield: Dry, In Shell - Pounds Per Acre				1000
<b>Cash Overhead Costs:</b>					
Office Expense		100	100	100	100
Liability Insurance		8	8	8	8
Sanitation Costs		9	9	9	9
Property Taxes		268	268	268	268
Property Insurance		24	24	24	24
Investment Repairs		67	67	67	67
<b>TOTAL CASH OVERHEAD COSTS</b>		<b>475</b>	<b>475</b>	<b>475</b>	<b>475</b>
<b>TOTAL CASH COSTS/ACRE</b>		<b>13,943</b>	<b>1,360</b>	<b>1,790</b>	<b>2,074</b>
<b>INCOME/ACRE FROM PRODUCTION</b>					<b>500</b>
<b>NET CASH COSTS/ACRE FOR THE YEAR</b>		<b>13,943</b>	<b>1,360</b>	<b>1,790</b>	<b>1,574</b>
<b>NET PROFIT/ACRE ABOVE CASH COSTS</b>					
<b>ACCUMULATED NET CASH COSTS/ACRE</b>		<b>13,943</b>	<b>15,303</b>	<b>17,093</b>	<b>18,667</b>
<b>Non-Cash Overhead (Capital Recovery):</b>					
Buildings		43	43	43	43
Fuel Tanks 2-500 gal		6	6	6	6
Shop/Field Tools		14	14	14	14
Well/Pumps/Filters 100Ac		191	191	191	191
Land-Walnuts 100 Acres		1,625	1,625	1,625	1,625
Pressure Chamber Instrument		1	1	1	1
Equipment		21	19	19	19
<b>TOTAL NON-CASH OVERHEAD COSTS</b>		<b>1,902</b>	<b>1,900</b>	<b>1,900</b>	<b>1,900</b>
<b>TOTAL COST/ACRE FOR THE YEAR</b>		<b>15,845</b>	<b>3,261</b>	<b>3,690</b>	<b>3,974</b>
<b>INCOME/ACRE FROM PRODUCTION</b>					<b>500</b>
<b>TOTAL NET COST/ACRE FOR THE YEAR</b>		<b>15,845</b>	<b>3,261</b>	<b>3,690</b>	<b>3,474</b>
<b>NET PROFIT/ACRE ABOVE TOTAL COST</b>					
<b>TOTAL ACCUMULATED NET COST/ACRE</b>		<b>15,845</b>	<b>19,106</b>	<b>22,796</b>	<b>26,270</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS

**TABLE 2. COSTS PER ACRE TO PRODUCE WALNUTS**

SACRAMENTO VALLEY – 2022

Operation	Equipment Time (Hrs/A)	Labor Cost	Fuel	Cash and Labor Costs per Acre			Total Cost	Your Cost
				Lube & Repairs	Material Cost	Custom/ Rent		
Cultural:								
Sanitation- NOW	0.29	9	7	3	0	0	19	
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	4	1	0	4	0	9	
Pests- Insects/Scale	0.00	0	0	0	44	25	69	
Weeds-Mow Middles 5X	0.74	23	21	11	0	0	55	
Disease-Walnut Blight 2X	0.00	0	0	0	155	50	205	
Pests-Squirrels (Bait) 4X	0.00	18	0	0	32	0	50	
Disease-Bot 2X	0.00	0	0	0	57	50	107	
Pressure Chamber Monitoring	0.00	0	0	0	0	15	15	
Irrigate 10X	0.00	0	0	0	600	0	600	
Fertigate UAN-32 4X	0.00	0	0	0	183	0	183	
Pests-Insects/WHF 2X	0.00	0	0	0	110	50	160	
Leaf Analysis (1 per 100/acres)	0.00	0	0	0	0	1	1	
Pests-Insects-CM/WHF/Mites	0.00	0	0	0	159	25	184	
Prune (Dead Limb Removal/Push Brush	0.23	52	7	2	0	0	60	
Pruning Tower (every 3rd Year)	1.42	44	17	3	0	0	65	
Weeds- In-Season Strip Spray	0.16	5	0	1	10	0	16	
Pests-Insects/NOW	0.00	0	0	0	10	25	35	
Irrigation Labor	0.00	67	0	0	0	0	67	
Weeds- Winter Strip Spray	0.16	5	0	1	93	0	99	
Fertilize- Band Potassium (SOP)	0.06	2	2	1	74	0	78	
PCA/CCA Fee	0.00	0	0	0	0	35	35	
Pickup Truck-Farm Use	0.75	23	11	3	0	0	38	
ATV-Farm Use	0.33	10	1	0	0	0	11	
<b>TOTAL CULTURAL COSTS</b>	<b>4.26</b>	<b>264</b>	<b>67</b>	<b>25</b>	<b>1,532</b>	<b>308</b>	<b>2,195</b>	
Harvest:								
Harvest Aid-Ethephon 50% of Acreage	0.00	0	0	0	15	13	28	
Shake/Sweep/Pickup/Load	0.00	0	0	0	0	540	540	
Haul/Hull/Dry	0.00	0	0	0	0	540	540	
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>1,093</b>	<b>1,168</b>	
Interest on Operating Capital at 7.00%							59	
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>4</b>	<b>264</b>	<b>67</b>	<b>25</b>	<b>1,607</b>	<b>1,400</b>	<b>3,422</b>	

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS

**TABLE 2. CONTINUED**  
SACRAMENTO VALLEY – 2022

Operation	Equipment Time (Hrs/A)	Labor Cost	Fuel	Cash and Labor Costs per Acre			Total Cost	Your Cost
				Lube & Repairs	Material Cost	Custom/ Rent		
<b>CASH OVERHEAD:</b>								
Liability Insurance							8	
Office Expense							100	
Sanitation Services							9	
Property Taxes							362	
Property Insurance							32	
Investment Repairs							68	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>							<b>579</b>	
<b>TOTAL CASH COSTS/ACRE</b>							<b>4,001</b>	
<b>NON-CASH OVERHEAD:</b>								
		<u>Per Producing Acre</u>		<u>Annual Cost Capital Recovery</u>				
Buildings 2400sqft		571		43			43	
Fuel Tanks 2-500gal		85		6			6	
Shop/Field Tools		190		14			14	
Well/Pumps/Filters (100 Acres)		2,488		191			191	
Land		25,000		1,625			1,625	
Orchard Establishment		18,667		1506			1,506	
Pressure Chamber Instrument		16		1			1	
Equipment		332		36			36	
<b>TOTAL NON-CASH OVERHEAD COSTS</b>							<b>3,424</b>	
<b>TOTAL COSTS/ACRE</b>							<b>7,424</b>	

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS  
**TABLE 3. COSTS AND RETURNS PER ACRE TO PRODUCE WALNUTS**  
 SACRAMENTO VALLEY – 2022

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
<b>GROSS RETURNS</b>					
Year 7+	6,000	Lb	0.50	3,000	
<b>TOTAL GROSS RETURNS</b>				3,000	
<b>OPERATING COSTS</b>					
<b>Herbicide:</b>					<b>104</b>
Rely 280	12.00	floz	0.87	10	
Alion	3.50	floz	14.50	51	
Matrix SG	4.00	oz	6.37	25	
Roundup PowerMax	2.00	pt	8.50	17	
<b>Fungicide:</b>					<b>155</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	2.35	28	
<b>Bactericide:</b>					<b>58</b>
Kasumin	0.50	gal	115.22	58	
<b>Insecticide:</b>					<b>323</b>
Seize 35 WP	4.00	floz	11.05	44	
Brigade WSB	3.20	oz	1.75	6	
Nu-Lure Bait	9.00	pt	6.95	63	
Zeal	2.00	oz	17.40	35	
Altacor	4.50	floz	14.27	64	
Assail 30 SG	8.00	oz	4.95	40	
Delegate	6.00	floz	10.38	62	
Bifenture EC	12.00	floz	0.80	10	
<b>Rodenticide:</b>					<b>36</b>
Vertebrate Pest Bait	10.00	lb	1.92	19	
Bait Stations	2.00	each	8.50	17	
<b>Tree Aids:</b>					<b>15</b>
Ethephon 2SL	2.00	pt	7.71	15	
<b>Custom:</b>					<b>1,400</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	9.50	acre	25.00	238	
Pressure Chamber Monitoring	1.00	acre	15.00	15	
Leaf Analysis	0.02	each	50.00	1	
Shake Sweep Pickup Load	6000.00	lb	0.09	540	
Haul/Hull/Dry	6000.00	lb	0.09	540	
PCA/CCA Fee (YR4-8)	1.00	acre	35.00	35	
<b>Irrigation:</b>					<b>600</b>
Water-Pumped	36.00	acin	16.67	600	
<b>Fertilizer:</b>					<b>257</b>
UAN-32	150.00	lb N	1.22	183	
SOP Fines, 0-0-50	150.00	lb	0.49	74	
<b>Assessment:</b>					<b>60</b>
CWC	6000.00	lb	0.01	60	
<b>Labor</b>					<b>264</b>
Equipment Operator Labor	5.11	hrs	26.10	133	
Non-Machine Labor	2.80	hrs	22.48	63	
Irrigation Labor	3.00	hrs	22.48	67	
<b>Machinery</b>					<b>92</b>
Fuel-Gas	3.36	gal	5.45	18	
Fuel-Diesel	8.28	gal	5.85	48	
Lube				10	
Machinery Repair				15	
Interest on Operating Capital @ 7.00%				59	
<b>TOTAL OPERATING COSTS/ACRE</b>				3,422	
<b>TOTAL OPERATING COSTS/LB</b>				1	
<b>NET RETURNS ABOVE OPERATING COSTS</b>				-422	



**TABLE 3. CONTINUED**  
SACRAMENTO VALLEY – 2022

	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				362	
Property Insurance				32	
Investment Repairs				68	
<b>TOTAL CASH OVERHEAD COSTS/ACRE</b>				<b>579</b>	
<b>TOTAL CASH OVERHEAD COSTS/LB</b>				<b>0</b>	
<b>TOTAL CASH COSTS/ACRE</b>				<b>4,001</b>	
<b>TOTAL CASH COSTS/LB</b>				<b>1</b>	
<b>NET RETURNS ABOVE CASH COSTS</b>				<b>-1,001</b>	
<b>NON-CASH OVERHEAD COSTS (Capital Recovery)</b>					
Buildings 2400sqft				43	
Fuel Tanks 2-500gal				6	
Shop/Field Tools				14	
Well/Pumps/Filters				191	
Land Walnuts				1,625	
Orchard Establishment				1,506	
Pressure Chamber Instrument				1	
Equipment				36	
<b>TOTAL NON-CASH OVERHEAD COSTS/ACRE</b>				<b>3,424</b>	
<b>TOTAL NON-CASH OVERHEAD COSTS/LB</b>				<b>1</b>	
<b>TOTAL COST/ACRE</b>				<b>7,424</b>	
<b>TOTAL COST/LB</b>				<b>1</b>	
<b>NET RETURNS ABOVE TOTAL COST</b>				<b>-4,424</b>	

**Cost per Pound to Produce Walnuts**

<b>TOTAL OPERATING COSTS/LB</b>	<b>57 cents</b>
<b>TOTAL CASH OVERHEAD COSTS/LB</b>	<b>10 cents</b>
<b>TOTAL CASH COSTS/LB</b>	<b>67 cents</b>
<b>TOTAL NON-CASH OVERHEAD COSTS/LB</b>	<b>57 cents</b>
<b>TOTAL COST/LB</b>	<b>124 cents</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS  
**TABLE 4. MONTHLY COSTS PER ACRE TO PRODUCE WALNUTS**  
 SACRAMENTO VALLEY – 2022

	JAN 22	FEB 22	MAR 22	APR 22	MAY 22	JUN 22	JUL 22	AUG 22	SEP 22	OCT 22	NOV 22	Total
<b>Cultural:</b>												
Sanitation- NOW	19											19
Replant 1% of Orchard		26										26
Well Test/Water Analysis			6									6
Pests- Gophers			9									9
Pests- Insects/Scale			69									69
Weeds-Mow Middles 5X				11	11	11	11	11				55
Disease-Walnut Blight 2X				74	132							205
Pests-Squirrels (Bait) 4X					25	8			8	8		50
Disease-Bot 2X					54	53						107
Pressure Chamber Monitoring					3	3	3	3	3			15
Irrigate 10X					117	117	133	150	83			600
Fertigate UAN-32 4X					46	46	46	46				183
Pests-Insects/WHF 2X						51		108				160
Leaf Analysis (1 per 100/acres)							1					1
Pests-Insects-CM/WHF/Mites							184					184
Prune (Dead Limb Removal/Push Brush								60				60
Pruning Tower (every 3rd Year)								65				65
Weeds- In-Season Strip Spray								16				16
Pests-Insects/NOW									35			35
Irrigation Labor									67			67
Weeds- Winter Strip Spray											99	99
Fertilize- Band Potassium (SOP)											78	78
PCA/CCA Fee	3	3	3	3	3	3	3	3	3	3	3	35
Pickup Truck-Farm Use	3	3	3	3	3	3	3	3	3	3	3	38
ATV-Farm Use	1	1	1	1	1	1	1	1	1	1	1	11
<b>TOTAL CULTURAL COSTS</b>	<b>26</b>	<b>33</b>	<b>92</b>	<b>93</b>	<b>395</b>	<b>297</b>	<b>386</b>	<b>467</b>	<b>204</b>	<b>16</b>	<b>185</b>	<b>2,195</b>
<b>Harvest:</b>												
Harvest Aid-Ethephon 50%									28			28
Shake/Sweep/Pickup/Load										540		540
Haul/Hull/Dry										540		540
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>1,140</b>	<b>0</b>	<b>1,168</b>
Interest on Operating Capital @7.00%	0	0	1	1	4	5	8	10	12	19	-1	59
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>27</b>	<b>34</b>	<b>93</b>	<b>94</b>	<b>399</b>	<b>303</b>	<b>394</b>	<b>477</b>	<b>244</b>	<b>1,175</b>	<b>184</b>	<b>3,422</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		181				181						362
Property Insurance		16				16						32
Investment Repairs	6	6	6	6	6	6	6	6	6	6	6	68
<b>TOTAL CASH OVERHEAD COSTS</b>	<b>16</b>	<b>213</b>	<b>24</b>	<b>16</b>	<b>16</b>	<b>213</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>579</b>
<b>TOTAL CASH COSTS/ACRE</b>	<b>43</b>	<b>247</b>	<b>117</b>	<b>110</b>	<b>415</b>	<b>516</b>	<b>410</b>	<b>493</b>	<b>260</b>	<b>1,191</b>	<b>200</b>	<b>4,001</b>

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS

**TABLE 5. RANGING ANALYSIS - WALNUTS**

SACRAMENTO VALLEY – 2022

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	2,195	2,195	2,195	2,195	2,195	2,195	2,195
Harvest	876	973	1,071	1,168	1,265	1,362	1,460
Interest on Operating Capital @ 7.00%	58	58	59	59	60	61	61
<b>TOTAL OPERATING COSTS/ACRE</b>	<b>3,129</b>	<b>3,227</b>	<b>3,324</b>	<b>3,422</b>	<b>3,520</b>	<b>3,618</b>	<b>3,716</b>
<b>TOTAL OPERATING COSTS/LB</b>	<b>0.70</b>	<b>0.65</b>	<b>0.60</b>	<b>0.57</b>	<b>0.54</b>	<b>0.52</b>	<b>0.50</b>
<b>CASH OVERHEAD COSTS/ACRE</b>							
<b>TOTAL CASH COSTS/ACRE</b>	<b>3,707</b>	<b>3,805</b>	<b>3,903</b>	<b>4,001</b>	<b>4,099</b>	<b>4,196</b>	<b>4,295</b>
<b>TOTAL CASH COSTS/LB</b>	<b>0.82</b>	<b>0.76</b>	<b>0.71</b>	<b>0.67</b>	<b>0.63</b>	<b>0.60</b>	<b>0.57</b>
<b>NON-CASH OVERHEAD COSTS/ACRE</b>							
<b>TOTAL COSTS/ACRE</b>	<b>7,131</b>	<b>7,229</b>	<b>7,326</b>	<b>7,424</b>	<b>7,522</b>	<b>7,620</b>	<b>7,718</b>
<b>TOTAL COSTS/LB</b>	<b>1.58</b>	<b>1.44</b>	<b>1.33</b>	<b>1.24</b>	<b>1.16</b>	<b>1.09</b>	<b>1.03</b>
<b>Net Return per Acre above Operating Costs for Walnuts</b>							
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.30	-1,779	-1,727	-1,674	-1,622	-1,570	-1,518	-1,466
0.35	-1,554	-1,477	-1,399	-1,322	-1,245	-1,168	-1,091
0.40	-1,329	-1,227	-1,124	-1,022	-920	-818	-716
0.50	-879	-727	-574	-422	-270	-118	34
0.60	-429	-227	-24	178	380	582	784
0.70	21	273	526	778	1,030	1,282	1,534
0.80	471	773	1,076	1,378	1,680	1,982	2,284
<b>Net Return per Acre above Cash Costs for Walnuts</b>							
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.30	-2,357	-2,305	-2,253	-2,201	-2,149	-2,096	-2,045
0.35	-2,132	-2,055	-1,978	-1,901	-1,824	-1,746	-1,670
0.40	-1,907	-1,805	-1,703	-1,601	-1,499	-1,396	-1,295
0.50	-1,457	-1,305	-1,153	-1,001	-849	-696	-545
0.60	-1,007	-805	-603	-401	-199	4	205
0.70	-557	-305	-53	199	451	704	955
0.80	-107	195	497	799	1,101	1,404	1,705
<b>Net Return per Acre above Total Costs for Walnuts</b>							
Walnuts	4500.00	5000.00	5500.00	6000.00	6500.00	7000.00	7500.00
0.30	-5,781	-5,729	-5,676	-5,624	-5,572	-5,520	-5,468
0.35	-5,556	-5,479	-5,401	-5,324	-5,247	-5,170	-5,093
0.40	-5,331	-5,229	-5,126	-5,024	-4,922	-4,820	-4,718
0.50	-4,881	-4,729	-4,576	-4,424	-4,272	-4,120	-3,968
0.60	-4,431	-4,229	-4,026	-3,824	-3,622	-3,420	-3,218
0.70	-3,981	-3,729	-3,476	-3,224	-2,972	-2,720	-2,468
0.80	-3,531	-3,229	-2,926	-2,624	-2,322	-2,020	-1,718

UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS  
**TABLE 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS**  
 SACRAMENTO VALLEY – 2022

ANNUAL EQUIPMENT COSTS

Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
22	90 HP 4WD Tractor	91,000	15	17,716	8,945	48	544	9,537
22	Pickup Truck 1/2 Ton	32,000	5	14,342	5,181	21	232	5,434
22	Flail Mower 14'	16,890	10	2,987	2,128	9	99	2,236
22	ATV-4WD	9,300	8	3,246	1,205	6	63	1,274
22	Bait Applicator	2,473	10	437	312	1	15	327
22	34HP2WD Tractor	35,500	12	8,875	3,840	20	222	4,082
22	ATV sprayer 200 gal 26'	9,700	6	2,796	1,608	6	62	1,676
22	Brush Rake 9'	1,800	25	51	147	1	9	157
22	Sweeper/Blower	62,000	15	5,952	6,348	30	340	6,718
22	Pruning Tower	26,900	20	1,402	2,405	13	142	2,559
22	Fertilizer spreader PTO	15,000	12	2,078	1,719	8	85	1,812
TOTAL		302,563	-	59,882	33,839	161	1,812	35,811
60% of New Cost*		181,538	-	35,929	20,303	96	1,087	21,487

\*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	4,546	28	321	1,200	6,095
Fuel Tanks 2-500gal	8,900	30	623	674	4	48	178	904
Shop/Field Tools	20,000	30	1,400	1,515	9	107	400	2,032
Well/Pumps/Filters 100Ac	248,800	30	0	19,052	110	1,244	4,976	25,383
Land Walnuts	2,625,000	30	2,625,000	170,625	2,326	26,250	0	199,201
Orchard Establishment	1,866,700	26	0	150,633	827	9,334	72	160,865
Pressure Chamber Instrument	1,600	20	112	142	1	9	32	184
TOTAL INVESTMENT	4,831,000	-	2,631,335	347,188	3,306	37,312	6,858	394,664

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

**TABLE 7. HOURLY EQUIPMENT COSTS**

SACRAMENTO VALLEY – 2022

Yr	Description	Walnuts	Total	Capital Recovery	Cash Overhead			Operating		Total Oper.	Total Costs/Hr.
		Hours Used	Hours Used		Insurance	Taxes	Lube & Repairs	Fuel			
22	90 HP 4WD Tractor	130	1066	5.04	0.03	0.31	6.09	25.85	31.95	37.32	
22	Pickup Truck 1/2 Ton	75	400	7.77	0.03	0.35	4.56	14.63	19.19	27.34	
22	Flail Mower 14'	88	200	6.38	0.03	0.30	8.00	0.00	8.00	14.71	
22	ATV-4WD	66	250	2.89	0.01	0.15	0.98	2.04	3.03	6.08	
22	Bait Applicator	11	120	1.56	0.01	0.07	0.95	0.00	0.95	2.58	
22	34HP2WD Tractor	12	1000	2.30	0.01	0.13	3.03	9.77	12.80	15.25	
22	ATV sprayer 200 gal 26'	33	250	3.86	0.01	0.15	2.63	0.00	2.63	6.65	
22	Brush Rake 9'	23	80	1.10	0.01	0.07	0.30	0.00	0.30	1.48	
22	Sweeper/Blower	16	250	15.23	0.07	0.82	3.79	17.55	21.34	37.47	
22	Pruning Tower	156	200	7.22	0.04	0.42	2.14	10.90	13.04	20.72	
22	Fertilizer spreader PTO	6	100	10.31	0.05	0.51	5.69	0.00	5.69	16.56	



UC COOPERATIVE EXTENSION-AGRICULTURAL AND RESOURCE ECONOMICS, UC DAVIS

**TABLE 8. OPERATIONS WITH EQUIPMENT & MATERIALS**

SACRAMENTO VALLEY – 2022

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit	
Sanitation- NOW	Jan	90 HP 4WD Tractor	Flail Mower 14'	Equipment Operator Labor	0.18	hour	
	Jan		Sweeper/Blower	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	
	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	
Oct				Vertebrate Pest Bait	2.00	lb	
				Non-Machine Labor	0.20	hour	
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	
Pressure Chamber	May			Quadris Top	12.00	floz	
				Pressure Chamber Monitoring	0.20	acre	
	June			Pressure Chamber Monitoring	0.20	acre	
	July			Pressure Chamber Monitoring	0.20	acre	
	Aug			Pressure Chamber Monitoring	0.20	acre	
	Sept			Pressure Chamber Monitoring	0.20	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 4X	May			UAN-32	37.50	lb N	
	June			UAN-32	37.50	lb N	
	July			UAN-32	37.50	lb N	
	Aug			UAN-32	37.50	lb N	
Pests-Insects/WHF 2X	June			Spray Ground - Air Blast Sprayer	1.00	acre	
				Brigade WSB	3.20	oz	
				Nu-Lure Bait	3.00	pt	
				Delegate	6.00	floz	
	Aug				Spray Ground - Air Blast Sprayer	1.00	acre
					Nu-Lure Bait	3.00	pt
					Leaf Analysis	0.02	each
					Spray Ground - Air Blast Sprayer	1.00	acre
Leaf Analysis	July			Zeal	2.00	oz	
				Altacor	4.50	floz	
Pests-Insects-CM/WHF	July			Nu-Lure Bait	3.00	pt	
				Assail 30 SG	8.00	oz	
				Non-Machine Labor	2.00	hours	
Prune (Dead Limbs)	Aug	90 HP 4WD Tractor	Brush Rake 9'	Non-Machine Labor	2.00	hours	
	Aug		Pruning Tower	Equipment Operator Labor	1.70	hours	
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	
				ATV-4WD	Equipment Operator Labor	0.20	hour
Weeds- Winter Strip	Nov			Alion	3.50	floz	
				ATV sprayer 200 gal 26'	Matrix SG	4.00	oz

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Fertilize- Band Pota	Nov	90 HP 4WD Tractor	Fertilizer spreader PTO	Roundup PowerMax	2.00	pt
				Equipment Operator Labor	0.08	hour
				SOP Fines, 0-0-50	150.00	lb
PCA/CCA Fee	Nov			PCA/CCA Fee (YR4-8)	1.00	acre
Pickup Truck-Farm Use	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 Sprayer	0.50	acre
				Ethephon 2SL	2.00	pt
Shake/Sweep/Pickup	Oct			Shake Sweep Pickup Load	6,000.00	lb
Haul/Hull/Dry	Oct			Haul/Hull/Dry	6,000.00	lb
Assessment Fees	Oct			CWC	6,000.00	lb