
**University of California Agriculture and Natural Resources
UC Cooperative Extension
UC Davis Department of Agricultural and Resource Economics**

2023

**SAMPLE COSTS TO PRODUCE AND HARVEST
ORGANIC APPLES FOR PROCESSING**



CENTRAL COAST REGION
Santa Cruz, San Benito, Monterey Counties

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SAMPLE COSTS TO PRODUCE AND HARVEST ORGANIC APPLES FOR PROCESSING - 2023
Various Varieties

Central Coast – Santa Cruz, San Benito, Monterey County

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INTRODUCTION

The sample costs to produce organic apples for processing in the Central Coast Region – Santa Cruz, San Benito, and Monterey Counties – are presented in this study. The study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets, and evaluate production loans. The practices described are based on production procedures considered typical for this crop and area but will not apply to every situation. Sample costs for labor, materials, equipment, and custom services are based on current figures. A blank column titled "Your Cost" is provided to enter your actual costs on Tables 1 and 2.

The hypothetical farm operation, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of the calculations used in the study, contact Jeremy Murdock, Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-4651, Mark Bolda, UC Cooperative Extension Farm Advisor, mpbolda@ucanr.edu, or your local UC Cooperative Extension office, <https://ucanr.edu/About/Locations/>. An additional cost and return study for conventionally produced apples for processing is also available: *Sample Costs to Produce and Harvest Apples for Processing – Central Coast Region – 2023*. The major differences between the two companion studies are in fertilizer, pest control, yield, and price received for the crop.

Sample Cost of Production studies for many commodities are available and can be downloaded from the website <https://coststudies.ucdavis.edu/>. Archived studies are also available on the website.

ASSUMPTIONS

The following assumptions refer to Tables 1 to 6 and pertain to sample costs to produce and harvest organic apples for processing in the Central Coast Region – Santa Cruz, San Benito, and Monterey Counties. Sample costs are given for tractor, fuel, labor, repairs, labor, materials, and custom services and are based on current figures. **Costs per acre can vary considerably depending upon many variables including individual grower, production location and weather conditions, land cost and taxes, soil type, water costs, pest pressures, material inputs, energy costs, and labor costs and availability.** Uncertainty about climate change and the regulatory environment may also impact the costs and returns studied here.

The practices and costs used in this study may not be applicable to all situations or used in each production year. Individual growers may use this study as a template and modify it to more accurately reflect their own situations. **The use of trade names and cultural practices in this report does not constitute an endorsement or recommendation by the University of California, nor is any criticism implied by omission of other similar products or cultural practices.**

Farm. This study is for a 100-acre organic farm operation, with land owned by the farmer. Roads, buffer zones, the irrigation system, and a homestead comprise roughly six percent of the acreage. Organic apples are planted on 20 acres and assumed to be in full production. Apples are harvested from August until early November using hand labor; mechanical harvesting is not currently used. The remaining farm acreage is planted to apples (not yet in full production), caneberries, strawberries, and vegetables. **In this study, land value for an established apple orchard is estimated at \$30,000 per acre; no other establishment costs are included here. The land/establishment costs shown on Table 1 non-cash overhead and Table 5 annual investments may be lower for apple orchards with long-term land ownership and therefore change the estimated costs and returns studied here.**

Production Cultural Practices and Material Inputs

Apple Varieties. No specific apple variety is shown in this study. Varieties grown in this region include Newtown Pippin, Gala, Jonagold, Fuji, Red and Golden Delicious, and various heirloom varieties.

Tree Establishment/Orchard Life. The trees are planted on a 10 x 16 foot spacing (tree x row) with 272 trees per acre on standard rootstocks. Rootstocks are an important part of the orchard establishment; different rootstocks (standard vs size-controlling) can affect the size and growth of trees throughout their life. In the second year of establishment 5 percent or 14 trees per acre are replanted to replace those lost in the first year. In the following years trees are replanted as needed when lost to disease, mechanical injury, age, or other environmental conditions. The life of the orchard is assumed to be 25 years. Establishment cost is assumed to be included in the land value shown above and is included on Tables 1 and 5.

Cover Crop. In November of the first establishment year a perennial cover crop (orchard mix) is planted in row middles and germinated by fall and winter rains. Each year the cover crop is managed by mowing and discing the above ground biomass into the soil without damaging tree roots, usually in late May or early June after the cover crop has self-reseeded. Cover crops may need to be replanted during the life of the orchard but only costs for annual cover crop mowing and discing are included in this study.

Fertilizer/Amendments. Soil and leaf samples are taken once per year, which helps determine nutrient management practices in the orchard. Cover crops are assumed to supply most of the nitrogen needs for the apple crop. Compost may also be applied to supplement nitrogen and other nutrient needs but is not included in this study. The soil may also be amended with micronutrients such as boron or zinc if a deficiency is shown. If there is evidence of other nutrient deficiencies in the orchard, calcium may also be

applied. Before any materials are applied it is important to verify acceptability for use in organic operations by national and state organic programs and the farmer's USDA accredited certifying agent.

Training/Pruning. Apple trees are trained as needed to develop tree structure during the establishment years. Established/producing trees are hand pruned in the winter months (December to February) to remove shoots affected by disease and/or to enable light to penetrate the tree canopy for fruit wood production. The estimated cost of pruning is \$1,397 per acre. Prunings are placed in the row middles, shredded with a flail mower, and disced into the soil. Summer pruning may also take place in July to remove diseased, insect, weather, or mechanically damaged wood but is not included here. When used, summer pruning keeps the inner tree canopy open and produces fruit wood. Pruning strategies are dependent on several factors including the use of size-controlling rootstocks, the density of planting, and the susceptibility of apples to sunburn.

Frost Protection. Average winter temperatures in the area are such that frost protection is generally unnecessary and therefore not included in this study.

Pest Management. Information for specific pest management materials and associated application rates can be found in the *UC Integrated Pest Management (IPM) Guidelines for Apple*. For more information on pest identification, monitoring, and pest management materials, visit the UC IPM website at <https://ipm.ucanr.edu/agriculture/apple/>. Pesticide use permits and regulatory information are available through your local Agricultural Commissioner's office. The pesticides shown in this study are used to calculate rates and costs; applications, timing, and materials vary according to pest pressure. Before any pesticides are applied it is important to verify that the materials are allowed for use by national and state organic programs and the farmer's USDA accredited certifying agent. Orchard sanitation, pest identification, monitoring and prevention are essential elements of successful organic apple production. Beneficial insects and predaceous arthropods including parasitic wasps, spiders, lacewings, and lady beetles can lessen overall pest damage within orchards and should be encouraged to proliferate by providing appropriate habitat. Whenever possible, pest management applications that may harm beneficial insects should be avoided. Organically acceptable pest control methods including the purchase of beneficial insects may be cost prohibitive for organic apples grown for processing and are therefore not included in this study.

Weeds. Weeds are managed by mowing and discing the orchard floor a total of four times: once at the same time that the cover crop is mowed and disced, and three additional times during the year.

Diseases. In this area pathogens may overwinter on prunings and other plant material left in the orchard after harvest; they are managed by shredding, mowing, and discing tree and plant material into the soil during the winter months. Also, winter and early spring applications of organically acceptable pest management materials such as horticultural oils, lime sulfur and/or micronized sulfur can assist with disease management.

In this study, apple scab (*Venturia inaequalis*) and powdery mildew (*Podosphaera leucotricha*) are the two main diseases that require attention each year. Management begins with an application of horticultural oil in winter, followed three weeks or more later by a second application at green tip. Lime sulfur or micronized sulfur is then applied at pink bud. Particularly rainy or wet and foggy years may necessitate additional treatments. Management of the bacterial disease fire blight (*Erwinia amylovora*) may also be needed in some years but is not included in this study. Some apple varieties are more susceptible to this disease than others and therefore may require additional management.

Insects. Various insect pests overwinter in orchards in this area including leafrollers, aphids, and scales. The horticultural oil applications used for disease management also help with control of overwintering insects by smothering eggs and larvae, resulting in decreased pest populations.

Leafrollers. Codling moth (*Cydia pomonella*) is a significant insect pest in apples; orchard location, production practices, pest history, and grower experience will factor into how codling moth is monitored and managed. In this study a relatively low codling moth population is assumed, however, management is still required each year. Pheromone-based mating disruption is deployed in April and late July in orchards in this study; effectiveness depends on several factors, including the weather, and the number and type of dispensers used. Pheromones are a species-specific female sex odor that “competitively attracts” male moths resulting in decreased mating and moth populations. No other pesticide applications are assumed for codling moth management. Typically, lower codling moth populations are found in orchards that have a history of pheromone mating disruption use, therefore lessening the need for supplemental treatments.

Two other leafroller species often require pest management each year: apple pandemis (*Pandemis pyrusana*) and orange tortrix (*Argyrotaenia citrana*). Apple pandemis overwinters in orchards and in early spring feeds on blooms and young fruit, leading to scarred and distorted fruit. Orange tortrix also overwinters in orchards and is most damaging later in the season in June, July, and August. Feeding damage also leads to fruit scarring. Pests are managed by applications of spinosad (Entrust) and *Bacillus thuringiensis* (Bt ssp. kurstaki) for both apple pandemis and organic tortrix. For Bt to be effective it must be ingested; the timing and application is critical and most effective in warm, dry weather after egg hatch when larvae are actively feeding. More than one application is generally needed to reduce the population of these pests as is shown in this study.

Aphids and Scales. Various aphid and scale species may also overwinter in apple orchards in this area. Aphids produce the exudate honeydew, which can promote a black sooty mold that damages leaves and small fruits. In significant numbers, scales can hinder growth and development of trees and fruit. The horticultural oils used for management of disease can also assist with aphid and scale management. Because low populations of these pests are assumed for this study no additional pest management practices are included.

Snails. Snails can be a significant pest in organic apple orchards in areas and years with high rainfall, and wet and foggy conditions. In this study Sluggo snail bait is broadcast around the base of the trees using a mechanical spreader/spinner at the rate of 20 pounds per acre. Baits are used only in areas and years with high infestations.

Vertebrates. Gophers are controlled in the spring, early summer and/or in the fall after harvest. Ten traps per acre are deployed and monitored. Although deer can also be a significant pest for apples, control measures are limited and therefore not included here.

Pollination. Cross pollinating apple varieties are interplanted in orchards during establishment. But because apples require adequate pollination to produce a crop, farmers bring beehives onto the farm at the rate of one hive per acre. Cost is estimated at \$150 per acre. This practice improves pollination rates, fruit set, and yield.

Irrigation. The cost of water is estimated at \$282 per acre-foot or \$23.50 per acre-inch in this study. Water costs vary considerably in the area depending upon the water district or agency, delivery, associated fees and taxes, and pumping variables. Spring rainfall and wet, foggy conditions reduce the need for orchard irrigations early in the growing season. During the summer months (July and August) the orchard is irrigated 2 times using 3 acre-inches of water with each irrigation; this helps with fruit growth and sizing. After each irrigation the orchard floor is mowed, disced and smoothed.

Apple Thinning. Organic apples are thinned by hand, usually in June or July, to increase fruit size, remove poor quality fruit, minimize pest habitat around fruit clusters, protect against limb breakage, and manage heavy vs light fruit loads in apple varieties that are prone to alternate bearing crop cycles. Newtown Pippin and Fuji varieties are two varieties that normally require thinning each year for a more consistent and uniform yield. Apples for processing are not always thinned because the increase in cultural costs is not necessarily beneficial from an economic perspective. This study assumes that 50 percent of the apple production acreage is thinned each year. Cost is estimated at \$260 per acre.

Fruit Load/Tree Props. In June or July and in years with heavy fruit loads, tree branches are supported with props and ties to help prevent limb breakage and damage. Older established trees that are well trained and have strong branches generally require fewer props than younger trees. Labor costs to set out props are estimated at \$142 per acre and shown in Table 1 under cultural costs. Material costs are shown in Table 5 under annual investment costs.

Harvest. Depending on the apple variety, harvest may begin as early as mid-August and can go on through early November. This study assumes a one-time harvest in September. Crews use ladders and harvest bags to hand pick fruit from trees; fruit is then transferred into field bins. Tractors with attachments pick up the filled bins and move them from the orchard to a staging area. A forklift moves the bins onto a flatbed truck. Bins are then hauled to the processor, which in this area is generally a short distance away. Harvest cost is estimated at \$75 per ton excluding loading and hauling costs.

Yields. The yield of organic apples for processing is variable and dependent on variety and fruit load in any given year. For this study a representative yield of 20.0 tons per acre is used; the range of yields for organic apples for processing in this area is shown on Table 4 Ranging Analysis.

Returns. A price to growers of \$405 per ton is assumed for this study. This price falls within a range of prices received by growers in the area. The Ranging Analysis (Table 4) shows a range of prices, yields, and potential returns to growers for the organic apples studied here.

Post Harvest Operations. After harvest and to help prevent overwintering diseases and pests for the next season's crop, unharvested fruit is removed from trees and disced into the soil along with any other fruit or plant material found on the ground. The irrigation system is also checked and maintained after the harvest as is necessary.

Labor, Interest, and Equipment

Labor. The labor rates used in this study are \$29.60 per hour for machine operators and \$23.68 for general labor, which includes overhead of 48 percent. The basic hourly wages are \$20.00 for machine operators and \$16.00 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for orchard crops (code 0016), and a percentage for other possible benefits. Workers' compensation insurance costs will vary among growers, but for this study the cost is based upon the average industry rate as of January 1, 2023. Labor for the operations involving machinery are 20 percent higher than the operation time given in Table 1 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 new minimum wage and overtime laws were passed in California that were gradually phased in over time. For 2023 minimum wage increased to \$15.50 per hour, a 3.3 percent increase over the 2022 minimum wage. Many growers may already pay wages that are higher than the state's legal requirement, as is shown in this study. For 2023 overtime wages for farming operations with 25 or fewer employees is required for work over 9 hours per day or 50 hours per

week. For operations that employ 26 or more employees overtime wages are now required for work over 8 hours per day or 40 hours per week.

Federal H-2A Program. Growers may choose to use the H-2A guestworker visa program to employ workers. Rates of pay are determined by the highest applicable wage rates that are in effect at the time work is performed: the adverse effect wage rate (AEWR), the applicable prevailing wage, the agreed-upon collective bargaining rate, or the Federal or State statutory minimum wage (US Department of Labor). Growers also need to comply with other requirements associated with the H-2A program, including those for housing, meals, and transportation. Use of this program may result in labor costs that are higher than those shown in this study but may be necessary in order to assure a reliable supply of labor.

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 January 2023.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by the 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 red dye diesel and gasoline are \$5.40 (excludes excise tax) and \$4.50 per gallon, respectively. The cost includes a 2 percent local sales tax on diesel fuel and 8 percent sales tax on gasoline. Gasoline costs also include federal and state excise taxes, which are refundable for on-farm use when filing income taxes. The fuel, lube, and repair cost per acre for each operation in Table 1 is determined by multiplying the total hourly operating cost in Table 6 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.

Pickup Truck. This study includes costs for use of a pickup truck for business purposes.

Risk. The risks associated with organic apple production for processing are not assigned a production cost. This study assumes that all acres are contracted prior to harvest and all tonnage delivered on time to meet contracts. While this study makes an effort to model a production system based on typical, real world practices, it cannot fully represent the production, financial, market, legal, and human resource risks that ultimately affect the profitability and economic viability of organic apple production. Crop insurance is one tool that growers may use to protect against loss but is not included 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. Because overhead costs are farm and ranch specific, costs will vary among growers. In most cases costs are apportioned based on the number of crops produced per acre per year.

Property Taxes. Counties charge a base property tax rate of 1 percent on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1 percent of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.710 percent of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and is estimated at \$945 per year.

Office Expense. Office and business expenses are estimated to be \$600 per acre. Costs include, but are not limited to, a variety of administration and office expenses, telephones, supplies, utilities, bookkeeping, and accounting.

Food Safety and Regulatory Programs. To ensure the safety of agricultural products, accommodate buyer contracts and requests, and comply with regulatory programs such as those for water quality and nutrient management, growers now dedicate staff time to supervise and manage these programs.

Food Safety. An estimated cost of \$50 per acre per year is included in this study. It includes participation in a third party (independent) audit of food safety practices for farm products marketed as fresh and products targeted for processing. Costs associated with food safety programs vary depending upon the farm and inspection circumstances.

Fertilizer and Irrigation Regulatory Programs. This study includes a cost of \$95 per acre per year for compliance and fees associated with current water quality and nutrient management regulatory programs: the State's Sustainable Groundwater Management Act (SGMA) and the Central Coast's Irrigated Lands Regulatory Program (ILRP). The estimated costs are for participation in a third-party entity to comply with ILRP's Central Coast (Region 3) Agricultural Order (Ag Order 4.0), and those associated with SGMA's local Groundwater Sustainability Agency (GSA). Cost also includes supervision/staff time to assist with recordkeeping, data analysis, decision-making, reporting, and administration.

Organic Certification and Registration Fees. Certification and registration fees for organic apples for processing are estimated at \$53 per acre. This includes fees associated with gross sales, travel and inspection, and certification by a USDA accredited certifying agent and the California Department of Food and Agriculture's Organic Program. Fees will vary from year to year depending upon inspection requirements and product sales.

California Apple Commission. No fees or charges are incurred for organic apples produced for processing.

Farm Management/Supervision. Costs for a farm manager/supervisor are not included in this study but may be applicable for some farm businesses.

Field Sanitation. Sanitation services for the farm provide portable toilets and washing facilities to the farm and are shown at \$40 per acre. The cost includes delivery and weekly service as needed during the cropping season. Costs also include soap, other suitable cleansing agents, and single-use towels. Separate potable water and single-use drinking cups are also supplied. Cost will vary depending upon the number of employees and portable units required.

Investment Repairs. Annual repairs on investment or capital recovery items that require maintenance are calculated as two percent of the purchase price.

Non-Cash Overhead

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

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements) the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by the American Society of Agricultural 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 equal to the purchase price because land does not depreciate. The purchase price and salvage value for certain equipment and investments are shown in Table 5.

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 and the life of the machine.

Interest Rate. The interest rate of 8.50 percent is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions but the basic suggested rate is provided by a farm lending agency as of January 2023.

Tools and Harvest Aids. This includes shop and orchard tools used on the farm. The value estimated does not represent any specific inventory. It also includes twenty picking bags for hand harvest, twenty 10-foot aluminum tripod ladders, and 500 (4x4) wooden bins for transporting apples from the orchard to the processor.

Fuel Tanks. Two 500-gallon fuel tanks, one for diesel and one for gasoline, are set up in a cement containment pad that meets federal, state and county regulations.

Irrigation System. The irrigation system consists of a pump, metering system, main lines, filtration station, and micro sprinkler system, which is assumed to have been installed prior to establishing the orchard. The irrigation system is considered an improvement to the property and has a 25-year lifespan. Annual irrigation system maintenance costs are included in this study and shown in Table 1 under Post-Harvest.

Equipment. Farm equipment is purchased when it is new or used. This study shows the current purchase price for new equipment, which is adjusted to 70 percent to reflect a mix of new and used equipment. Seventy percent indicated a relatively high percentage of new equipment because of machinery upgrades necessary for air quality requirements. Annual ownership costs for equipment and other investments are shown in Table 5. 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 – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 1. COSTS PER ACRE TO PRODUCE AND HARVEST ORGANIC APPLES FOR PROCESSING

Operation	Operation		Cash and Labor Costs per Acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent			
Cultural:									
Orchard Prunings	59.00	1,397	0	0	0	0	1,397		
Shred/Mow Prunings	0.34	12	5	3	0	0	19		
Disc Prunings	0.26	9	3	2	0	0	15		
Disease/Insect Management-Winter	0.46	16	6	3	57	0	82		
Disease/Insect Management-GreenTip	0.46	16	6	3	73	0	98		
Vertebrate Pest Management 2X	0.75	18	0	0	45	0	63		
Pollination (1 Hive per Acre)	0.00	0	0	0	0	150	150		
Disease/Insect Management-Pink Bud	0.46	16	6	3	39	0	64		
Pheromone Application 2X	5.00	118	0	0	280	0	398		
Mow Cover Crop	0.34	12	5	3	0	0	19		
Disc Cover Crop	0.26	9	3	2	0	0	15		
Snail Bait Application	0.26	9	3	1	73	0	87		
Insect Control 3X	1.38	49	18	9	141	0	217		
Mow Orchard 3X	1.03	37	14	8	0	0	58		
Disc-Smooth Orchard Floor 3X	0.77	27	10	6	0	0	44		
Thin Apples	11.00	260	0	0	0	0	260		
Prop/Tie Tree Branches	6.00	142	0	0	0	0	142		
Soil & Leaf Samples	0.00	0	0	0	0	17	17		
Irrigate 2X	2.00	47	0	0	141	0	188		
Vertebrate Pest Management 2X	0.75	18	0	0	45	0	63		
Pickup Truck ¾ Ton	0.53	19	6	3	0	0	28		
TOTAL CULTURAL COSTS	91.06	2,234	85	44	894	167	3,425		
Harvest:									
Harvest Apples	0.00	0	0	0	0	1,500	1,500		
Load Apples	0.82	29	11	4	0	0	44		
Haul Apples	0.50	18	15	6	0	0	39		
TOTAL HARVEST COSTS	1.32	47	26	10	0	1,500	1,583		
Post-Harvest:									
Orchard Clean Up	1.75	41	0	0	0	0	41		
Disc-Smooth Orchard Floor	0.26	9	3	2	0	0	15		
Irrigation System Maintenance	1.50	36	0	0	28	0	64		
TOTAL POST-HARVEST COSTS	3.51	86	3	2	28	0	119		
Interest on Operating Capital at 7.00%							145		
TOTAL OPERATING COSTS/ACRE	96	2,367	114	57	922	1,667	5,272		

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 1. CONTINUED

Operation	Operation		Cash and Labor Costs per Acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/Rent			
CASH OVERHEAD:									
Office Expense								600	
Field Sanitation								40	
Liability Insurance								9	
Food Safety Program								50	
Water/Nutrient Management Programs								95	
Organic Certification/Registration								53	
Property Taxes								307	
Property Insurance								22	
Investment Repairs								21	
TOTAL CASH OVERHEAD COSTS/ACRE								1,198	
TOTAL CASH COSTS/ACRE								6,470	
NON-CASH OVERHEAD:									
		Per Producing Acre		Annual Cost					
				Capital Recovery					
Land – Established Apples		30,000		2,550				2,550	
Bins (500)		295		29				29	
Shop Tools		237		23				23	
Harvest Bin Trailer		25		2				2	
Harvest Bin Trailer		25		2				2	
Fuel Tanks		259		27				27	
Wood Props 6'		24		4				4	
Tripod Harvesting Ladders (20)		69		7				7	
Harvest Shoulder Bags (20)		12		1				1	
Forklift		147		17				17	
Equipment		1,019		119				119	
TOTAL NON-CASH OVERHEAD COSTS								2,781	
TOTAL COSTS/ACRE								9,251	

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 2. COSTS AND RETURNS PER ACRE TO PRODUCE AND HARVEST ORGANIC APPLES FOR PROCESSING

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Organic Apples	20	Ton	405.00	8,100	
TOTAL GROSS RETURNS					
	20	Ton		8,100	
OPERATING COSTS					
Insecticide:				451	
Dipel (Bt)	5.00	Lb	19.99	100	
Pheromone Dispensers	1.00	Acre	280.00	280	
Entrust	6.00	Oz	11.88	71	
Fungicide:				139	
Superior Oil Spray	7.00	Gal	14.28	100	
Lime Sulfur	2.00	Gal	19.60	39	
Irrigation:				169	
Water-Central Coast	6.00	AcIn	23.50	141	
Irrigation System-Parts	0.50	Acre	56.00	28	
Custom:				150	
Pollination (1 Hive per Acre)	1.00	Acre	150.00	150	
Contract:				1,517	
Soil & Leaf Samples	0.10	Acre	170.00	17	
Harvest Apples	20.00	Ton	75.00	1,500	
Miscellaneous:				163	
Gopher Traps	10.00	Each	9.00	90	
Sluggo Snail Bait	20.00	Lb	3.65	73	
Labor				2,367	
Equipment Operator Labor	9.77	hrs	29.60	289	
Non-Machine Labor	87.75	hrs	23.68	2,078	
Machinery				171	
Fuel-Gas	1.33	gal	4.50	6	
Fuel-Diesel	20.08	gal	5.40	108	
Lube				17	
Machinery Repair				39	
Interest on Operating Capital @ 7.00%				145	
TOTAL OPERATING COSTS/ACRE				5,272	
TOTAL OPERATING COSTS/TON				264	
NET RETURNS ABOVE OPERATING COSTS				2,828	

UC COOPERATIVE EXTENSION - UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 2. CONTINUED

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS					
Office Expense				600	
Field Sanitation				40	
Liability Insurance				9	
Food Safety Program				50	
Water/Nutrient Management Programs				95	
Organic Certification/Registration				53	
Property Taxes				307	
Property Insurance				22	
Investment Repairs				21	
TOTAL CASH OVERHEAD COSTS/ACRE				1,198	
TOTAL CASH OVERHEAD COSTS/TON				60	
TOTAL CASH COSTS/ACRE				6,470	
TOTAL CASH COSTS/TON				323	
NET RETURNS ABOVE CASH COSTS				1,630	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Land - Established Apples				2,550	
Bins (500)				29	
Shop Tools				23	
Harvest Bin Trailer				2	
Harvest Bin Trailer				2	
Fuel Tanks				27	
Wood Props 6'				4	
Tripod Harvesting Ladders (20)				7	
Harvest Shoulder Bags (20)				1	
Forklift				17	
Equipment				119	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				2,781	
TOTAL NON-CASH OVERHEAD COSTS/TON				139	
TOTAL COST/ACRE				9,251	
TOTAL COST/TON				463	
NET RETURNS ABOVE TOTAL COST				-1,151	

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 3. MONTHLY CASH COSTS PER ACRE TO PRODUCE AND HARVEST ORGANIC APPLES FOR PROCESSING

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Total
	22	23	23	23	23	23	23	23	23	23	23	
Cultural:												
Orchard Prunings	1,397											1,397
Shred/Mow Prunings	19											19
Disc Prunings	15											15
Disease/Insect Management-Winter		82										82
Disease/Insect Management-Green Tip			98									98
Vertebrate Pest Management 2X				63								63
Pollination (1 Hive per Acre)				150								150
Disease/Insect Management-Pink Bud					64							64
Pheromone Application 2X					199			199				398
Mow Cover Crop						19						19
Disc Cover Crop						15						15
Snail Bait Application							87					87
Insect Control 3X							79	69	69			217
Mow Orchard 3X							19	19	19			58
Disc-Smooth Orchard Floor 3X							15	15	15			44
Thin Apples							260					260
Prop/Tie Tree Branches							142					142
Soil & Leaf Samples								17				17
Irrigate 2X								94	94			188
Vertebrate Pest Management 2X										63		63
Pickup Truck 3/4 Ton	3	3	3	3	3	3	3	3	3	3	3	28
TOTAL CULTURAL COSTS	1,434	85	101	215	266	36	605	416	200	65	3	3,425
Harvest:												
Harvest Apples										1,500		1,500
Load Apples										44		44
Haul Apples										39		39
TOTAL HARVEST COSTS	0	0	0	0	0	0	0	0	0	1,583	0	1,583
Post-Harvest:												
Orchard Clean Up											41	41
Disc-Smooth Orchard Floor											15	15
Irrigation System Maintenance											64	64
TOTAL POST-HARVEST COSTS	0	0	0	0	0	0	0	0	0	0	119	119
Interest on Operating Capital @7.00%	8	9	9	11	12	12	16	18	20	29	-1	145
TOTAL OPERATING COSTS/ACRE	1,442	94	110	226	278	49	621	434	219	1,678	121	5,272
CASH OVERHEAD												
Office Expense										600		600
Field Sanitation										40		40
Liability Insurance										9		9
Food Safety Program										50		50
Water/Nutrient Management Programs										95		95
Organic Certification/Registration										53		53
Property Taxes			154					154				307
Property Insurance			11					11				22
Investment Repairs	2	2	2	2	2	2	2	2	2	2	2	21
TOTAL CASH OVERHEAD COSTS	2	2	166	2	2	2	2	166	2	849	2	1,198
TOTAL CASH COSTS/ACRE	1,444	96	276	228	280	51	623	601	221	2,527	123	6,470

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 4. RANGING ANALYSIS

COSTS PER ACRE AND PER TON AT VARYING YIELDS TO PRODUCE AND HARVEST ORGANIC APPLES FOR PROCESSING

	YIELD (TONS)						
	16.40	17.60	18.80	20.00	21.20	22.40	23.60
OPERATING COSTS/ACRE:							
Cultural	3,425	3,425	3,425	3,425	3,425	3,425	3,425
Harvest	1,313	1,403	1,493	1,583	1,673	1,763	1,853
Post-Harvest	119	119	119	119	119	119	119
Interest on Operating Capital @ 7.00%	143	144	144	145	145	146	146
TOTAL OPERATING COSTS/ACRE	5,000	5,091	5,181	5,272	5,362	5,453	5,544
TOTAL OPERATING COSTS/TON	305	289	276	264	253	243	235
CASH OVERHEAD COSTS/ACRE	1,198	1,198	1,198	1,198	1,198	1,198	1,198
TOTAL CASH COSTS/ACRE	6,198	6,289	6,379	6,470	6,560	6,651	6,742
TOTAL CASH COSTS/TON	378	358	340	323	310	297	286
NON-CASH OVERHEAD COSTS/ACRE	2,781	2,781	2,781	2,781	2,781	2,781	2,781
TOTAL COSTS/ACRE	8,979	9,070	9,160	9,251	9,341	9,432	9,523
TOTAL COSTS/TON	548	516	488	463	441	421	404

Net Return Per Acre Above Operating Costs For Organic Apples For Processing

PRICE (\$/ton)	YIELD (ton/acre)						
Organic Apples	16.40	17.60	18.80	20.00	21.20	22.40	23.60
360.00	904	1,245	1,587	1,928	2,270	2,611	2,952
375.00	1,150	1,509	1,869	2,228	2,588	2,947	3,306
390.00	1,396	1,773	2,151	2,528	2,906	3,283	3,660
405.00	1,642	2,037	2,433	2,828	3,224	3,619	4,014
420.00	1,888	2,301	2,715	3,128	3,542	3,955	4,368
435.00	2,134	2,565	2,997	3,428	3,860	4,291	4,722
450.00	2,380	2,829	3,279	3,728	4,178	4,627	5,076

Net Return Per Acre Above Cash Costs For Organic Apples For Processing

PRICE (\$/ton)	YIELD (ton/acre)						
Organic Apples	16.40	17.60	18.80	20.00	21.20	22.40	23.60
360.00	-299	42	384	730	1,067	1,408	1,750
375.00	-53	306	666	1,030	1,385	1,744	2,104
390.00	193	570	948	1,330	1,703	2,080	2,458
405.00	439	834	1,230	1,630	2,021	2,416	2,812
420.00	685	1,098	1,512	1,930	2,339	2,752	3,166
435.00	931	1,362	1,794	2,230	2,657	3,088	3,520
450.00	1,177	1,626	2,076	2,530	2,975	3,424	3,874

Net Return Per Acre Above Total Costs for Organic Apples for Processing

PRICE (\$/ton)	YIELD (ton/acre)						
Organic Apples	16.40	17.60	18.80	20.00	21.20	22.40	23.60
360.00	-3,081	-2,739	-2,398	-2,051	-1,715	-1,373	-1,032
375.00	-2,835	-2,475	-2,116	-1,751	-1,397	-1,037	-678
390.00	-2,589	-2,211	-1,834	-1,451	-1,079	-701	-324
405.00	-2,343	-1,947	-1,552	-1,151	-761	-365	30
420.00	-2,097	-1,683	-1,270	-851	-443	-29	384
435.00	-1,851	-1,419	-988	-551	-125	307	738
450.00	-1,605	-1,155	-706	-251	193	643	1,092

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 5. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS FOR ORGANIC APPLES FOR PROCESSING

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
23	45 HP2WD Tractor	54,000	20	6,929	5,563	22	305	5,889
23	Airblast Sprayer 3 PT, 100 Gal	8,930	10	1,579	1,255	4	53	1,311
23	Flail Mower 6'	6,455	10	1,142	907	3	38	948
23	Offset Disc 8'	14,800	10	2,617	2,079	6	87	2,172
23	Ring Roller 8'	3,390	15	325	397	1	19	417
23	Spreader-Double Spinner	4,030	10	760	563	2	24	589
23	Pickup Truck 3/4 Ton	50,000	7	18,967	7,675	24	345	8,044
23	Bin Hauler - 3 PT	3,920	15	376	459	2	21	482
23	Flatbed Truck	70,000	15	13,628	7,947	30	418	8,395
TOTAL		215,525	-	46,323	26,844	93	1,309	28,246
70% of New Cost*		150,868	-	32,426	18,791	65	916	19,772

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes	Repairs	
INVESTMENT								
Land - Established Apples (20Acres)	600,000	25	600,000	51,000	426	6,000	0	57,426
Bins (500)	28,000	25	1,960	2,711	11	150	560	3,431
Shop Tools	22,500	25	1,575	2,178	9	120	450	2,757
Harvest Bin Trailer	2,340	25	164	227	1	13	47	287
Harvest Bin Trailer	2,340	25	164	227	1	13	47	287
Fuel Tanks	24,585	20	1,721	2,562	9	132	492	3,195
Wood Props 6'	2,240	10	0	341	1	11	0	353
Tripod Harvesting Ladders (20)	6,600	25	462	639	3	35	132	809
Harvest Shoulder Bags (20)	1,160	25	0	113	0	6	23	143
Forklift	14,000	15	980	1,651	5	75	280	2,011
TOTAL INVESTMENT	703,765	-	607,026	61,650	465	6,554	2,031	70,700

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Office Expense	20	Acre	600.00	12,000
Field Sanitation	20	Acre	40.00	800
Liability Insurance	20	Acre	9.45	189
Food Safety Program	20	Acre	50.00	1,000
Water/Nutrient Management Programs	20	Acre	95.00	1,900
Organic Certification/Registration	20	Acre	53.00	1,060

UC COOPERATIVE EXTENSION - UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 6. HOURLY EQUIPMENT COSTS FOR ORGANIC APPLES FOR PROCESSING

Yr	Description	Organic Apples	Total	Cash Overhead			Operating			Total Costs/Hr.
		Hours Used	Hours Used	Capital Recovery	Insur- ance	Taxes	Lube& Repairs	Fuel	Total Oper.	
23	45 HP2WD Tractor	156	600	6.49	0.03	0.36	4.14	11.93	16.07	22.94
23	Airblast Sprayer 3 PT, 100 Gal	55	200	4.39	0.01	0.18	1.72	0.00	1.72	6.31
23	Flail Mower 6'	34	200	3.17	0.01	0.13	3.02	0.00	3.02	6.34
23	Offset Disc 8'	31	200	7.28	0.02	0.30	2.71	0.00	2.71	10.32
23	Ring Roller 8'	31	130	2.14	0.01	0.10	0.43	0.00	0.43	2.67
23	Spreader-Double Spinner	5	200	1.97	0.01	0.08	0.00	0.00	0.00	2.06
23	Pickup Truck 3/4 Ton	11	250	21.49	0.07	0.97	5.69	11.25	16.94	39.47
23	Bin Hauler - 3 PT	16	200	1.61	0.01	0.08	0.67	0.00	0.67	2.35
23	Flatbed Truck	10	120	46.36	0.17	2.44	11.62	30.38	42.00	90.96