
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
ROMAINE HEARTS LETTUCE



CENTRAL COAST REGION
Monterey, Santa Cruz, and San Benito Counties

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Central Coast - Monterey, Santa Cruz, and San Benito Counties

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INTRODUCTION

The sample costs to produce and harvest romaine hearts lettuce in the Central Coast Region – Monterey, Santa Cruz, and San Benito 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 assumptions. For additional information or explanation of calculations used in the study, call Jeremy Murdock, Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-4651 or the local UC Cooperative Extension office, <https://ucanr.edu/About/Locations/>.

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 through 6 and pertain to sample costs to produce and harvest romaine hearts lettuce for the Central Coast Region – Monterey, Santa Cruz, and San Benito Counties. Sample costs are given for tractor, fuel, 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 practices vs custom services, production location and weather conditions, land rent and taxes, soil type, water costs, pest pressures, material inputs, energy costs, and labor costs and availability.** For example, lettuce produced in areas with heavy clay soils may have higher land preparation costs per acre than areas with sandy soils. Areas with sandy soils, in turn, will likely have higher water use and irrigation costs per acre than areas with heavy clay soils. 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. Additional leaf lettuce production information for California is available online from the University of California Division of Agriculture and Natural Resources at: <https://anrcatalog.ucanr.edu/Details.aspx?itemNo=7216>. **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 assumes a farm operation of 1,500 non-contiguous acres of rented land. Roads and buffer zones comprise roughly six percent of the acreage. Romaine lettuce for the hearts market is planted on 250 acres and rotated with other lettuce and cool season vegetable crops to assist with pest management and soil fertility. Cover crops, which also assist with soil fertility and water quality and nutrient management regulatory programs, are included in crop rotations when calendars of operations and the economics of coastal vegetable production allow. Costs for a cover crop are not included in this study. In some production areas lettuce may also be rotated with strawberries, which may help with disease management. Lettuce is planted continuously from late December to mid-August along the Central Coast. Monterey County has a host-free period (December 7 through 21) for management of lettuce mosaic virus (LMV) during which time lettuce may not be planted. Typically, a farm can produce up to two vegetable crops per year on each field. Costs that affect both crops are allocated accordingly. Land rents for row crops range from a low of \$500 to a high of \$4,000 per acre per year in the area. For this study, an annual rental rate of \$3,200 per acre per year is assumed, with \$1,600 allocated to the lettuce crop.

Production Cultural Practices and Material Inputs

Land Preparation. Prior to land preparation and to help determine fertilization practices, a total of 12 preplant soil samples per 250 acres are taken for analysis. For this study land preparation begins in November and December of the year preceding the lettuce planting and includes disking (four times), subsoiling (twice), land and laser leveling (once each for every 2 crops). The acreage is then chiseled (a total of four times), disced (twice), and the beds are listed. In January, the beds are cultivated (twice) with a rolling cultivator (Lilliston), and then shaped with a power mulcher. Though not included in this study, some growers amend soils with compost during land preparation. If compost is used, an estimated cost of \$170 per acre should be added to the total operating costs shown on Tables 1, 2 and 3, which reflects a custom application rate of two tons per acre per crop each year. This application rate is indicative of a soil

maintenance rather than the beginning of a soil building program; in the case of a beginning soil building program compost application rates and costs would likely be considerably higher.

Plant/Thin. Romaine lettuce is direct-seeded using an 80-inch 6-row 3-bed precision air-planter. Bed preparation and precision planting is especially important when using automated technologies. This study assumes that lettuce is planted in January at the rate of 189,000 seeds per acre using a 3.0-inch in-row spacing and then thinned to a 9-inch in-row spacing approximately 14 to 21 days after planting using an automated thinner. The custom application and material cost for this practice is estimated at \$300 per acre. Alternatively, some growers use contract or field labor to thin lettuce crops.

Fertilizers. Potassium sulfate is custom applied prior to planting at the rate of 150 pounds per acre. At planting, an anti-crustant (7-7-0-7) is custom applied at the rate of 30 gallons per acre, which supplies 22 pounds of nitrogen (N) to the crop. During the automated thinning process a fertilizer is applied, which supplies the equivalent of 30 pounds N per acre. A liquid fertilizer (20-0-0-5) is injected into the drip irrigation system once in late February and once in March for a total of 60 gallons per acre or 126 pounds N. A total of 178 pounds of N per acre is applied during the season. Fertilization practices and materials will vary from grower to grower and location to location.

Irrigation. For this study, the estimated cost of pumped water is \$282 per acre-foot or \$23.50 per acre-inch. Water costs vary considerably in the area depending upon the water district or agency, delivery, associated fees and taxes, and pumping variables and for 2023 were as high as \$435 per acre-foot in the area. A total of 4.5 acre-inches of water are applied through sprinklers during stand establishment until thinning – 3.5 acre-inches during the first 6 to 10 days after planting and another 1 acre-inch during the week prior to thinning. An additional 7.5 acre-inches are applied through the drip system using single use drip tape during the remainder of the growing season (February, March, and April) for a seasonal total of 12 acre-inches per acre. The cost for single use drip tape is estimated at \$300 per acre. Labor costs include time to set up and monitor the sprinkler and drip irrigation systems for proper function. Total water use will vary depending upon factors such as irrigation method, soil type, weather, and the time of the year the crop is planted.

CropManage. Growers may now take advantage of real-time recommendations for efficient water use and nitrogen fertilizer applications by using UC ANR's CropManage: <https://cropmanage.ucanr.edu/>. CropManage, which is currently available at no cost to growers, may be especially helpful in decision-making, accurate documentation of material inputs, sustainable practices, and compliance with both state and regional regulatory programs (see Fertilizer and Irrigation Regulatory Programs section below). Commercially available software programs may also be used.

Pest Management. Information for specific pest management materials and the associated application rates can be found in the *UC Integrated Pest Management (IPM) Guidelines for Lettuce*. For more information on pest identification, monitoring, and pest management materials, visit the UC IPM website at: <https://ipm.ucanr.edu/agriculture/lettuce/>. Written recommendations are required for many commercially applied pesticides and are made by licensed pest control advisers. For information and pesticide use permits, contact your local county Agricultural Commissioner's office.

Pest Control Adviser/Certified Crop Adviser (PCA/CCA). A PCA/CCA monitors the field for insects, diseases, irrigation, nutrition, and other production needs to determine the necessary management practices. The cost for a PCA in this study is \$39 per acre.

Weeds. Weeds are managed using one banded (applied to 37.5 percent of the area) herbicide application immediately after planting. Material type will depend on the specific weed populations and time of year planted. The crop is cultivated once at the time of thinning, which is performed in conjunction with the automated thinning operation. A second cultivation occurs roughly two weeks after thinning. The beds are hand weeded and any remaining doubles are removed approximately three weeks after thinning, and then weeded again prior to harvest when necessary. Two hand weeding operations are included here at a cost of \$284 per acre. Although not included in this study, many growers now include automated technologies in their weed management programs. An estimated cost of \$200 per acre (as a custom service) should be added to the operating costs shown on Tables 1, 2 and 3 if an automated weeding operation is used; the hand weeding costs shown here may then be lower. Costs for automated technologies will vary depending upon weed populations, the number of passes needed per acre, and custom services vs in-house operations.

Insects/Diseases. Predominant insect pests include but are not limited to aphids and thrips. Depending on pest pressures, three to four pest management applications are typically used during the growing season. Recently, Impatiens necrotic spot virus (INSV – a tospovirus) has become an important disease in Salinas Valley lettuce production. It is vectored by western flower thrips (*Frankliniella occidentalis*). Management includes monitoring fields and removing weeds in and around lettuce plantings to reduce non-crop reservoirs of INSV and thrips. The use of tolerant varieties can help manage the severity of this disease. The seed costs shown in this study will likely increase as a result of research that is underway to breed resistance into lettuce varieties. Soilborne diseases include wilts such as pythium (pathogen: *Pythium uncinulatum*), fusarium (pathogen: *Fusarium oxysporum* f. sp. *lactucae*), and verticillium (pathogen: *Verticillium dahlia*), plus the disease lettuce drop (pathogen: *Sclerotinia minor*), and foliar diseases such as downy mildew (pathogen: *Bremia lactucae*). All can cause substantial damage and crop loss in romaine lettuce production. Control of soilborne diseases is mostly achieved by selecting resistant/tolerant seed varieties at planting. If disease control is necessary, two to five fungicide applications are used during the season. Because of the variation in insect and disease pressures from year to year and location to location, costs for a generic pest management program are included in this study.

Harvest. Romaine hearts lettuce is hand harvested and field packed at crop maturity. The exact timing depends on the variety and time of year planted. Cool season plantings may require 100 days to mature, but as the season warms, time to maturity decreases. For this study, a harvest and field packing cost of \$8.00 per carton is assumed. A carton contains 12 3-count bags (3 hearts per bag) weighing 22 pounds. Transportation costs vary depending on the distance to market and are included in the above costs. Cooling and palletizing costs an additional \$1.70 per carton, which brings the total harvest cost to \$9.70 per carton. In addition, a sales and marketing cost of \$1.35 per carton is included in this study; this cost may vary from grower to grower.

Yield. Yield is estimated to range from 700 to 1,000 cartons per acre, with 850 cartons the representative yield used in this study. The 12 3-count bag (per carton) pack, weighing 22 pounds, is only one of many different packs that may be used for romaine lettuce. Actual yield per acre depends upon many variables, including time of year planted, production location, conditions, and pack type and weight.

Returns. Price for romaine hearts lettuce is estimated to range from \$12 to over \$36 per carton (12 3-count bags) with a representative price of \$24 per carton used in this study. This range reflects the Salinas-Watsonville 2020 to 2022 3-year weekly shipping point averages of the USDA Agricultural Marketing Service. Table 4 provides more information on yield and price ranges, including sample net returns above indicated costs. **It is important to note that lettuce prices are influenced by market conditions and that**

lettuce is also sold on contract, which may impact the prices and net returns that are studied here in complex ways.

Growing Costs. Some growers along the Central Coast of California prefer to focus on growing costs and therefore separate total harvest costs from total cash costs, and equipment depreciation and replacement costs. For this study, growing costs are noted at the bottom of Table 1 and are calculated by subtracting total harvest costs from total costs. **Growing costs in this region vary considerably and depend on grower specific production practices, water and other input costs, and land rent and taxes.**

Labor, Interest, and Equipment

Labor. The labor rates used in this study are \$29.60 per hour for machine operators, \$25.00 for irrigators and \$23.68 for general labor, which includes overhead of 48 percent. The basic hourly wages are \$20.00 for machine operators, \$16.90 for irrigators and \$16.00 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for truck crops (code 0172), 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 operations involving machinery is 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. In 2022 the new overtime law completed its multi-year phase in period for farming 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 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 American Society of Agricultural and Biological Engineers (ASABE). Fuel and lubrication costs are also determined by ASAE 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 taxes) 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 the cost for use of a pickup truck for business purposes.

Risk. The risks associated with producing and marketing lettuce are considered high. While this study makes every 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 fresh market vegetable production. The market for fresh vegetables is volatile for both price and quantity. A market channel should be determined before any lettuce production begins.

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 two on a per acre basis.

Insurance. Insurance for farm investments varies depending upon 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 and other potential farm related liabilities and costs \$2 per acre for each crop.

Office Expense. Annual office and business expenses are estimated at \$750 per acre. Because two crops are produced per acre each year, half of that cost, or \$375 is assumed for the lettuce crop studied here. Costs include, but are not limited to, a variety of administration and office expenses, a ranch supervisor, telephones, supplies, utilities, bookkeeping, and accounting. Some growers have one or more additional sub-foremen for various aspects of their operations. Costs for additional foremen are not included here.

Land Rent. Land rents in Monterey, Santa Cruz, and San Benito Counties range from \$500 to \$4,000 per acre per year. In this study land rent is assumed to be \$3,200 per acre per year, with \$1,600 allocated to the lettuce crop. However, rents vary substantially in the area. Land rent includes developed wells and irrigation system. In general, growers in the region are responsible for the portion above ground such as the pump, and the landowner is responsible for what is below ground, such as the well running dry.

Food Safety and Regulatory Programs. To ensure the safety of fresh products, accommodate buyer requests, and comply with regulatory programs such as those for water quality and nutrient management, growers often have in-house departments and/or staff specially dedicated to supervision and management of these programs. **Associated costs will vary depending upon the farm size and complexity of operations.**

Food Safety. An estimated cost of \$112 per acre per year or \$56 per acre per crop is included in this study. It includes participation in a third party (independent) audit of food safety practices.

Fertilizer and Irrigation Regulatory Programs. This study includes a cost of \$150 per acre per year or \$75 per acre per crop 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 two full time employees: a field technician to assist with sampling, data collection and on-farm problem-solving and an in-house supervisory program manager/analyst to assist with recordkeeping, data analysis, decision-making, reporting, and administration. Fees associated with both SGMA's local Groundwater Sustainability Agency (GSA) and participation in a third-party entity to comply with ILRP's Central Coast (Region 3) Agricultural Order (Ag Order 4.0) are also estimated and included in the cost.

Management Salaries. Wages for other farm managers are not included as a cash cost. Any returns above total costs are considered a return to management.

Field Sanitation. Sanitation services for the farm provide portable toilets and washbasins to the farm at a cost of \$15 per acre. The cost includes two double toilets with washbasins, delivery and pickup, and 12 months of weekly servicing. Costs also include soap or other suitable cleansing agent, and single-use towels. Separate potable water and single-use drinking cups are also supplied. Growers using contract labor may not have a separate sanitation cost.

Investment Repair. Repair costs are the annual maintenance costs for investments in non-cash overhead. For this study, annual repairs are calculated as 2 percent of the new cost, with the exception of drip system repairs, which are 5 percent of the total cost and include materials & labor.

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 the annual capital recovery costs is: $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$.

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements), the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by 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 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 used and the life of the machine.

Interest Rate. An 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 is the basic suggested rate by a farm lending agency as of January 2023.

Building. The metal building or buildings are on a cement slab and comprise 2,400 square feet.

Tools. This includes shop and field tools used on the farm. The value is estimated and does not represent any specific inventory.

Fuel Tanks. Two 1,000-gallon fuel tanks, one for diesel and one for gasoline, are on metal stands. The tanks are set up in a cement containment pad that meets federal, state, and county regulations.

Irrigation System/Trailers. The irrigation system is maintained by the landowner and assumed to be included in the land rental cost. The grower invests in and owns sprinkler pipe and drip system materials sufficient for irrigation needs. The grower also owns trailers and equipment needed for moving pipe and other irrigation supplies to and from the field. Irrigation water is pumped from a well and delivered to the fields through an underground pipe system. Main lines above ground are connected to the underground system to deliver water for the sprinkler and drip irrigations. In this study, water is pumped from a depth of 120 feet in a 500-foot well and the grower pays the pumping cost.

Equipment. Farm equipment is purchased when it is both new and used. This study shows the current purchase price for new equipment, which is then adjusted to 70 percent to reflect a mix of new and used equipment. Seventy percent indicates a relatively high percentage of new equipment because of machinery upgrades that are currently necessary to meet 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 ROMAINE HEARTS LETTUCE

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:								
Soil Samples (12 per 250 Ac)	0.00	0	0	0	0	9	9	
Disc & Roll 6X	1.73	61	122	66	0	0	249	
Sub-Soil 2X	1.02	36	72	39	0	0	148	
Land Plane (1X per 2 Crops)	0.18	7	13	5	0	0	25	
Laser Level (1X per 2 Crops)	0.00	0	0	0	0	93	93	
Chisel 4X	1.42	50	100	53	0	0	204	
List Beds 3-Row	0.00	0	0	0	0	26	26	
Cultivate-Lilliston 2X	0.40	14	17	9	0	0	40	
Power Mulch/Shape Beds	0.48	17	25	8	0	0	50	
Fertilizer (Potassium Sulfate)	0.00	0	0	0	137	30	167	
Plant/Fertilize (7-0-0-7)	0.57	20	30	21	543	0	615	
Herbicide Application	0.00	0	0	0	80	30	110	
Sprinkler Setup/Irrigate	5.00	125	0	0	106	0	231	
Thin Stand-Automated/Fertilize	0.00	0	0	0	0	300	300	
Disease/Insect Management	0.00	0	0	0	850	140	990	
Cultivate-Break Bottoms	0.32	11	13	6	0	0	31	
Hand Weed 2X	12.00	284	0	0	0	0	284	
Drip Setup/Irrigate	1.32	247	60	30	476	0	813	
Fertigate (20-0-0-5) 2X	0.00	0	0	0	151	0	151	
Vertebrate Pest Management	0.88	20	0	0	0	0	20	
PCA/CCA Fee	0.00	0	0	0	0	39	39	
Pickup-3/4 Ton Farm Use	1.00	36	9	6	0	0	50	
TOTAL CULTURAL COSTS	26.32	929	461	242	2,343	666	4,642	
Harvest:								
Harvest/Field Pack	0.00	0	0	0	0	6,800	6,800	
Cool/Palletize	0.00	0	0	0	0	1,445	1,445	
Market/Sales Fee	0.00	0	0	0	0	1,148	1,148	
TOTAL HARVEST COSTS	0.00	0	0	0	0	9,393	9,393	
Interest on Operating Capital at 7.00%							145	
TOTAL OPERATING COSTS/ACRE	26	929	461	242	2,343	10,059	14,179	

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:								
Land Rent							1,600	
Liability Insurance							2	
Food Safety Program							56	
Water/Nutrient Management Programs							75	
Office Expense							375	
Field Sanitation							15	
Property Taxes							11	
Property Insurance							1	
Investment Repairs							33	
TOTAL CASH OVERHEAD COSTS/ACRE							2,168	
TOTAL CASH COSTS/ACRE							16,347	
NON-CASH OVERHEAD:								
		Per Producing Acre		Annual Cost				
				Capital Recovery				
Building 2400sqft		64		7			7	
Fuel Tanks Overhead		7		1			1	
Shop Tools		13		1			1	
Drip System		228		35			35	
Sprinkler System		247		24			24	
Sprinkler Pipe		759		68			68	
Equipment		1,990		311			311	
TOTAL NON-CASH OVERHEAD COSTS							446	
TOTAL COSTS/ACRE							16,793	

Total Costs per Acre – Harvest Costs per Acre = Growing Costs per Acre*

$$\$16,793 - \$9,393 = \$7,400$$

* Growing costs can vary considerably in this region and depend on grower specific production practices, water and other input costs, and land rent and taxes.

Example: Potential Additional Growing Costs per Acre**

Compost (Maintenance) Application = \$170

Automated Weed Management (One Pass) = \$200

** These custom services are sometimes used by area growers but are excluded from the costs studied here. For more detailed information refer to the narrative section.

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 2. COSTS AND RETURNS PER ACRE TO PRODUCE AND HARVEST ROMAINE HEARTS LETTUCE

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Romaine Hearts	850	Carton	24.00	20,400	
TOTAL GROSS RETURNS				20,400	
OPERATING COSTS					
Fertilizer:				359	
Potassium Sulfate	150.00	Lb	0.91	137	
7-7-0-7	30.00	Gal	2.36	71	
20-0-0-5	60.00	Gal	2.52	151	
Custom:				10,059	
Soil Analysis	0.05	Acre	170.00	9	
Laser Level	0.50	Acre	185.00	93	
List beds 3-Row 80"	1.00	Acre	26.00	26	
Ground Application	2.00	Acre	30.00	60	
Plant Thinning-Automated	1.00	Acre	300.00	300	
Air Application	4.00	Acre	35.00	140	
Harvest-Field Pack	850.00	Carton	8.00	6,800	
Harvest-Cool/Palletizing	850.00	Carton	1.70	1,445	
Marketing & Sales Fee	850.00	Carton	1.35	1,148	
PCA/CCA	1.00	Acre	39.00	39	
Seed:				473	
Seed-Romaine Hearts	189.00	Thou	2.50	473	
Herbicide:				80	
Herbicide Material Cost/Ac*				80	
Insecticide:				419	
Insecticide Material Cost/Ac*				419	
Fungicide:				431	
Fungicide Material Cost/Ac*				431	
Irrigation:				582	
Water-Central Coast	12.00	AcIn	23.50	282	
Single Use Drip Tape	1.00	Acre	300.00	300	
Labor				929	
Equipment Operator Labor	10.14	hrs	29.60	300	
Irrigation Labor	13.00	hrs	25.00	325	
Non-Machine Labor	12.88	hrs	23.68	304	
Machinery				704	
Fuel-Gas	2.00	gal	4.50	9	
Fuel-Diesel	83.79	gal	5.40	452	
Lube				69	
Machinery Repair				173	
Interest on Operating Capital @ 7.00%				145	
TOTAL OPERATING COSTS/ACRE				14,179	
TOTAL OPERATING COSTS/CARTON				17	
* Pest management programs vary depending on annual production conditions and pest pressure.					

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 3. MONTHLY COSTS PER ACRE TO PRODUCE AND HARVEST ROMAINE HEARTS LETTUCE

	NOV 22	DEC 22	JAN 23	FEB 23	MAR 23	APR 23	Total
Cultural:							
Soil Samples (12 per 250 Ac)	9						9
Disc & Roll 6X	166	83					249
Sub-Soil 2X	148						148
Land Plane (1X per 2 Crops)	25						25
Laser Level (1X per 2 Crops)	93						93
Chisel 4X		204					204
List Beds 3-Row		26					26
Cultivate-Lilliston 2X			40				40
Power Mulch/Shape Beds			50				50
Fertilizer (Potassium Sulfate)			167				167
Plant/Fertilize (7-0-0-7)			615				615
Herbicide Application			110				110
Sprinkler Setup/Irrigate			157	74			231
Thin Stand-Automated/Fertilize				300			300
Disease/Insect Management				495	248	248	990
Cultivate-Break Bottoms				31			31
Hand Weed 2X				142		142	284
Drip Setup/Irrigate				483	134	197	813
Fertigate (20-0-0-5) 2X				76	76		151
Vertebrate Pest Management					20		20
PCA/CCA Fee	7	7	7	7	7	7	39
Pickup-3/4 Ton Farm Use	8	8	8	8	8	8	50
TOTAL CULTURAL COSTS	454	328	1,153	1,614	492	601	4,642
Harvest:							
Harvest/Field Pack						6,800	6,800
Cool/Palletize						1,445	1,445
Market/Sales Fee						1,148	1,148
TOTAL HARVEST COSTS	0	0	0	0	0	9,393	9,393
Interest on Operating Capital @7.00%	3	5	11	21	24	82	145
TOTAL OPERATING COSTS/ACRE	457	332	1,164	1,635	515	10,075	14,179
CASH OVERHEAD							
Land Rent						1,600	1,600
Liability Insurance						2	2
Food Safety Program						56	56
Water/Nutrient Management Programs						75	75
Office Expense	63	63	63	63	63	63	375
Field Sanitation	3	3	3	3	3	3	15
Property Taxes				6			11
Property Insurance				0			1
Investment Repairs	6	6	6	6	6	6	33
TOTAL CASH OVERHEAD COSTS	71	71	71	77	71	1,804	2,168
TOTAL CASH COSTS/ACRE	528	403	1,235	1,711	586	11,879	16,347

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 4. RANGING ANALYSIS

COSTS PER ACRE AND PER CARTON AT VARYING YIELDS TO PRODUCE AND HARVEST ROMAINE HEARTS LETTUCE

	YIELD (CARTON)						
	700	750	800	850	900	950	1,000
OPERATING COSTS/ACRE:							
Cultural	4,642	4,642	4,642	4,642	4,642	4,642	4,642
Harvest	7,735	8,288	8,840	9,393	9,945	10,498	11,050
Interest on Operating Capital @ 7.00%	135	138	141	145	148	151	154
TOTAL OPERATING COSTS/ACRE	12,512	13,068	13,623	14,179	14,735	15,291	15,846
TOTAL OPERATING COSTS/CARTON	17.87	17.42	17.03	16.68	16.37	16.10	15.85
CASH OVERHEAD COSTS/ACRE	2,168	2,168	2,168	2,168	2,168	2,168	2,168
TOTAL CASH COSTS/ACRE	14,680	15,236	15,791	16,347	16,903	17,459	18,014
TOTAL CASH COSTS/CARTON	20.97	20.31	19.73	19.23	18.78	18.38	18.01
NON-CASH OVERHEAD COSTS/ACRE	446	446	446	446	446	446	446
TOTAL COSTS/ACRE	15,126	15,682	16,237	16,793	17,349	17,905	18,460
TOTAL COSTS/CARTON	22.00	21.00	20.00	20.00	19.00	19.00	18.00

Net Return Per Acre Above Operating Costs For Romaine Hearts

PRICE (\$/carton)	YIELD (carton/acre)						
Romaine Hearts	700	750	800	850	900	950	1000
12.00	-4,112	-4,068	-4,023	-3,979	-3,935	-3,891	-3,846
16.00	-1,312	-1,068	-823	-579	-335	-91	154
20.00	1,488	1,932	2,377	2,821	3,265	3,709	4,154
24.00	4,288	4,932	5,577	6,221	6,865	7,509	8,154
28.00	7,088	7,932	8,777	9,621	10,465	11,309	12,154
32.00	9,888	10,932	11,977	13,021	14,065	15,109	16,154
36.00	12,688	13,932	15,177	16,421	17,665	18,909	20,154

Net Return Per Acre Above Cash Costs For Romaine Hearts

PRICE (\$/carton)	YIELD (carton/acre)						
Romaine Hearts	700	750	800	850	900	950	1000
12.00	-6,292	-6,247	-6,203	-6,159	-6,115	-6,070	-6,026
16.00	-3,492	-3,247	-3,003	-2,759	-2,515	-2,270	-2,026
20.00	-692	-247	197	641	1,085	1,530	1,974
24.00	2,108	2,753	3,397	4,041	4,685	5,330	5,974
28.00	4,908	5,753	6,597	7,441	8,285	9,130	9,974
32.00	7,708	8,753	9,797	10,841	11,885	12,930	13,974
36.00	10,508	11,753	12,997	14,241	15,485	16,730	17,974

Net Return Per Acre Above Total Costs For Romaine Hearts

PRICE (\$/carton)	YIELD (carton/acre)						
Romaine Hearts	700	750	800	850	900	950	1000
12.00	-6,738	-6,693	-6,649	-6,605	-6,561	-6,516	-6,472
16.00	-3,938	-3,693	-3,449	-3,205	-2,961	-2,716	-2,472
20.00	-1,138	-693	-249	195	639	1,084	1,528
24.00	1,662	2,307	2,951	3,595	4,239	4,884	5,528
28.00	4,462	5,307	6,151	6,995	7,839	8,684	9,528
32.00	7,262	8,307	9,351	10,395	11,439	12,484	13,528
36.00	10,062	11,307	12,551	13,795	15,039	16,284	17,528

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 5. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS FOR ROMAINE HEARTS LETTUCE

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
23	205HP Crawler	350,000	10	103,384	46,374	161	2,267	48,802
23	Disc - Offset 25'	58,520	4	21,539	13,121	28	400	13,549
23	Subsoiler - 16'	50,900	5	16,580	10,119	24	337	10,480
23	Triplane - 16'	45,600	10	8,064	6,406	19	268	6,694
23	Chisel - Heavy 26'	61,460	5	20,020	12,218	29	407	12,654
23	Ring Roller-Heavy 18"	18,660	4	6,868	4,184	9	128	4,320
23	Lilliston-Rolling 3-Row	21,600	10	3,820	3,035	9	127	3,171
23	150HP4WD Tractor	225,000	10	66,461	29,812	103	1,457	31,372
23	Row crop planter	65,860	10	11,647	9,252	28	388	9,668
23	Cultivator 3-Row	11,400	10	2,016	1,602	5	67	1,673
23	Drip Tape Laying Machine 3-Row	19,340	10	3,420	2,717	8	114	2,839
23	Pickup 3/4 Ton	50,000	5	22,409	8,906	26	362	9,294
23	#1 Spray Boom 20'	3,480	6	1,003	629	2	22	653
23	Ring-roller 25'	34,800	4	12,809	7,802	17	238	8,057
23	Drip Tape Extraction Sled	36,000	5	11,727	7,157	17	239	7,412
23	120HP2WD Tractor	144,000	10	42,535	19,080	66	933	20,078
23	Bed Shaper 3-Row	53,290	15	5,457	6,224	21	294	6,538
23	Fertilizer Bar 20'	15,670	15	1,605	1,830	6	86	1,923
23	#2 Saddle Tanks 300gal	1,990	6	574	360	1	13	374
TOTAL		1,267,570	-	361,938	190,826	578	8,148	199,552
70% of New Cost*		887,299	-	253,356	133,578	405	5,703	139,686

*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								
Building 2400sqft	96,000	20	0	10,144	34	480	1,920	12,578
Fuel Tanks Overhead	10,975	20	0	1,160	4	55	220	1,439
Shop Tools	20,000	20	2,000	2,072	8	110	400	2,590
Drip System	341,884	10	0	52,106	121	1,709	17,094	71,031
Sprinkler System	370,495	20	185,247	35,321	197	2,779	7,410	45,707
Sprinkler Pipe	1,139,000	30	569,500	101,400	607	8,543	22,780	133,329
TOTAL INVESTMENT	1,978,354	-	756,747	202,203	971	13,676	49,824	266,674

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Land Rent	250	Acre	1600	400,000
Liability Insurance	250	Acre	2	500
Food Safety Program	250	Acre	56	14,000
Water/Nutrient Management Programs	250	Acre	75	18,750
Office Expense	250	Acre	375	93,750
Field Sanitation	250	Acre	15	3,750

UC COOPERATIVE EXTENSION – UC DAVIS AGRICULTURAL AND RESOURCE ECONOMICS

TABLE 6. HOURLY EQUIPMENT COSTS FOR ROMAINE HEARTS LETTUCE

Yr	Description	Romaine Hearts	Total	Cash Overhead			Operating		Total Oper.	Total Costs/Hr.
		Hours Used	Hours Used	Capital Recovery	Insur- ance	Taxes	Lube& Repairs	Fuel		
23	205HP Crawler	1198	1600	20.29	0.07	0.99	19.83	64.25	84.08	105.43
23	Disc - Offset 25'	431	500	18.37	0.04	0.56	11.50	0.00	11.50	30.47
23	Subsoiler - 16'	256	400	17.71	0.04	0.59	13.64	0.00	13.64	31.98
23	Triplane - 16'	46	300	14.95	0.04	0.63	7.98	0.00	7.98	23.60
23	Chisel - Heavy 26'	355	400	21.38	0.05	0.71	15.38	0.00	15.38	37.52
23	Ring Roller-Heavy 18"	256	500	5.86	0.01	0.18	2.52	0.00	2.52	8.57
23	Lilliston-Rolling 3-Row	100	200	10.62	0.03	0.44	5.02	0.00	5.02	16.12
23	150HP4WD Tractor	447	1600	13.04	0.05	0.64	13.60	47.01	60.61	74.34
23	Row crop planter	144	150	43.18	0.13	1.81	19.79	0.00	19.79	64.90
23	Cultivator 3-Row	79	200	5.61	0.02	0.23	2.65	0.00	2.65	8.51
23	Drip Tape Laying Machine 3-Row	188	200	9.51	0.03	0.40	4.50	0.00	4.50	14.43
23	Pickup 3/4 Ton	250	400	15.59	0.04	0.63	5.64	9.00	14.64	30.90
23	#1 Spray Boom 20'	144	250	1.76	0.00	0.06	1.09	0.00	1.09	2.92
23	Ring-roller 25'	431	500	10.92	0.02	0.33	4.70	0.00	4.70	15.98
23	Drip Tape Extraction Sled	142	400	12.52	0.03	0.42	8.69	0.00	8.69	21.66
23	120HP2WD Tractor	403	1600	8.35	0.03	0.41	15.43	37.61	53.03	61.82
23	Bed Shaper 3-Row	121	400	10.89	0.04	0.51	1.37	0.00	1.37	12.81
23	Fertilizer Bar 20'	144	400	3.20	0.01	0.15	0.40	0.00	0.40	3.77
23	#2 Saddle Tanks 300gal	144	250	1.01	0.00	0.04	0.62	0.00	0.62	1.67