

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

PROJECTED COSTS TO ESTABLISH A LYCHEE
ORCHARD AND PRODUCE LYCHEES

COASTAL REGIONS OF CALIFORNIA, 2002
Reprinted 2005



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INTRODUCTION

California crop growers have become increasingly interested in growing high value specialty crops. One of the new crops being considered in the Coastal region of California is Lychees. Knowledge of investment costs to establish the orchard and to analyze production and return analyses for this crop is needed to help growers assess profitability and evaluate future ventures. However, we do not have sufficient information regarding the production practices and costs of this crop in California. Therefore, our information here is just a projection based on data from other states and production practices of crops with similar characteristics. The study is intended as a guide for making production decisions, estimating potential returns, preparing budgets and evaluating production loans.

The hypothetical farm operations (production practices and cost calculations) are described in the assumptions section. For additional information or explanations of the assumptions and calculations used in this study, please contact Eta Takele, the Farm Management advisor, University of California Cooperative Extension. This projected cost study will be available at the Farm Management Website of the University of California Cooperative Extension Program for Southern California at: <http://groups.ucanr.org/farmgt>.

ASSUMPTIONS: BASIS AND METHODS OF COST CALCULATIONS

Costs and return projections in this study are based on data (cost studies) from other producing states such as Florida as well as from similar production practices of other crops (*mainly lemons in Ventura county, see reference*) in the Coastal region of California. Costs for labor, materials, equipments and custom services are based on 2002 figures.

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Land Preparation. Costs for this operation are estimated based on a custom operator to rip the ground in a similar way as a strawberry field. The cost of ripping the field is estimated to be \$375 per acre. All land preparation operations such as orchard layout and soil preparations are done right after the ripping of the ground.

Planting. Farm advisors in the southern Coastal region indicated that the main variety that is being considered for production in the coastal region of California is the Brewster variety. They projected there will be about 136 plants per acre (16 feet x 20 feet). It is also assumed that 5% of the trees need to be replanted in the second year to replace those that did not survive during the first year. It is assumed planting will take about ten minute per tree. Trees cost are estimated at \$25 each.

Topping, Hedging and Pruning. These operations are estimated at half of the lemon costs beginning the second year. These operations take less than a minute/tree for young tress in the second and third year and probably twice as much during the fifth and sixth year. During production, the topping, hedging and pruning operation cost is estimated at 10 minutes per tree.

Fertilization. Fertilizer requirements are estimated in relation to lemon trees. Zinc sulfate and manganese sulfate requirements are assumed equal to lemons in the coastal region at about 8 lbs/acre and 8 qt/acre, respectively annually during both establishment and production. Nitrogen (N) is estimated at half of the lemon trees. Table A. shows the amount of N assumed to be needed..

Leaf and soil tests are done beginning the first year to determine the nutrient levels and the required. Also, for well water irrigation, an analysis should be done periodically to determine nitrate availability, salinity, chloride and sodium pH.

**TABLE A. ESTIMATED AMOUNT OF NITROGEN BY AGE OF LYCHEES
IN COASTAL REGION OF CALIFORNIA, 2002**

Year	Amount of Nitrogen (in lbs/ Per acre)
1	13.08
2	26.15
3	39.23
4	52.31
5+	88.92

Irrigation. Growers in coastal region of California use both district water or have on site wells. In most cases, well water provides the majority of the growers' needs. Growers purchasing acreage for a new farm will likely have an established well on site or access to water mutual that shares wells. District water may be delivered, stored and pumped from a reservoir through a filtration system. Water for this study is assumed to cost \$204/acre-foot.

Table B. provides the assumption for irrigation water, similar to water use is as for lemons. No assumption is made about effective rainfall, evaporation, or runoff. Information on evapotranspiration and rainfall are available from various sources. In the coastal region of California evapotranspiration information can be obtained from the Fox Canyon Groundwater Management Agency (<http://www.foxcanyongma.org> and from California Irrigation Management Information System (CIMIS) at www.cimis.water.ca.gov/cimis. Labor for irrigation is estimated at 2 hr/acre/year. No information is available regarding the frequency of irrigation.

**TABLE B. ESTIMATED IRRIGATION WATER BY AGE OF LYCHEE,
IN COASTAL REGION OF CALIFORNIA, 2002**

Year	Amount of Water Acre Inches per year
1	3
2	9
3	18
4	20
5	24
6+	30

Pest Management. The following is included for pest management in our projection.

Weeds. Weed control is assumed to be similar to that of lemons in Ventura county. Weed control begins with spraying of Roundup between trees beginning in the first year of establishment as well as spot spray when needed.

Insects. Scale may be a problem; therefore oil control cost is included in the projected cost beginning the third year. No other treatment costs are included at this time. Future studies will be based on actual practices.

Harvesting, Hauling and Marketing. Harvesting is assumed to begin in the fourth year. Picking and hauling are projected at \$0.25/lb. The fruit is assumed to be picked in containers of 5 lb flat. Each flat is estimated to cost \$0.75. Fruits are collected and transported to the packing house. Unloading and hauling costs to local packing facility are estimated at \$0.01/lb. Our projection also included an overall average fee of \$0.05/lb for all marketing activities.

Yield. Table C. provides yield expectations for Lychee production in the coastal region of California.

**TABLE C. ESTIMATED ANNUAL YIELD FOR LYCHEES
COASTAL REGION OF CALIFORNIA, 2002**

Year	lbs/tree	lbs/acre
4	15	2040
5	25	3400
6	30	4080
Production	40	5440

Crop Returns. Crop values would vary depending on yield of the orchard and prices received by individual growers. Whole sale prices at Los Angeles market range from \$1/lb to \$4/lb depending on the season. We provided returns at various prices and yields. Crop values during the establishment years are used to offset costs.

Labor Costs. Labor for both machine and manual is estimated at \$12.00/hour for both owner and hired labor.

Fuel, Lubricant and Repair Costs. Based on other cost studies in the coastal regions (lemons in Ventura county), machinery costs for fuel, lubricant and repair are estimated at \$14/hour.

Cash Overhead Costs: Cash overhead costs consisting of interest on operating capital, property taxes and insurance, office expenses and investment repairs are based on other tree crop cost studies done in the coastal region of southern California.

Interest on Operating Capital. This is the cost of borrowing or the opportunity cost for the money used in the business of producing Lychee. A nominal Interest is charged by financial institutions for operating loans.

Property Taxes. Counties charge a base property tax rate of 1% on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on properties including equipment, buildings and improvements. For this study, annual property taxes are calculated at 1.0 % of the value of land. For depreciable assets, annual property taxes are calculated at the base county rate of 1.0% of the average value of the property. Average value equals cost of the investment plus salvage value divided by two.

Insurance. Insurance for farm investments varies depending on the assets used for the farm and the amount of coverage. Property insurance provides coverage for property loss and is charged annually at 0.70% of the average value of the assets over their useful life.

Office Expenses. Office expenses are estimated at \$180 per acre. These include rent, supplies, telephone, bookkeeping, accounting, legal fees, shop and utilities and miscellaneous administrative expenses.

Investment Repairs. An annual repair and maintenance cost for farm buildings, irrigation system, fuel tanks and pumps and tools is estimated to be about \$84 per acre during the production period.

Non-Cash Overhead Costs: Non-cash overhead costs also referred as ownership or fixed costs include depreciation and interest on capital investments is based on other tree crop cost studies done for the coastal region. These costs for farm equipment, farm buildings, irrigation system, farm tools and fuel pumps are calculated using capital recovery system (a combined cost of interest on investment and depreciation).

Equipment and Investment. Ownership costs for the various machineries, equipments and investments are assumed at a value of 60% of the new cost in order to take in to account for the mix of old and new equipment in the farm.

Irrigation System. Investment of the Irrigation system includes the costs to build a reservoir (built on the site to store water from the water district) as well as the costs of pumps, filtration station, fertilizer injector system and the labor to install the components. The filtration/injector station is installed at planting. The irrigation system is set up for drip irrigation method and has a life of 36 years.

Building. The farm is assumed to have a metal building and sheds built on cement slab. It includes a packing shed area.

Farm tools. This category includes pruning and picking clips, lug boxes and other miscellaneous farm tools used in the production of Lychees.

Land rent. Land does not depreciate, therefore, only the rental value is calculated to reflect the opportunity cost of using the land for production of Lychee instead of other alternative uses. The opportunity cost of land is calculated at the 8.06% per year (the long-run rate of return of agricultural assets to current income) of its value. The land value in the study area ranges from \$18,000 to \$30,000 per acre according to the American Society of Farm Managers and Rural

Appraisers (<http://www.asfmra.org>). Land in this particular study is valued at an average price of \$ 27,500 per acre.

Tree Establishment Costs. The cumulative net costs (gross returns less costs) incurred during the first six years of the trees is referred as the establishment cost. This value is amortized over the number of years of expected useful life of the orchard to determine an annual charge for depreciation of trees and the opportunity cost of the investment.

Establishment and production cost projection in this study are based on our reading of production practices from other states and from data of crops with similar production practices in the growing region. Actual cost studies will be conducted when sufficient information is available.

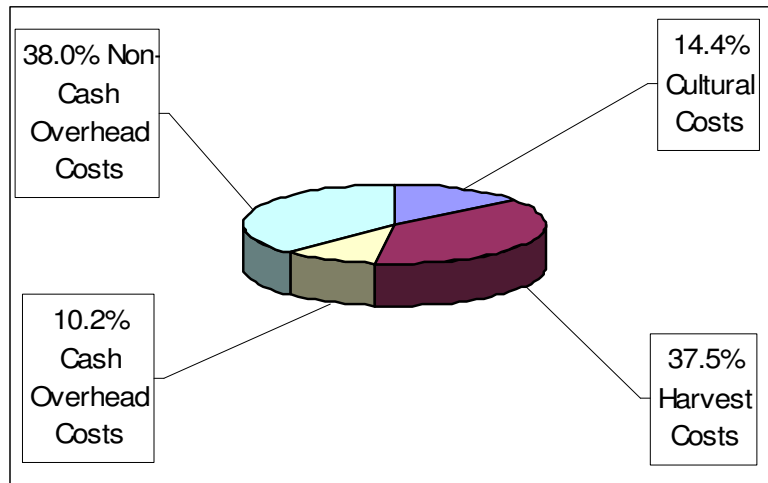
SUMMARY

This study provides a projection of costs of establishment and production for lychees in the coastal region of southern California. An actual study will be conducted when sufficient data will be available on the establishment and production of this crop.

Our projected cost for six years of establishment period of a lychee orchard in the coastal region of California is \$15,037/acre (Table 1). The costs include \$6,213/acre during the first year, \$2,792/acre during the second year, \$3,024/acre during the third year, \$1,721/acre during the fourth year, \$836/acre during the fifth year and \$451/acre during the sixth year (Table 1).

The annual production cost is projected at \$6,243/acre (Table 1). The pie graph (Figure 1) that follows shows the proportion of production costs by category. The breakdown includes 14.4% (\$898/acre) for cultural costs such as pruning, weed control, fertilization, irrigation and insect control. Harvesting costs of picking, hauling, marketing and container purchase constitute 37.5% (\$2341/acre). The proportion for cash overhead costs including liability insurance, soil test, office expenses, property taxes, property insurance and investment repairs account about 10.2% (\$634/acre). Non-cash overhead or annual ownership costs of land rent, equipments, buildings, tools, and irrigation system approximate 38% (\$2370/acre).

**FIGURE 1. PROPORTION OF PROJECTED PRODUCTION COSTS FOR LYCHEES
COASTAL REGION OF CALIFORNIA, 2002**



PROFIT ANALYSIS

We analyzed profitability using break-even costs per pound as well as using gross and economic margins.

Break-even costs allow growers to compare expected market prices with a unit cost of production. Unit costs of production are calculated as the cost of production per acre divided by yield per acre. Gross margin (or returns above cash costs) is what growers often refer to as profit if there is no debt on the farming operation. It approximates the return to management and investment. If you deduct depreciation, it also approximates the taxable income of the investment. Gross margin is calculated as gross returns (price times yield) minus cash costs of production.

Economic profit (or returns above all total cost including management) is a measure of how attractive the enterprise is for potential investors. Economic profit can be zero or positive. A zero economic profit should not be alarming if all costs including the owners' labor and management fees are included in the production cost. In this study we didn't include management charges. The return after all costs are deducted can be allocated to management and profit determined by the grower.

Crop yield and prices received by growers could vary from individual to individual. Therefore we calculated break-even costs at several yields starting from 20 pounds to 60 pounds per tree. We also calculated gross and economic margins at various prices and yield level (Table 3).

TABLE D. LYCHEE SUMMARY OF ESTABLISHMENT AND PRODUCTION COSTS

Year	1	2	3	4	5	6	Prod.
Yield/tree				15	25	30	40
Yield/acre				2,040	3,400	4,080	5,440
Price/lb 1.25							
Gross returns /acre				2,550	4,250	5,100	6,800
Cultural	4,355	518	494	578	652	754	898
Harvest				886	1,468	1,759	2,341
Cash overhead	640	1,056	1,313	1,589	1,748	1,819	634
Non-cash overhead	1,218	1,218	1,218	1,218	1,218	1,218	2,370
Total costs	6,213	2,792	3,024	4,271	5,086	5,550	6,243
Returns to management	-6,213	-2,792	-3,024	-1,721	-836	-450	557
Accumulated establishment cost	6,213	9,005	12,029	13,750	14,587	15,037	

Cultural: material, labor, machinery (fuel, lube and repair) for planting, fertilization, pest, & disease control

Harvest: picking, packing, & containers

Cash overhead: interest on investment, property taxes, insurance, & office expenses

Non-cash overhead: land rent, investment, & machinery fixed costs

TABLE E. LYCHEE PROFITABILITY ANALYSIS

Yield: lbs/tree	20	25	30	35	40	45	50	55	60
Yield: lbs/acre	2,720	3,400	4,080	4,760	5,440	6,120	6,800	7,480	8,160
	-----\$/acre-----								
Part A. Cost per acre and per pound at varying yield									
Operating costs/acre:									
Cultural Costs	898	898	898	898	898	898	898	898	898
Harvest labor & material	1,164	1,455	1,746	2,036	2,327	2,618	2,909	3,200	3,491
Harvest machine & mach.lab.	14	14	14	14	14	14	14	14	14
TOTAL OPERATING COSTS/ACRE	2,075	2,366	2,657	2,948	3,239	3,530	3,821	4,112	4,403
TOTAL OPERATING COSTS/POUND	0.76	0.70	0.65	0.62	0.60	0.58	0.56	0.55	0.54
CASH OVERHEAD COSTS/ACRE	634	634	634	634	634	634	634	634	634
TOTAL CASH COSTS/ACRE	2,710	3,001	3,292	3,583	3,873	4,164	4,455	4,746	5,037
TOTAL CASH COSTS/POUND (GROSS MARGIN BREAK EVEN)	1.00	0.88	0.81	0.75	0.71	0.68	0.66	0.63	0.62
NON-CASH OVERHEAD COSTS/ACRE	2,370	2,370	2,370	2,370	2,370	2,370	2,370	2,370	2,370
TOTAL COSTS/ACRE	5,080	5,371	5,661	5,952	6,243	6,534	6,825	7,116	7,407
TOTAL COSTS/POUND (RETURNS TO MANAGEMENT BREAK EVEN)	1.87	1.58	1.39	1.25	1.15	1.07	1.00	0.95	0.91
Part B. Returns per acre above operating costs									
Price (\$/pound):									
1.10	917	1,374	1,831	2,288	2,745	3,202	3,659	4,116	4,573
1.15	1,053	1,544	2,035	2,526	3,017	3,508	3,999	4,490	4,981
1.20	1,189	1,714	2,239	2,764	3,289	3,814	4,339	4,864	5,389
1.25	1,325	1,884	2,443	3,002	3,561	4,120	4,679	5,238	5,797
1.30	1,461	2,054	2,647	3,240	3,833	4,426	5,019	5,612	6,205
1.35	1,597	2,224	2,851	3,478	4,105	4,732	5,359	5,986	6,613
1.40	1,733	2,394	3,055	3,716	4,377	5,038	5,699	6,360	7,021
Part C. Returns per acre above all cash costs (gross margin analysis)									
Price (\$/pound):									
1.10	282	739	1,196	1,653	2,111	2,568	3,025	3,482	3,939
1.15	418	909	1,400	1,891	2,383	2,874	3,365	3,856	4,347
1.20	554	1,079	1,604	2,129	2,655	3,180	3,705	4,230	4,755
1.25	690	1,249	1,808	2,367	2,927	3,486	4,045	4,604	5,163
1.30	826	1,419	2,012	2,605	3,199	3,792	4,385	4,978	5,571
1.35	962	1,589	2,216	2,843	3,471	4,098	4,725	5,352	5,979
1.40	1,098	1,759	2,420	3,081	3,743	4,404	5,065	5,726	6,387
Part D. Returns above all costs (returns to management analysis)									
Price (\$/pound):									
1.10	-2,088	-1,631	-1,173	-716	-259	198	655	1,112	1,569
1.15	-1,952	-1,461	-969	-478	13	504	995	1,486	1,977
1.20	-1,816	-1,291	-765	-240	285	810	1,335	1,860	2,385
1.25	-1,680	-1,121	-561	-2	557	1,116	1,675	2,234	2,793
1.30	-1,544	-951	-357	236	829	1,422	2,015	2,608	3,201
1.35	-1,408	-781	-153	474	1,101	1,728	2,355	2,982	3,609
1.40	-1,272	-611	51	712	1,373	2,034	2,695	3,356	4,017

Projected Establishment and Production Costs and Returns for Lychees
 Coastal Regions of California, 2002
 Planting Space of 16'x20' or 136 plants/acre, Labor Wages @ \$12/hr
 6 establishment and 30 production years

Operation	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Production Year	
			Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre
Brewster Yield: lbs/tree									15		25		30		40	
GROSS RETURNS																
Yield (lb/ac) & Returns (\$/ac) Prices: (LA \$1/lb to \$4/lb at wholesale) & (Florida Cost Study \$1.25/lb)	lb	1.25							2,040	2,550	3,400	4,250	4,080	5,100	5,440	6,800
Total Gross Returns									2,040	2,550	3,400	4,250	4,080	5,100	5,440	6,800
VARIABLE COSTS																
Field Preparation (same as strawberry)																
Rip field (custom)	ac	375	1	375												
Orchard Layout																
Machine labor	hr	12	0.55	6.6												
Machine (fuel, lube, & repair)	hr	14	0.5	7												
Soil Test	ac	5	1	5	1	5	1	5	1	5	1	5	1	5	1	5
Irrigation System Set up																
Manual labor	hr	12	9	108												
Machine labor	hr	12	0.55	6.6												
Machine (fuel, lube, & repair)	hr	14	0.5	7												
Planting																
Spacing	16' x 20'															
Plants	plant	25	136	3,400	7	175										
Labor (as lemons, 10 min/plant)	plant	12	22.667	272	1.17	14										
Land prep. replacing trees	hr	12			0.5	6										
Machine labor	hr	12	0.55	6.6												
Machine (fuel, lube, & repair)	hr	14	0.5	7												
Weed Control (as in lemon trees)																
Round-up row & spot spray	ac	25	1	25	1	25	1	25	1	25	1	25	1	25	1	25
Machine & spot spray labor	hr	12	0.99	11.88	0.99	11.88	0.99	11.88	0.99	11.88	0.99	11.88	0.99	11.88	0.99	11.88
Machine (fuel, lube, & repair)	hr	14	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7
Insect Control																
Oil spray for scale	ac	15				1	15	1	15	1	15	1	15	1	15	1
Machine labor	hr	12	0.55	6.6	0.55	6.6	0.55	6.6	0.55	6.6	0.55	6.6	0.55	6.6	0.55	6.6
Machine (fuel, lube, & repair)	hr	14	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7	0.5	7

Lychees establishment and production costs and returns cont. (page 2)																
Operation	Unit	\$/Unit	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Production Year	
			Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre	Quant./Acre	\$/Acre
Fertilization																
Zinc sulfate (as for lemon trees)	lb	0.35	8	2.80	8	2.80	8	2.80	8	2.80	8	2.80	8	2.80	8	2.80
Manganese Sulfate (as for lemon trees)	qt	0.38	8	3.04	8	3.04	8	3.04	8	3.04	8	3.04	8	3.04	8	3.04
N (1/2 as lemons)---urea	lb	0.17	13.08	2.22	26.15	4.45	39.23	6.67	52.31	8.89	88.92	15.12	88.92	15.12	88.92	15.12
Labor - micro nutrients spray	hr	12	0.55	6.60	0.55	6.60	0.55	6.60	0.55	6.60	0.55	6.60	0.55	6.60	0.55	6.60
Machine (fuel, lube, & repair)	hr	14	0.50	7	0.50	7	0.50	7	0.50	7	0.50	7	0.50	7	0.50	7
Top, Hedge, & Prune (1/2 Lemon hr)	hr	12			5	60	5	60	9	108	9	108	9	108	21	252
Irrigation																
Water (as for lemon trees)	ac in	17.00	3	51.00	9	153.00	18	306	20	340	24	408	30	510	30	510
Manual labor (frequency of irrig.?)	hr	12	2	24	2	24	2	24	2	24	2	24	2	24	2	24
Total Cultural Costs				4,355		518		494		578		652		754		898
Harvest																
Picking & packing	lb	0.25							2,040	510	3,400	850	4,080	1,020	5,440	1,360
Containers (5 lb flat) 80% pack out	flat	0.75							326.40	244.80	544	408	652.80	489.60	870.40	652.80
Load & haul	lb	0.01							2,040	15.97	3,400	26.61	4,080	31.93	5,440	42.57
Sell fresh (?)	lb	0.05							2,040	102	3,400	170	4,080	204	5,440	272
Machine labor	hr	12							0.55	6.60	0.55	6.60	0.55	6.60	0.55	6.60
Machine (fuel, lube, & repair)	hr	14							0.50	7	0.50	7	0.50	7	0.50	7
Total Harvest Costs									886		1,468		1,759		1,759	2,341
CASH OVERHEAD COSTS																
Interest on investment @ 8.5%	ac					528		765		1,022		1,169		1,240		
Property taxes & insurance	ac			181		227		241		256		265		261		308
Investment repairs	ac			75		78		84		84		84		84		84
Office expense	ac			180		180		180		180		180		180		180
Interest on operating capital	ac			203.62		42.64		42.44	0.00	46.66		50.19		54.36		62.48
Total Cash Overhead Costs				640		1,056		1,313		1,589		1,748		1,819		634
NON-CASH OVERHEAD/OWNERSHIP COSTS																
Land rent	ac			1,053		1,053		1,053		1,053		1,053		1,053		1,053
Depr. & int. on mach., equip., build.	ac			78		78		78		78		78		78		78
Depr. & int. irrig. system	ac			67		67		67		67		67		67		67
Miscellaneous (tools etc.)	ac			20		20		20		20		20		20		20
Amortized establishment (30 years)	ac															1,152
Total Non-Cash Overhead Costs				1,218		1,218		1,218		1,218		1,218		1,218		2,370
Total of all Costs				6,213		2,792		3,024		4,271		5,086		5,550		6,243
Returns to Management				-6,213		-2,792		-3,024		-1,721		-836		-450		557
Accumulated Establishment Cost				6,213		9,005		12,029		13,750		14,587		15,037		

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