Projecting Costs and Returns: Enterprise Budgeting

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Introduction

Budgets are basic economic tools that can be used to project costs and returns, and analyze business decisions for a farming operation. There are four main types of budgets used in farm management.

- Whole farm budgets
- Enterprise budgets
- Partial budgets
- Capital budgets

The type of budget used in an analysis depends on the needs of each grower or farm manager. Whole farm budgets are appropriately used when an entire business is to be evaluated. Enterprise budgets are useful for determining the potential profitability of a specific crop. Partial budgets enable growers and managers to examine the financial impact of specific changes within an enterprise. Examples include changing fertilization practices or pest management techniques in a cropping system. Capital budgets are used to assess the impact of long-term business investments such as the purchase of land or equipment. This focus of this publication is enterprise budgeting for crops.

Why Enterprise Budgets?

An enterprise budget is one of the most useful management tools for a farmer. An enterprise budget helps a farmer understand what is necessary to produce a crop. It allows a farmer to organize and consolidate production information from a wide variety of sources, for example, the type and quantity of inputs that will be needed to produce and harvest a crop. Performing an enterprise budget analysis also helps a farmer project average or estimated annual yields, costs and returns, cash flow and potential credit needs. In total, these budgets help a farmer make informed business decisions and understand the potential risk and profitability associated with each crop.

Enterprise Budgets in California

Enterprise budgets can be concise or detailed documents depending on the level of information needed by a farmer. Concise documents are easier to prepare and contain limited amounts of

information. Detailed documents require greater effort to construct but often provide more specific data that can be important to managing a farm over time.

In California, detailed enterprise budgets, or cost and return studies, have been prepared for a wide variety of conventional and organic crops and regions. Studies are available at many local UC Cooperative Extension offices (http://ucanr.org/ce.cfm) and can be accessed from the UC Davis Department of Agricultural and Resource Economics outreach website at http://coststudies.ucdavis.edu.

Each study generally consists of two parts: (1) the written assumptions that are used to perform the analysis, and (2) a series of tables that show estimated costs by operation and input, monthly cash costs, and net returns that are possible for a range of yields and prices. Because each farming situation varies, estimated costs are intended to help growers or farm managers understand costs, make production decisions, determine potential returns, evaluate production loans, and prepare their own budgets. Many studies contain a 'Your Cost' section, which allows a farmer to add or subtract costs specific to their own enterprise. Studies are updated periodically, with analyses of additional crops performed each year. Other states also have enterprise budgets available to assist farmers in analysis and decision-making processes.

Example: Central Coast Organic Leaf Lettuce

A 2009 enterprise budget for organic leaf lettuce on the Central Coast (Santa Cruz and Monterey Counties), including a monthly cash cost analysis, is presented in Tables 1 to 3. Costs are based on representative cultural practices. These practices may not be used every year or by all growers; each farming situation varies.

The following are the underlying assumptions used to derive the cost and return estimate.

- **Farm Size.** The total farm size is 200 non-contiguous acres. Organic leaf lettuce is planted on five acres with 195 additional acres planted to other organic or conventional vegetables such as broccoli, cauliflower and celery. The farmer rents the land at $2,200 per acre per year. Up to two cash crops per acre per year can be grown; in this example, $1,200 per acre is charged as the land rent for organic lettuce. This cost is within a range of rental values for row cropland on the Central Coast.
- **Planting.** Leaf lettuce is direct seeded into 40-inch double-line beds using a four-bed precision planter. Organic seed is used but no variety is specified for this study.
- **Yield.** Yield for organic leaf lettuce varies depending on season and growing conditions. Yields range from 500 to 1,000 24-count 25-pound boxes per acre. The assumed yield for this study is 750 boxes per acre, which falls within the range of yields reached by growers in the area. It also takes into account that five percent of the acreage is planted to an insectary crop, alyssum, for assistance with pest management.
- **Labor.** Hourly wages for workers are $17.55 and $13.50 for machine operators and general labor, respectively, and includes payroll overhead of 35 percent. The basic hourly wages are $13.00 for machine operators and $10.00 for general labor. Overhead includes the employers' share of payroll taxes, workers' compensation for truck crops,

and a percentage of other possible benefits. Labor for operations involving machinery are 20 percent higher than actual operation time due to the extra time involved in equipment setup, moving, maintenance, work breaks, and repair.

- **Interest on Operating Capital.** This interest rate is based on cash cultural costs. It is calculated monthly until harvest at the rate of 5.75 percent per year. This interest can be viewed as the market cost of borrowed funds. For a business that is self-financed, the interest can be interpreted as the opportunity cost of tying up capital in the crop.

Tables 1, 2, and 3 provide information for the hypothetical organic leaf lettuce operation described in the set of assumptions. Each table presents the corresponding enterprise budget information in a different format and as such contains different levels of detail on production practices, inputs, and costs.

Table 1 lists the cash and labor costs by cultural operation. The operations are listed in order of occurrence. The portion of the cost that is allocated to organic leaf lettuce and the cost of the material inputs are also listed. Cash and noncash overhead costs are included to calculate the total costs of production excluding management and risk. Table 2 details the materials and labor costs associated with the operations that are included in Table 1. The quantities, costs per unit, and costs per acre of each input are presented. Table 2 does not list the cash and noncash overhead costs to avoid redundancy with Table 1. Table 3 lists the total operating costs by operation from Table 1 on a monthly basis. The total cash costs per month are included.

For the hypothetical organic leaf lettuce operation presented, the total cash costs are estimated to be $8,994 per acre at a yield of 750 25-pound boxes per acre. When capital recovery on buildings and equipment are included, the total costs are estimated at $9,112 per acre.

For product marketed as organic, total revenue per acre (gross returns) is calculated by multiplying the yield (number of boxes per acre) by the price per box. The price to growers is expected to range from $10 to $19 per 25-pound box. Net returns represent revenue to growers minus a specific set of costs, for example, operating costs or cash costs. Net returns above total costs are considered profit, or returns to management and labor. One useful measure is to calculate the breakeven price and yield for the operation. For the breakeven price, this entails selecting an expected yield and then calculating the price received for which revenue equals costs at that expected yield. Similarly, calculating the breakeven yield requires selecting an expected price and then calculating the yield at which total income equals the costs of production. For the farming operation studied here, which has an assumed yield of 750 boxes per acre, and prices at or below $12.15 per box, organic leaf lettuce is not a profitable crop (Table 1). At a mid-point price of $14.50 per 25-pound box, the breakeven yield is calculated to be 531 boxes per acre. Actual economic performance depends on numerous factors including variety, site conditions, yearly production conditions, consumer demand, and market competition.

Table 1. 2009 Operation costs ($/acre) for organic leaf lettuce on the Central Coast†

Operation	Operation Time (hr/acre)	Labor ($/acre)	Fuel & Repairs ($/acre)	Materials ($/acre)	Custom/Rent ($/acre)	Total ($/acre)
Cultural costs						
Fertilize: gypsum, compost (1/2 cost)	0.00	--	--	121	30	151
Land prep: subsoil (1/2 cost)	0.61	13	51	--	--	64
Land prep: disc & roll 2X (1/2 cost)	0.29	6	25	--	--	31
Land prep: chisel 2X (1/2 cost)	0.35	7	29	--	--	37
Land prep: land plane 2X (1/2 cost)	0.24	5	21	--	--	26
Cover crop: plant 1X/2 yr (1/4 cost)	0.04	1	2	36	--	39
Cover crop: mow 1X/2 yr (1/4 cost)	0.04	1	2	--	--	3
Cover crop: disc 2X/2 yr (1/4 cost)	0.07	2	6	--	--	8
Land prep: disc & roll 1X	0.14	3	13	--	--	16
Land prep: list beds; fertilize (pellets)	0.00	--	--	250	25	275
Irrigate: preirrigate, sprinkle	2.00	27	--	17	--	44
Land prep: cultivate 2X (rolling)	0.21	5	9	--	--	14
Land prep: shape beds & roll	0.23	5	10	--	--	15
Plant: lettuce	0.28	9	13	148	--	169
Insect: plant insectary (alyssum)	0.07	1	2	1	--	4
Irrigate: sprinkle 3X	3.00	41	--	25	--	65
Stand establishment: thin & hand weed	16.25	219	--	--	--	219
Weed: cultivate	0.11	2	4	--	--	7
Irrigate: install drip tape/laterals	1.00	63	43	196	--	301
Fertilize: sidedress 1X (bloodmeal)	0.20	4	5	338	--	347
Irrigate: drip 5X	0.75	10	--	100	--	110
Fertilize: through drip (phytamin)	0.00	--	--	87	--	87
Pest: worms (dipel)/aphids (pyganic)	0.00	--	--	66	25	91
Weed: cultivate & break bottoms 2X	0.21	5	9	--	--	13
Weed: hand hoe	12.00	162	--	--	--	162
Irrigate: retrieve drip tape/laterals	1.50	113	62	--	--	175
Pest: management consultant	0.00	--	--	--	30	30
Pickup use	1.43	30	26	--	--	56
Total cultural costs	41.02	732	331	1,384	110	2,557
Harvest costs						
Cut, pack, haul	0.00	--	--	--	3,113	3,113
Cool, palletize, sell	0.00	--	--	--	1,725	1,725
Total harvest costs	0.00	--	--	--	4,838	4,838
Postharvest costs						
Chop stubble	0.16	3	7	--	--	11
Total postharvest costs	0.16	3	7	--	--	11
Interest on operating capital @ 5.75 percent		--	--	--	--	80
Total operating costs/acre		735	338	1,384	4,948	7,485

Table 1. Continued

Operation	Operation Time (hr/acre)	Labor ($/acre)	Fuel & Repairs ($/acre)	Materials ($/acre)	Custom/Rent ($/acre)	Total ($/acre)
Cash overhead costs						
Land rent						1,200
Office expenses						127
Field sanitation						63
Liability insurance						2
Annual Organic Certification Fees						90
Property taxes						7
Property insurance						6
Investment repairs						12
Total cash overhead costs						1,509
Total cash costs/acre*						8,994

Non-cash overhead

Investment	Annual cost ($/acre) $/producing acre	Capital recovery	Total
Building, 2,400 square feet	400	25	25
Shop tools	75	6	6
Fuel tank, 2-300 gallon	23	1	1
Sprinkler pipe 1,456 feet	66	8	8
Trailer – pipe #1	11	2	2
Trailer – pipe #2	11	2	2
Equipment	695	74	74
Total non-cash overhead costs	1,280	117	117
Total costs/acre			9,112
Total costs/box			12.15

† From: Sample costs to produce organic leaf lettuce, Central Coast region, 2009. Authors: Tourte, Smith, Klonsky & De Moura.

* Some growers prefer to separate harvest costs from total cash costs to reflect growing costs. For this and the following tables: total cash costs – harvest costs = total growing costs ($8,994 - $4,838 = $4,156).

Due to rounding the totals may be slightly different from the sum of the components.

Table 2. 2009 Costs and returns ($/acre) for organic leaf lettuce on the Central Coast†

Gross returns organic leaf lettuce	750	box	15.00	11,250
Operating costs	Quantity/acre	Unit	Cost/unit	Cost/acre
Fertilizer/soil amendments				
Compost - green waste (1/2 cost to lettuce)	2.50	ton	40.00	100
Gypsum (1/2 cost to lettuce)	.50	ton	42.00	21
Pelleted chicken manure (list beds/fertilize)	1,000.00	lb	0.25	250
13-0-0 bloodmeal	450.00	lb	0.75	338
6-1-1 phytamin 801	171.00	lb	0.51	87
Seed				
Cover crop – cereal/legume mix (1/4 cost to lettuce)	30.00	lb	1.20	36
Leaf lettuce (organic)	148.20	thou	1.00	148
Alyssum (insectary)	0.05	lb	15.00	1
Irrigation				
Water - pumped	17.00	ac in	8.33	142
Drip tape - 10 mil (1/2 cost to lettuce)	6,541.00	foot	0.03	196
Insect control				
Dipel DF	1.00	lb	15.99	16
Pyganic 1.4 EC	2.00	pint	24.87	50
Contract/custom				
Ground application (insects)	1.00	acre	25.00	25
Harvest (box, pick, haul, supervision)	750.00	box	4.15	3,113
Harvest (palletize, cool)	750.00	box	1.10	825
Sell – commission 8 percent of $15	750.00	box	1.20	900
Pest management consultant	1	acre	30.00	30
Spread green waste+gypsum mixture	3.00	ton	10.00	30
List & fertilize	1.00	acre	25.00	25
Labor (machine)	8.61	hr	17.55	151
Labor (non-machine)	43.28	hr	13.50	584
Fuel, gas	5.95	gal	3.36	20
Fuel, diesel	63.06	gal	3.70	233
Lube				38
Machinery repair				47
Interest on operating capital @ 5.75 percent				80
Total operating costs/acre				7,485
Net returns above operating costs				3,765

† From: Sample costs to produce organic leaf lettuce, Central Coast region, 2009. Tourte, Smith, Klonsky & De Moura.

Due to rounding the totals may be slightly different from the sum of the components.

Table 3. 2009 Monthly cash costs ($/acre) to produce organic leaf lettuce on the Central Coast†

Beginning Oct '03	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	TOTAL
Ending Nov '04	03	03	03	04	04	04	04	04	04	04	04	04	04	04	
Cultural cost															
Fertilize: gypsum, compost	151	--	--	--	--	--	--	--	--	--	--	--	--	--	151
Land prep: subsoil	64	--	--	--	--	--	--	--	--	--	--	--	--	--	64
Land prep: disc & roll 2X	31	--	--	--	--	--	--	--	--	--	--	--	--	--	31
Land prep: chisel 2X	37	--	--	--	--	--	--	--	--	--	--	--	--	--	37
Land prep: land plane field 2X	26	--	--	--	--	--	--	--	--	--	--	--	--	--	26
Cover crop: plant 1X/2 yr	39	--	--	--	--	--	--	--	--	--	--	--	--	--	39
Cover crop: mow 1X/2 yr	--	--	--	--	--	3	--	--	--	--	--	--	--	--	3
Cover crop: disc 2X/2 yr	--	--	--	--	--	8	--	--	--	--	--	--	--	--	8
Land prep: disc & roll 1X	--	--	--	--	--	--	--	--	--	--	16	--	--	--	16
Land prep: list; fertilize (pellets)	--	--	--	--	--	--	--	--	--	--	275	--	--	--	275
Irrigate: preirrigate, sprinkle	--	--	--	--	--	--	--	--	--	--	44	--	--	--	44
Land prep: cultivate 2X (rolling)	--	--	--	--	--	--	--	--	--	--	14	--	--	--	14
Land prep: shape beds & roll	--	--	--	--	--	--	--	--	--	--	15	--	--	--	15
Plant: lettuce	--	--	--	--	--	--	--	--	--	--	169	--	--	--	169
Insect: plant insectary	--	--	--	--	--	--	--	--	--	--	4	--	--	--	4
Irrigate: sprinkle 3X	--	--	--	--	--	--	--	--	--	--	44	22	--	--	65
Stand establish: thin & weed	--	--	--	--	--	--	--	--	--	--	--	219	--	--	219
Weed: cultivate	--	--	--	--	--	--	--	--	--	--	--	7	--	--	7
Irrigate: install drip tape/laterals	--	--	--	--	--	--	--	--	--	--	--	301	--	--	301
Fertilize: sidedress 1X	--	--	--	--	--	--	--	--	--	--	--	347	--	--	347
Irrigate: drip 5X	--	--	--	--	--	--	--	--	--	--	--	27	56	27	110
Fertilize: through drip	--	--	--	--	--	--	--	--	--	--	--	29	58	--	88
Pest: worms/aphids	--	--	--	--	--	--	--	--	--	--	--	91	--	--	91
Weed: cult/break bottoms 2X	--	--	--	--	--	--	--	--	--	--	--	7	7	--	14
Weed: hand hoe	--	--	--	--	--	--	--	--	--	--	--	--	162	--	162
Irrigate: retrieve tape/laterals	--	--	--	--	--	--	--	--	--	--	--	--	--	175	175
Pest: management consultant	--	--	--	--	--	--	--	--	--	--	8	8	8	8	30
Pickup use	6	--	--	--	--	6	--	--	--	--	11	11	11	11	56
Total cultural costs	353	--	--	--	--	16	--	--	--	--	598	1,068	302	221	2,557
Harvest cost															
Cut, pack, haul	--	--	--	--	--	--	--	--	--	--	--	--	--	3,113	3,113
Cool, palletize, sell	--	--	--	--	--	--	--	--	--	--	--	--	--	1,725	1,725
Total harvest costs	--	--	--	--	--	--	--	--	--	--	--	--	--	4,838	4,838
Postharvest cost															
Chop stubble	--	--	--	--	--	--	--	--	--	--	--	--	--	11	11
Total postharvest costs	--	--	--	--	--	--	--	--	--	--	--	--	--	11	11
Interest on operating capital	2	2	2	2	2	2	2	2	2	2	5	10	11	35	80
Total operating costs/acre	354	2	2	2	2	18	2	2	2	2	603	1,078	313	5,104	7,485

Table 3. Continued

Beginning Oct '03	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	TOTAL
Ending Nov '04	03	03	03	04	04	04	04	04	04	04	04	04	04	04	
Cash overhead cost															
Land rent	--	--	--	--	--	--	--	--	--	--	--	1,200	--	--	1,200
Office expense	25	--	--	--	--	--	--	--	--	--	25	25	25	25	127
Field sanitation	--	--	--	--	--	--	--	--	--	--	--	--	31	31	63
Liability insurance	--	--	--	--	--	--	--	--	--	--	--	--	--	2	2
Annual organic certification fee	--	--	--	--	--	--	--	--	--	--	--	--	--	90	90
Property taxes	7	--	--	--	--	--	--	--	--	--	--	--	--	--	7
Property insurance	6	--	--	--	--	--	--	--	--	--	--	--	--	--	6
Investment repairs	1	--	--	--	--	1	--	--	--	--	2	2	2	2	12
Total cash overhead costs	40	--	--	--	--	1	--	--	--	--	28	1,230	59	151	1,509
Total cash costs/acre	394	2	2	2	2	19	2	2	2	2	630	2,308	372	5,255	8,994

† From: Sample costs to produce organic leaf lettuce, Central Coast region, 2009. Tourte, Smith, Klonsky & De Moura.

Due to rounding the totals may be slightly different from the sum of the components.