RECLAMATION

Managing Water in the West

San Luis Drainage Feature Re-evaluation

Feasibility Study

Appendix L

Economics

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

November 2007

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Benefit Estimates – San Luis Unit

National Economic Development Account

The objective of the National Economic Development analysis is to determine the change in net value of the Nation's output of goods and services which would result from implementing each project alternative. Beneficial and adverse effects are evaluated in monetary terms and are measured in terms of changes in national income. The NED account describes the National Environmental Policy Act human environment and identifies beneficial and adverse effects on the economy. Beneficial effects in the NED account are (1) increases in the economic value of the national output of goods and services from a plan, (2) the value of output resulting from external economies caused by a plan, and (3) the value associated with the use of otherwise unemployed or under-employed labor resources. Adverse effects in the NED account are the opportunity costs of resources used in implementing a plan. These adverse effects include (1) implementation outlays, (2) associated costs, and (3) other direct costs. Specific guidelines, standards, and procedures used in the NED analysis are provided in the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*.

Effects to the NED account resulting from the two action alternative features are discussed below.

NED Benefits

Contributions to national economic development are measured as increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the project area and the rest of the Nation. Contributions to NED include increases in the net value of goods and services that are marketed, as well as those that may not be marketed.

NED benefits generated from the agricultural production of an alternative are measured as the increased value of agricultural output of the Nation plus any cost savings which occur in maintaining a given level of output. Such benefits include reductions in production costs and associated costs; reduction in damage costs from flooding, erosion, sedimentation, inadequate drainage, or inadequate water supply; and the value of increased production of crops.

Provision of Drainage Service

The benefits of the action alternatives are estimated relative to the No Action Alternative and are based on providing drainage service to drainage-impaired lands within the San Luis Unit service area. These benefits fall into three categories:

- Increased net revenues that are a result of continuing to farm those drainage-impaired lands that would otherwise have to be removed from agricultural production due to inadequate drainage

- Increased net revenues resulting from changing from a salinity- and water-restricted crop mix to a more revenue intensive crop mix on drainage-impaired lands

- Reduced costs of irrigation management practices by providing drainage service to drainage-impaired lands

The first category of benefits is the result of reclaiming drainage-impaired lands that would otherwise be removed from agricultural production without the provision of adequate drainage service. It is estimated that under the No Action Alternative, the drainage capacity of 65,000 acres would be impaired to the point that the land could no longer sustain irrigated agriculture. For the two action alternatives it was assumed that these 65,000 acres would be included in the drainage-impaired land removed from agricultural production. The amount of drainage-impaired land removed from agricultural production is shown in the following table. The second category of benefits is the result of farmers being able to grow a much broader selection of crops rather than being restricted to raising only salt-tolerant crops. The last benefit category is the result of a reduction in production costs that occurs as farmers are relieved from increasingly restrictive irrigation management practices required to keep farming drainage-impaired lands even as salts continue to accumulate in the root zone of the soil.

Changes in acres of land identified as drainage-impaired, drained, or retired relative to the No Action Alternative[1] (acres)

Subarea	In-Valley/Water Needs Land Retirement	In-Valley/ Drainage-Impaired Land Retirement
WESTLANDS		
DRAINAGE-IMPAIRED AREA (acres)	298,000	298,000
Existing Retired - Drainage Impairment	44,106	44,106
Remaining Drainage-Impaired Land	253,894	253,894
DRAINAGE-IMPAIRED LAND REMOVED FROM AGRICULTURAL PRODUCTION (acres)		
Land Retirement	139,850	253,894
Additional Land Retired for New Facilities	1,044	0
Total Land Retired for Action Alternatives	140,894	253,894
ADJUSTMENT TO LANDS RETIRED UNDER NO ACTION - DRAINED UNDER ACTION ALTERNATIVES (acres)		
Lands Retired Under No Action	65,000	65,000
Land Retirement	139,850	253,894
Benefited Area (retired to drained)	0	0
DRAINAGE-IMPAIRED LAND UNDER NO ACTION CONVERTED TO DRAINED LAND (acres)		
Remaining Drainage-Impaired Land	253,894	253,894
Total Land Retired for Action Alternatives	140,894	253,894
Retired to Drained Land Adjustment	0	0
Benefited Area (impaired to drained)	113,000	0
NORTHERLY AREA		
DRAINAGE-IMPAIRED AREA (acres)	81,000	81,000
Existing Retired - Drainage Impairment	0	0
Remaining Drainage-Impaired Land	81,000	81,000
DRAINAGE-IMPAIRED LAND REMOVED FROM AGRICULTURAL PRODUCTION (acres)		
Land Retirement	10,000	10,000
Additional Land Retired - New Facilities	4,467	4,467
Total Land Retired for Action Alternatives	14,467	14,467
LANDS RETIRED UNDER NO ACTION - DRAINED UNDER ACTION ALTERNATIVES (acres)		
Lands Retired Under No Action	0	0
Benefited Area (retired to drained)	0	0
DRAINAGE-IMPAIRED LAND UNDER NO ACTION CONVERTED TO DRAINED LAND (acres)		
Remaining Drainage-Impaired Land	81,000	81,000
Total Land Retired for Action Alternatives	14,467	14,467
Retired to Drained Land Adjustment	0	0
Benefited Area (impaired to drained)	66,533	66,533

[1] Values represent the number of acres in each category, relative to No Action.

The first category of benefits provided by drainage service alternatives is the increase in net farm revenues as a result of sustaining agricultural production on lands that would otherwise be retired because of inadequate drainage. Westlands has implemented a plan to retire 65,000 acres of drainage-impaired land. Under the No Action Alternative, this land is assumed to remain out of production for the 50-year planning horizon. The annual benefit per acre is estimated as the avoided loss of net farm revenue from lands removed from agricultural production. Based on prices, yields, and production costs developed for the PFR Addendum (Reclamation 2004), the net revenue loss would average $172.79 per acre per year in the Northerly Area and $158.39 per acre per year in Westlands (the difference is due to different crop mixes on the affected lands).

The second category of benefits is the result of farmers being able to grow a much broader selection of crops rather than being restricted to raising only salt-tolerant crops. These lands, which are drainage-impaired under the No Action Alternative, are estimated to generate an additional $101.49 per acre per year in Westlands and $160.03 per acre per year in the Northerly Area. As indicated above, the benefit estimated for lands changing from a drainage-impaired to a drained condition requires an adjustment to account for the 65,000 acres of the land retired under the No Action Alternative to avoid double counting the benefit of those lands. The land area converted from drainage-impaired to drained land for this second category of benefit is also shown in table 42.

The first two types of benefits described above are based on strategies used under the No Action Alternative to keep lands with limited natural drainage and high soil salinities under agricultural production. The last benefit category is the result of a reduction in production costs that occurs as farmers are relieved from increasingly restrictive irrigation management practices required to keep farming drainage-impaired lands even as salts continue to accumulate in the root zone of the soil. This reduced cost is estimated to be $8.01 per acre per year in Westlands and $8.45 per acre per year in the Northerly Area. However, these values are included in the increased net farm revenue indicated for the two benefit categories described above.

Value of Agricultural Production Lost to Retirement

Payments for purchasing and retiring land represent a transfer of income from the buyer (the Federal government, initially) to the landowners. As costs of the program are repaid over time, money is transferred back from the land retirement area to the Federal treasury. From the perspective of the national economy, these movements of money, though very important to those involved, are simply transfer payments among groups of citizens. The real change to the economy is the loss of current and future agricultural net income from the retired lands.

The *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (U.S. Water Resources Council 1983; subsequently referenced simply as *Principles and Guidelines*) provides guidance for estimating the economic loss from retiring agricultural lands. In essence, the *Principles and Guidelines* recommend using market valuation of goods and services as the best estimate of economic value, except where a substantial distortion may occur due to market failure or government involvement (such as regulatory restrictions or subsidy programs). Crop production is a case where adjustments are made to account for the effects of subsidy payments under Federal farm commodity programs. Net income from agricultural production was estimated using information on crop prices, crop yields, costs of production, and crop mix.

Most of the data for the analysis were compiled during preparation of the original 2002 PFR and the unpublished Administrative Draft EIS (Reclamation 2003a). Data for cotton production were updated to 2003 levels because of cotton's unique importance in the study area – it by far covers the largest acreage and provides the largest total revenue of any crop in the drainage-impaired area of the San Luis Unit.

Crop Mix

The analysis grouped crops of the San Luis Unit into nine categories:

• **Forage Crops.** Alfalfa hay is the largest crop in this category and its cost and revenue is used to represent the category.

• **Cotton.** A weighted average of prices and yields for two varieties is used. Upland cotton has historically been the dominant variety, but Pima cotton has increased in importance in recent years. Crop acreage data from Westlands shows that, for the years 1999–2002, Upland cotton was grown on about two-thirds of the cotton acreage and Pima was grown on the remainder.

• **Other Field Crops.** These include alfalfa seed, field corn, dry beans, oil seed crops, and others. Alfalfa seed is used to represent this category.

• **Small Grains.** Wheat and barley are the dominant crops. Wheat is used to represent this category.

• **Grapes.** Production costs and revenues for wine grapes are used for this category.

• **Sugar Beets.** No crops other than sugar beets are in this category.

• **Orchards.** Important crops include almonds, pistachios, and stone fruits. Almonds are used as the representative crop.

• **Tomatoes.** Both processing and fresh-market tomatoes are grown. Processing tomato costs and returns are used to represent this category.

• **Truck Crops.** Crops with the largest acreage include melons, lettuce, sweet corn, onion, and garlic. Cantaloupes are used to represent this category.

The *Principles and Guidelines* divide crops into two classes. Basic crops are those for which a change in acreage will have little or no effect on price. Acreages of basic crops are generally limited by available resources (land or water), and include cotton, small grains, corn, hay, and pasture. Other crops are limited by market demand, either through explicit marketing or processing contracts (like processing tomatoes) or through the price effects that changes in production would cause. The *Principles and Guidelines* argue that changes in acreage in a region will, under most conditions, occur in the basic crops, and prescribe that changes in crop acreage be valued using only those crops.

This analysis assumes that the following crop categories would shift to other lands within the San Luis Unit or elsewhere in the San Joaquin Valley if they are currently grown on lands that are retired: grapes, orchards, tomatoes, and truck crops. The remaining crop categories that would be affected are forage crops, cotton, other field crops, small grains, and sugar beets

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Crop Yields

Crop yields were estimated from Fresno County Agricultural Commissioner annual reports, using the average for the latest 5 years available (Fresno County Agricultural Commissioner 1997–2001).

Crop Prices

For crops unaffected by Federal farm commodity programs, prices are also County averages over 5 years (Fresno County Agricultural Commissioner 1997-2001). The U.S. Department of Agriculture (various years) estimates “normalized” prices for crops affected by commodity programs. These include alfalfa hay, upland cotton, small grains, and sugar beets. The normalized prices are statistical estimates of the market prices in the absence of commodity programs and other market-distorting influences.

Production Costs

University of California Cooperative Extension prepares sample costs to produce many different crops grown in the San Joaquin Valley. These sample costs are used to create crop production budgets for the representative crops in each of the crop categories.

Changes in Net and Gross Income per acre of land served by drains, in $/acre/year
(difference between net farm income with drainage service vs. without, in the drainage impact area)
(includes only P&G basic crops) USED for NED Randy: changes shown in yellow

	Net Revenue Change		Indexed for FS		Gross Revenue Chan		Indexed for FS	
	ND	WWD	ND	WWD	ND	WWD	ND	WWD
Alfalfa Hay	$ 22.44	$ 6.32	$ 24.06	$ 6.77	$ 105.16	$ 29.60	$ 112.74	$ 31.73
Cotton	$ 71.15	$ 53.75	$ 76.28	$ 57.63	$ 422.05	$ 318.87	$ 452.47	$ 341.85
Field	$ 13.68	$ 4.05	$ 14.67	$ 4.35	$ 26.09	$ 7.73	$ 27.97	$ 8.29
Grain	$ 37.41	$ 16.71	$ 40.10	$ 17.92	$ (89.76)	$ (40.10)	$ (96.23)	$ (42.99)
Grapes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pasture	$ -	$ -	$ -	$ -	$ -	$ 0.24	$ -	$ 0.25
Sugarbeets	$ 4.59	$ 13.84	$ 4.92	$ 14.83	$ 7.83	$ 23.57	$ 8.39	$ 25.27
Orchard	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tomato	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Truck	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
All Crops	$ 149.27	$ 94.67	$ 160.03	$ 101.49	$ 471.37	$ 339.91	$ 505.34	$ 364.40

Notes: Positive number means higher NR or GR with drainage service than without drainage service.
Changes in NR and GR apply only to lands recvg drainage compared to the No Action Alternative.
Net revenue changes use NED assumptions. Gross revenue changes use market prices.
Values used for the Feasibility Study were indexed from 2003 to 2006 using index numbers for "Prices Received by Farmers for All Crops" from the Agricultural Prices 2006 Summary released July 2007.

All results are weighted by crop mix percents.
Example: 1,000 acres receiving drainage in WWD would result in $339,910 of increased GR per year: $29,600 more from Alfalfa hay, $318,870 more from cotton, $40,100 less from grain, etc.

Loss of Net Return from Land Retirement, in $/acre/year
(includes only P&G basic crops) USED for IMPLAN

	Net Revenue Loss		Indexed for FS		Gross Revenue Loss		Indexed for FS	
	ND	WWD	ND	WWD	ND	WWD	ND	WWD
Alfalfa Hay	$ 22.44	$ 6.32	$ 24.06	$ 6.77	$ 105.16	$ 29.60	$ 112.74	$ 31.73
Cotton	$ 133.54	$ 142.89	$ 143.17	$ 153.19	$ 792.18	$ 847.62	$ 849.27	$ 908.71
Field	$ 13.68	$ 4.05	$ 14.67	$ 4.35	$ 26.09	$ 7.73	$ 27.97	$ 8.29
Grain	$ (13.09)	$ (19.36)	$ (14.03)	$ (20.75)	$ 31.40	$ 46.44	$ 33.66	$ 49.79
Grapes	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pasture	$ -	$ -	$ -	$ -	$ -	$ 0.24	$ -	$ 0.25
Sugarbeets	$ 4.59	$ 13.84	$ 4.92	$ 14.83	$ 7.83	$ 23.57	$ 8.39	$ 25.27
Orchard	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tomato	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Truck	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 161.17	$ 147.74	$ 172.79	$ 158.39	$ 962.65	$ 955.19	$ 1,032.03	$ 1,024.04

Notes: Values used for the Feasibility Study were indexed from 2003 to 2006 using index numbers for "Prices Received by Farmers for All Crops" from the Agricultural Prices 2006 Summary released July 2007.
Net revenue changes use NED assumptions. Gross revenue changes use market prices.

All results are weighted by crop mix percents.
Example: 1,000 acres retired in WWD would result in $955,190 of lost GR per year: $29,600 from Alfalfa hay, $847,620 from cotton, etc.

Payments made to Purchase Water, in M$/year
by alternative

	ND	WWD	Total	Indexed for FS ND	WWD	TOTAL
NAA	$ -	$ (11.34)	$ (11.34)	$ -	$ (13.36)	$ (13.36)
IV	$ -	$ (16.25)	$ (16.25)	$ -	$ (19.13)	$ (19.13)
OV	$ -	$ (16.25)	$ (16.25)	$ -	$ (19.13)	$ (19.13)
LR-WQ	$ -	$ (16.25)	$ (16.25)	$ -	$ (19.13)	$ (19.13)
LR-WS	$ -	$ (1.68)	$ (1.68)	$ -	$ (1.98)	$ (1.98)
LR-DIA	$ -	$ 16.83	$ 16.83	$ -	$ 19.82	$ 19.82

Notes: Values used for the Feasibility Study were indexed from 2003 to 2006 using index numbers for "Prices Paid by Farmers for Production Items" from the Agricultural Prices 2006 Summary released July 2007.
Production Items" from the Agricultural Prices 2006 Summary released July 2007.
Alternative LR-WS requires no additional purchases to meet crop water use, by assumption
Alternative LR-DIA generates excess water for sale (designated as a positive value)

Additional Cost of Irrigation Improvements, in M$/year
all alternatives except No Action

	ND	WWD	Total	Indexed for FS ND	WWD	TOTAL
Acres	126000	253000	379000	126000	253000	379000
Cost/acre/year	$ 7.18	$ 6.80		$ 8.45	$ 8.01	$ 16.46
Cost/year (millions)	$ 0.90	$ 1.72	$ 2.63	$ 1.07	$ 2.03	$ 3.09

Notes: Values used for the Feasibility Study were indexed from 2003 to 20065 using index numbers for "Prices Paid by Farmers for Production Items" from the Agricultural Prices 2006 Summary released July 2007.

Avoided Cost of Additional Water Supply

The San Luis Unit does not receive its full contract quantity of CVP water in the majority of years. Changes in CVP water deliveries have resulted from implementation of the CVPIA, Endangered Species Act Biological Opinions affecting Delta pumping, and other water quality restrictions. This analysis assumes that the Unit will receive, on average, 70 percent of its CVP delivery.

Planned land retirement in Westlands not only reduces the need for drainage facilities, but also reduces the need either to develop more costly replacement water supply or to fallow land involuntarily due to water shortage. Assuming that, in the absence of land retirement, Westlands would purchase or develop supply to meet its full water demand, one of the benefits of retirement would be to avoid that cost. Several sources of information were used to estimate what Westlands would have to pay to purchase or develop replacement supply:

• Groundwater storage conjunctive use projects submitted for state funding in the last two years included several in the western and southern San Joaquin Valley. Annualized costs per AF of yield for these projects ranged from about $70/AF to over $200/AF (DWR 2003).

• The Environmental Water Account (a program of the California Bay-Delta Authority) estimates that it will pay $140/AF, on average, for water it provides south of the Delta.

• The California Bay-Delta Authority has developed estimates of the willingness to pay for new water supply by different user groups. Its estimate for CVP Delta export agricultural users ranges from $80 to $125/AF, depending on year type, with an average of $90/AF.

These cited values represent the cost to acquire and deliver water to a district in the San Luis Unit such as Westlands. District costs to cover its internal expenses to deliver the water to its growers are not included. For purposes of screening land retirement scenarios, a cost of $90/AF is assumed to acquire or develop replacement water for the San Luis Unit (again, district delivery charges are not included).

Applied Water Use at buildout

WWD	NA	IV	OV	IV-WQ	IV-WN	IV-DIA
Applied Water						
Drnd	-	459,256	462,804	390,925	210,932	-
Undrnd	1,074,998	650,744	647,196	719,075	784,801	683,100
Retired	-	-	-	-	-	-
Total	1,074,998	1,110,000	1,110,000	1,110,000	995,733	683,100
AW exc. Undr,full	897,184	1,110,000	1,110,000	1,074,025	894,032	683,100
AW Avail for Undr,full	212,816	0	0	35,975	215,968	426,900
Drained Acres	0	164020	165287	139616	75333	0
Undrnd Acres	188894	82010	82643	69808	37667	0
Undr, full crop mix	65857	0	0	13324	37667	0
Undr, restr. Crops	123037	0	0	0	0	0
Upslope Acres	253000	241016	239702	253000	253000	253000
Total Active Acres	441894	405036	404989	405940	366000	253000
Acres Retired	109106	63954	63368	88576	185000	298000
Acres Fallowed	0	82010	82643	56484	0	0
Total Acres	551000	551000	551000	551000	551000	551000

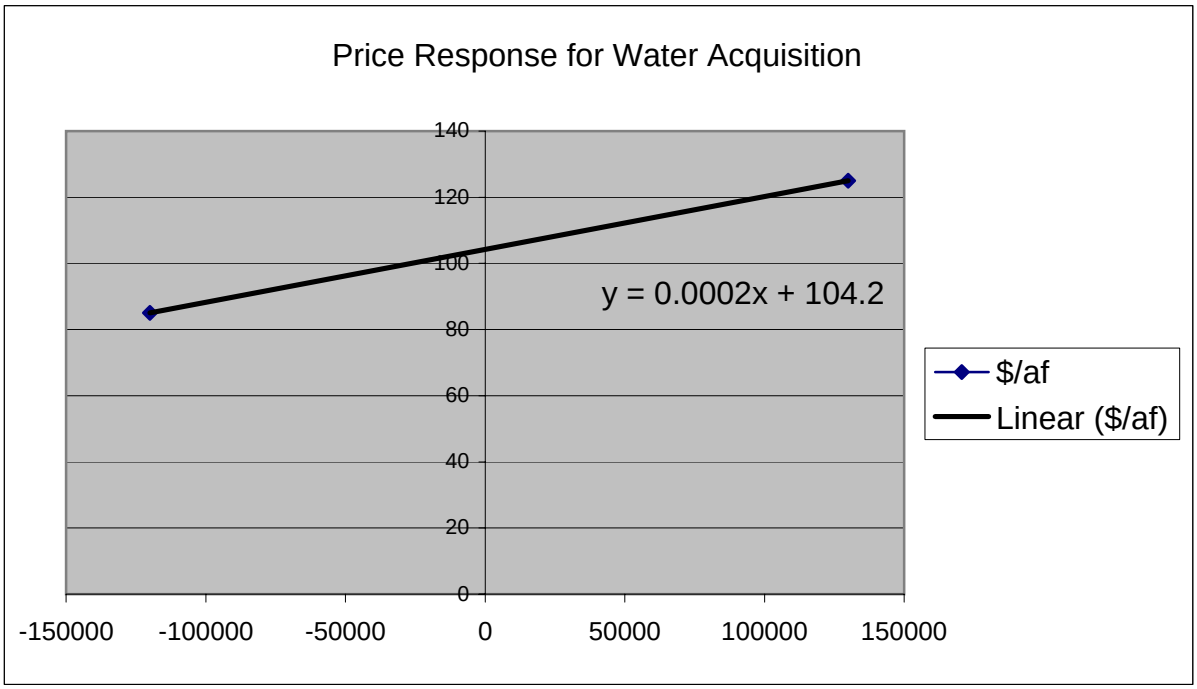
North	NA	IV	OV	IV-WQ	IV-WN	IV-DIA
Applied Water						
Drnd	-	151,200	151,200	133,000	133,000	133,000
Undrnd	282,150	201,150	201,150	191,700	191,700	191,700
Retired	-	0	0	0	0	0
Total	282,150	352,350	352,350	324,700	324,700	324,700
Drained Acres	0	54000	54000	47500	47500	47500
Undrnd Acres	81000	27000	27000	23500	23500	23500
Undr, full crop mix	27000	27000	27000	23500	23500	23500
Undr, restr. Crops	54000	0	0	0	0	0
Upslope Acres	45000	45000	45000	45000	45000	45000
Total Active Acres	126000	126000	126000	116000	116000	116000
Acres Retired	0	0	0	10000	10000	10000
Total Acres	126000	126000	126000	126000	126000	126000

Water Acquired	94,998	130,000	130,000	130,000	15,733	(296,900)
Price of Acq. Water	119	125	125	125	107	57
Total Value of Acq Wat	$ 11.34	$ 16.25	$ 16.25	$ 16.25	$ 1.68	$ (16.83)
Net Change Compared to No Action						
WWD						
In		35,002	35,002	35,002	(79,265)	(391,898)
NA						
In		70,200	70,200	42,550	42,550	42,550
Total						
In		105,202	105,202	77,552	(36,715)	(349,348)
Value (M$)		$ (4.91)	$ (4.91)	$ (4.91)	$ 9.66	$ 28.18

Water Price Paid (delivery to district turnout)

$/af	Total af	Slope/Int
125	130000	0.000160
85	-120000	104.200

Assumptions:
Current price and quantity based on 2002-2004 WWD data
Price with large net sale of 300,000 af based on avoided cost
of EWA water purchases from Northern Calif. (estimated
by EWA program as $85/af SOD equivalent for about 250taf
on average. WWD existing 130taf purchase plus another 120taf
would satisfy average EWA demand.)



Project Cost Estimates – San Luis Unit

NED Costs

Project measures, whether structural or nonstructural, require the use of various resources. NED costs are the opportunity costs of resource use. Opportunity costs are a measure of the highest valued alternative use that would be foregone as a result of using a particular resource. Both public and private uses of the various resources required in a project alternative should be considered when evaluating NED costs.

Economic Costs versus Financial or Accounting Costs

As indicated above, NED costs are the opportunity, or economic, costs of resources used in a project alternative. Financial or accounting costs are a measure of the actual cash outlays made to acquire the resources necessary to implement the project. In cases where financial costs reflect the full economic value of a particular resource to society, they can and should be used to determine NED costs. However, financial costs are often different from, and unrelated to, economic costs. Many financial costs do not reflect the true opportunity cost of a resource.

Market prices (i.e., the price that a particular commodity will fetch in the marketplace) are used to quantify the financial cost of a particular commodity or resource. When market prices do not accurately reflect the true opportunity cost of a resource to society, it is necessary to use other or additional means to estimate NED costs. In some cases, financial costs don't include all of the opportunity costs of a resource. Other times, actual cash outlays made to acquire a resource have no relationship to the opportunity costs of the resource. Economic costs may exceed financial costs when uncompensated or unmitigated losses occur as a result of the installation, operation, maintenance, and replacement of project measures. An example of such losses might be the degradation of water or air quality resulting from the construction and operation of a coal-fired electrical power plant. The true opportunity cost to society of using these resources is not captured in the accounting or financial costs of the power plant.

On the other hand, in some instances the financial costs paid by an entity may exceed the actual increased value of production (especially when measured for the entire Nation). For example, assume that one company buys another company. Unless one of the companies possesses a technological or management process that either increases the total output (or decreases the total production cost) of the new combined company, the actual financial transaction is very likely to exceed the actual increase in net revenue. When this transaction is viewed from a national perspective, the financial transaction is irrelevant to the total output minus the net change in total production costs of the combined company compared to the net revenues of the two separate companies before they were combined (assuming that the output of the rest of the Nation remains the same).

The *Principles and Guidelines* (U.S. Water Resources Council 1983) identifies three separate categories to use in measuring and analyzing NED costs: implementation outlays, associated costs, and other direct costs. These cost categories are discussed and estimated in the sections below.

Implementation Costs of Project Features
The NED costs of implementation outlays include the costs incurred by the responsible Federal entity and, where appropriate, contributed by other Federal or non-Federal entities to construct, operate, and maintain a project in accordance with sound engineering and environmental principles and place it in operation. These costs include remaining post-authorization planning and design costs; construction costs; construction contingency costs; administrative services costs; fish and wildlife habitat mitigation costs; relocation costs; historical and archaeological salvage costs; land, water, and mineral rights costs; and operation, maintenance, and replacement costs.

Treatment and Disposal Costs
Treatment and disposal costs include post-authorization planning and design costs, construction costs, construction contingency costs, administrative service costs, as well as operation, maintenance, and replacement costs.

Specific treatment and disposal facilities include facilities funded by the Federal Government, as well as those funded by non-Federal entities. Federally funded facilities consist of the drainage collection system, conveyance system, regional reuse facilities, evaporation basins, RO treatment facilities, biological selenium treatment facilities, and fish and wildlife mitigation facilities. Facilities funded by non-Federal entities include on-farm tile drains, drainwater recycling facilities, seepage reduction measures, shallow groundwater management measures, and on-farm irrigation efficiency improvements. Construction costs, interest during construction costs, and annual operation, maintenance, and replacement costs are expressed as annual equivalent costs using the fiscal year 2007 Federal discount rate of 4.875 percent over a 50-year project life. Annual treatment and disposal costs are shown in the following table.

Construction (field and noncontract) costs of drainage service (treatment, disposal, and mitigation)[1]

Subarea	In-Valley/Water Needs Land Retirement	In-Valley/Drainage-Impaired Area Land Retirement
Northerly Area and Westlands Combined		
FEDERAL PROJECT CONSTRUCTION COSTS		
Conveyance System	$136,616,000	$67,107,000
Evaporation Basins & Mitigation	917,700,000	473,500,000
Reverse Osmosis Facilities	76,294,000	44,037,000
Selenium Treatment	237,000,000	130,000,000
Drainage Collection System	296,474,000	18,474,000
Regional Reuse Facilities	363,031,000	255,031,000
TOTAL FEDERAL TREATMENT AND DISPOSAL COST	**$2,027,115,000**	**$988,149,000**
INTEREST DURING CONSTRUCTION (IDC) COST	**$197,555,000**	**$93,826,000**
TOTAL FEDERAL CONSTRUCTION AND IDC COSTS	**$2,224,670,000**	**$1,081,975,000**
ANNUAL EQUIVALENT FEDERAL CONSTRUCTION AND IDC	**$119,514,000**	**$58,126,000**
REPLACEMENT COSTS (Annual Equivalent)	**770,000**	**333,000**
OPERATION AND MAINTENANCE (O&M) COST	**19,800,000**	**11,800,000**
ENERGY COST	**1,285,000**	**914,000**
TOTAL ANNUAL EQUIVALENT OF FEDERAL TREATMENT AND DISPOSAL COSTS	**$141,369,000**	**$71,173,000**
ANNUAL EQUIVALENT OF NON-FEDERAL TREATMENT AND DISPOSAL PROJECT COSTS		
Drainage Reduction Costs		
Drainwater Recycling	$1,920,000	$832,000
Seepage Reduction	517,000	517,000
Shallow Groundwater Management	311,000	9,000
Irrigation Improvements	768,000	768,000
Subtotal ($)	$3,516,000	$2,126,000
On-Farm Tile Drains	$2,442,000	$498,000
NON-FEDERAL COST SUBTOTAL ($)	**$5,958,000**	**$2,624,000**
TOTAL ANNUAL EQUIVALENT TREATMENT AND DISPOSAL COSTS	**$147,327,000**	**$73,797,000**

1 Values represent additional costs relative to No Action. Values rounded to nearest $1,000. Totals may not add due to rounding.

Interest During Construction Cost Estimates – San Luis Unit

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Northerly Area	Total Est. Costs	Total Field Costs and Non-Contract Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Future Years
Collection System - Field Costs	$ 27,845,000	-	370,000	-	15,111,250	12,363,750	-	-	-					
Collection System - Non-Contract	$ 7,755,000	215,417	2,562,561	1,521,518	2,076,838	1,378,667	-	-	-					
Reuse Areas/Irrigation - Field Costs	$ 81,700,000	-	41,000,000	-	24,420,000	16,280,000	-	-						
Reuse Areas/Irrigation - Non-Contract	$ 23,300,000	647,222	7,699,248	4,571,422	6,239,886	4,142,222	-	-						
Conveyance & Pump Plants - Field Costs	$ 153,574,000	-	-	-	45,945,000	54,560,040	53,068,960	-						
Conveyance & Pump Plants - Non-Contract	$ 42,326,000	1,175,722	9,876,067	12,414,420	5,691,701	6,584,045	6,584,044	-	-					
Transmission Lines - Field Costs	$ 3,241,406	-	-	-	2,066,396	1,175,010	-	-	-	-				
Transmission Lines - Non-Contract	$ 907,594			302,531	302,531	302,532								
Reverse Osmosis - Field Costs	$ 34,390,000	-	20,000	-	-	15,312,704	17,051,265	2,006,031	-	-				
Reverse Osmosis - Non-Contract	$ 9,610,000	266,945	1,892,098	1,641,259	1,390,742	1,856,291	1,708,444	854,222	-					
Selenium Removal Plant - Field Costs	$ 103,535,000	-	15,000	-	-	50,954,397	51,357,198	1,208,405	-	-				
Selenium Removal Plant - Non-Contract	$ 26,465,000	735,139	4,695,075	5,913,305	3,321,021	4,743,127	4,704,889	2,352,444	-					
Evap. Ponds & Mitigation- Field Costs	$ 308,042,000	-	7,900,000	-	1,300,000	100,437,039	157,602,354	40,802,607	-					
Evaporation Ponds & Mitigation -Non-Contract	$ 84,458,000	2,215,500	15,703,428	14,561,594	12,952,432	14,211,446	17,724,000	7,089,600	-	-	-	-		
Mitigation - Phase 2 - Field Costs	$ 17,800,000										1,300,000		16,500,000	
Mitigation - Phase 2 - Non-Contract	$ 4,700,000										940,000	1,410,000	2,350,000	
Evaporation Ponds (Future) - Field Costs *	$ 45,780,000													45,780,000
Evaporation Ponds - Non-Contract *	$ 12,720,000													12,720,000
Northerly Totals	$ 988,149,000	5,255,945	91,733,476	40,926,048	120,817,796	284,301,270	309,801,155	54,313,309	-	-	2,240,000	1,410,000	18,850,000	58,500,000

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 17 & 18; Years 29 & 30; and Years 42 & 43

* Evap Pond Future Non-Contract Costs to occur: Years 15 - 18; Years 24 - 30; and Years 40 - 43

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - South	Total Est. Costs	Total Field Costs and Non-Contract Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Future Years
Collection System - Field Costs	$ 77,540,000	-	-	-	-	-	2,520,000	-	3,659,512	46,841,756	24,518,732	-	-	
Collection System - Non-Contract	$ 20,660,000	-	-	-	-	-	2,295,556	4,591,111	5,509,333	5,968,444	2,295,556	-	-	-
Reuse Areas/Irrigation - Field Costs	$ 29,600,000	-	-	-	-	-	8,500,000	-	1,029,268	13,174,634	6,896,098	-	-	
Reuse Areas/Irrigation - Non-Contract	$ 8,400,000	-	-	-	-	-	933,333	1,866,667	2,240,001	1,866,667	1,493,333	-	-	-
Conveyance & Pump Plants - Field Costs	$ 4,208,500	-	-	-	-	-	-	-	-	2,712,144	1,496,356	-	-	
Conveyance & Pump Plants - Non-Contract	$ 1,141,500	-	-	-	-	-	126,833	558,067	456,600	-	-	-	-	-
Transmission Lines - Field Costs	$ 6,719,000	-	-	-	-	-	-	-	222,405	4,044,170	2,452,426	-		
Transmission Lines - Non-Contract	$ 1,858,000	-	-	-	-	-	206,445	412,889	454,177	578,045	206,445	-	-	-
Reverse Osmosis - Field Costs	$ 8,376,000	-	-	-	-	-	16,000	-	-	4,305,400	4,054,600	-	-	
Reverse Osmosis - Non-Contract	$ 2,124,000	-	-	-	-	-	236,000	472,000	472,000	472,000	472,000	-	-	-
Selenium Removal Plant - Field Costs	$ 31,180,000	-	-	-	-	-	10,000	-	-	12,779,700	18,390,300	-	-	
Selenium Removal Plant - Non-Contract	$ 8,820,000	-	-	-	-	-	980,000	2,613,333	1,306,667	1,764,000	2,156,000	-	-	-
Evap. Ponds & Mitigation- Field Costs	$ 84,787,000	-	-	-	-	-	1,945,000	-	-	41,035,650	41,806,350	-	-	
Evaporation Ponds & Mitigation -Non-Contract	$ 25,163,000	-	-	-	-	-	2,795,889	5,591,778	5,591,777	5,591,778	5,591,778	-	-	-
Mitigation - Phase 2 - Field Costs	$ 3,895,000										295,000		3,600,000	
Mitigation - Phase 2 - Non-Contract	$ 1,055,000										211,000	316,500	527,500	
Evaporation Ponds (Future) - Field Costs *	$ 30,300,000													30,300,000
Evaporation Ponds - Non-Contract *	$ 8,700,000													8,700,000
Westlands South - Totals	$ 354,527,000	-	-	-	-	-	20,565,056	16,105,844	20,941,740	141,134,388	112,335,972	316,500	4,127,500	39,000,000

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 19 & 20; Years 31 & 32; and Years 45 & 46

* Evap Pond Future Non-Contract Costs to occur Years 17 - 20; Years 29 - 32; and Years 43 - 46

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - Central	Total Est. Costs	Total Field Costs and Non-Contract Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Future Years
Collection System - Field Costs	$ 127,210,000	-	-	4,660,000	-	-	10,499,491	38,521,509	-	19,707,261	47,133,252	6,688,487	-	
Collection System - Non-Contract	$ 34,290,000	-	-	1,143,000	2,476,500	9,080,500	3,683,000	4,699,000	1,270,000	3,937,000	6,477,000	1,524,000	-	-
Reuse Areas/Irrigation - Field Costs	$ 39,800,000	-	-	12,500,000	-	-	2,060,377	8,859,623	-	4,178,087	10,663,617	1,538,296		
Reuse Areas/Irrigation - Non-Contract	$ 11,200,000	-	-	373,333	808,889	2,965,926	1,202,963	1,534,815	414,815	1,285,926	2,115,556	497,778	-	-
Conveyance & Pump Plants - Field Costs	$ 6,625,000	-	-	-	-	-	-	2,022,833	627,167	832,857	2,728,238	413,905		
Conveyance & Pump Plants - Non-Contract	$ 1,775,000	-	-	59,167	128,194	470,046	190,648	243,241	65,741	203,796	335,278	78,890	-	-
Transmission Lines - Field Costs	$ 9,845,000	-	-	-	-	-	1,042,083	3,985,969	3,985,969	830,979	-			
Transmission Lines - Non-Contract	$ 2,660,000	-	-	88,667	192,111	704,407	285,704	364,518	364,518	660,075		-	-	-
Reverse Osmosis - Field Costs	$ 10,085,000	-	-	15,000	-	-	-	5,664,375	4,405,625	-	-			
Reverse Osmosis - Non-Contract	$ 2,915,000		-	97,167	426,454	879,898	345,481	647,778	518,222	-	-	-	-	-
Selenium Removal Plant - Field Costs	$ 31,175,000	-	-	15,000	-	-	-	19,397,100	11,762,900	-	-			
Selenium Removal Plant - Non-Contract	$ 8,825,000		-	294,167	1,160,325	2,794,583	653,704	2,157,222	1,765,000	-	-	-	-	-
Evap. Ponds & Mitigation- Field Costs	$ 118,352,000	-	-	-	3,060,000		40,352,200	57,646,000	17,293,800			-	-	-
Evaporation Ponds & Mitigation -Non-Contract	$ 29,648,000	-	-	988,267	2,141,244	12,479,748	5,473,763	6,588,444	1,976,533	-	-	-	-	-
Mitigation - Phase 2 - Field Costs	$ 6,210,000										460,000		5,750,000	
Mitigation - Phase 2 - Non-Contract	$ 1,790,000										358,000	537,000	895,000	
Evaporation Ponds (Future) - Field Costs *	$ 31,230,000													31,230,000
Evaporation Ponds - Non-Contract *	$ 7,770,000													7,770,000
Westlands Central - Totals	$ 481,405,000	-	-	20,233,766	10,393,716	29,375,108	65,789,413	152,332,428	44,450,290	31,635,981	70,270,941	11,278,355	6,645,000	39,000,000

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 18 - 19; Years 30 & 31; and Years 44 & 45

* Evap Pond Future Non-Contract Costs to occur Years 16 - 19; Years 28 - 31; and Years 42 - 45

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - North	Total Est. Costs	Total Field Costs and Non-Contract Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Future Years
Collection System - Field Costs	$ 34,500,000	-	-	-	1,650,000	-	-	1,533,000	9,417,000	4,094,348	16,710,652	1,095,000		
Collection System - Non-Contract	$ 9,700,000	-	-	-	-	970,000	2,622,593	898,148	1,868,148	1,113,704	2,011,852	215,555	-	-
Reuse Areas/Irrigation - Field Costs	$ 14,950,000	-	-	-	5,400,000	-	-	445,667	2,737,667	1,190,290	4,858,043	318,333		
Reuse Areas/Irrigation - Non-Contract	$ 4,050,000	-	-	-	-	405,000	1,095,000	375,000	780,000	465,000	840,000	90,000	-	-
Conveyance & Pump Plants - Field Costs	$ 3,562,000	-	-	-	-	-	-	-	838,554	792,739	1,811,974	118,733		
Conveyance & Pump Plants - Non-Contract	$ 938,000	-	-	-	-	93,800	253,607	86,852	180,652	107,696	194,548	20,845	-	-
Transmission Lines - Field Costs	$ 3,708,000	-	-	-	-	-		259,560	1,891,080	1,557,360				
Transmission Lines - Non-Contract	$ 1,026,000	-	-	-	-	102,600	277,400	159,600	266,000	220,400	-	-	-	-
Reverse Osmosis - Field Costs	$ 6,506,000	-	-	-	16,000	-	-	-	3,407,250	3,082,750	-			
Reverse Osmosis - Non-Contract	$ 1,794,000	-	-	-	-	179,400	86,378	730,889	398,667	398,668	-	-	-	-
Selenium Removal Plant - Field Costs	$ 21,190,000	-	-	-	10,000	-	-	-	8,154,300	13,025,700	-			
Selenium Removal Plant - Non-Contract	$ 5,810,000	-	-		-	581,000	1,272,903	1,373,875	1,032,889	1,549,333	-	-	-	-
Evap. Ponds & Mitigation- Field Costs	$ 56,697,000				1,205,000			55,492,000						
Evaporation Ponds & Mitigation -Non-Contract	$ 14,953,000	-	-	-	-	4,264,374	4,042,848	6,645,778	-	-	-	-	-	-
Mitigation - Phase 2 - Field Costs	$ 2,105,000										155,000		1,950,000	
Mitigation - Phase 2 - Non-Contract	$ 545,000										109,000	163,500	272,500	
Evaporation Ponds (Future) - Field Costs *	$ 16,590,000													16,590,000
Evaporation Ponds - Non-Contract *	$ 4,410,000													4,410,000
Westlands North - Totals	$ 203,034,000	-	-	-	8,281,000	6,596,174	9,650,729	68,000,368	30,972,206	27,597,987	26,691,070	2,021,967	2,222,500	21,000,000

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 19 & 20; Years 31 & 32; and Years 45 & 46

* Evap Pond Future Non-Contract Costs to occur Years 16 - 19; Years 28 - 32; and Years 42 - 46

Retired Lands	$ 660,000,000	6,600,000	6,600,000	132,000,000	132,000,000	132,000,000	132,000,000	118,800,000						
Project Totals by Year	**$ 2,687,115,000**	**11,855,945**	**98,333,476**	**193,159,815**	**271,492,513**	**452,272,553**	**537,806,352**	**409,551,949**	**96,364,236**	**200,368,355**	**211,537,982**	**15,026,822**	**31,845,000**	**157,500,000**

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Northerly Area	Total Est. Costs	Interest During Construction Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Collection System - Field Costs	$ 1,491,529	0	9,019	18,477	387,715	1,076,319	0	0	0	0	0	0		
Collection System - Non-Contract	$ 891,268	0	72,964	176,070	272,364	369,869	0	0	0	0	0	0		
Reuse Areas/Irrigation - Field Costs	$ 9,657,647	0	999,375	2,047,470	2,742,521	3,868,282	0	0	0	0	0	0		
Reuse Areas/Irrigation - Non-Contract	$ 2,677,825	0	219,221	529,006	818,321	1,111,278	0	0	0	0	0	0		
Conveyance & Pump Plants - Field Costs	$ 11,168,682	0	0	0	1,119,909	3,624,315	6,424,458	0	0	0	0	0		
Conveyance & Pump Plants - Non-Contract	$ 4,972,786	0	0	0	1,282,713	1,644,466	2,045,606	0	0	0	0	0		
Transmission Lines - Field Costs	$ 182,202	0	0	0	50,368	131,833	0	0	0	0	0	0		
Transmission Lines - Non-Contract	$ 60,072	0	0	0	22,123	37,949	0	0	0	0	0	0		
Reverse Osmosis - Field Costs	$ 3,261,931	0	488	999	1,047	374,346	1,181,467	1,703,585	0	0	0	0		
Reverse Osmosis - Non-Contract	$ 1,683,301	0	59,133	148,142	229,269	319,592	422,062	505,103	0	0	0	0		
Selenium Removal Plant - Field Costs	$ 10,305,683	0	366	749	786	1,242,837	3,797,271	5,263,674	0	0	0	0		
Selenium Removal Plant - Non-Contract	$ 4,675,331	0	150,280	416,186	661,562	890,376	1,164,078	1,392,849	0	0	0	0		
Initial Evap Ponds & Mitigation - Field Costs	$ 28,033,635	0	192,563	394,512	445,432	2,946,988	9,380,363	14,673,777	0	0	0	0		
Initial Evaporation Ponds - Non-Contract	$ 14,563,521	0	490,777	1,252,412	1,984,121	2,742,967	3,655,113	4,438,131	0	0	0	0		
Mitigation Phase 2 - Field Costs	$ 96,607	0	0	0	0	0	0	0	0	0	31,688	64,920		
Mitigation Phase 2 - Non-Contract	$ 104,223	0	0	0	0	0	0	0	0	0	22,913	81,311		
Evaporation Ponds (Future) - Field Costs *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Evaporation Ponds - Non-Contract *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Northerly Totals	$ 93,826,244	0	2,194,185	4,984,023	10,018,251	20,381,418	28,070,418	27,977,119	0	0	54,600	146,231	0	0

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 17 & 18; Years 29 & 30; and Years 42 & 43

* Evap Pond Future Non-Contract Costs to occur: Years 15 - 18; Years 24 - 30; and Years 40 - 43

San Luis Drain
Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - South	Total Est. Costs	Interest During Construction Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Collection System - Field Costs	$ 5,145,041	0	0	0	0	0	61,425	125,844	221,180	1,462,931	3,273,661	0		
Collection System - Non-Contract	$ 2,580,378	0	0	0	0	0	55,954	226,544	483,787	787,142	1,026,950	0		
Reuse Areas/Irrigation - Field Costs	$ 3,310,869	0	0	0	0	0	207,188	424,475	470,257	839,402	1,369,547	0		
Reuse Areas/Irrigation - Non-Contract	$ 1,021,172	0	0	0	0	0	22,750	92,109	196,699	306,388	403,225	0		
Conveyance & Pump Plants - Field Costs	$ 238,022	0	0	0	0	0	0	0	0	66,109	171,913	0		
Conveyance & Pump Plants - Non-Contract	$ 114,009	0	0	0	0	0	0	0	0	55,648	58,361	0		
Transmission Lines - Field Costs	$ 388,489	0	0	0	0	0	0	0	5,421	109,683	273,385	0		
Transmission Lines - Non-Contract	$ 200,591	0	0	0	0	0	0	0	41,263	68,435	90,893	0		
Reverse Osmosis - Field Costs	$ 422,607	0	0	0	0	0	390	799	838	105,823	314,757	0		
Reverse Osmosis - Non-Contract	$ 248,552	0	0	0	0	0	5,753	23,290	47,436	72,758	99,315	0		
Selenium Removal Plant - Field Costs	$ 1,400,357	0	0	0	0	0	244	499	524	312,054	1,087,036	0		
Selenium Removal Plant - Non-Contract	$ 1,058,222	0	0	0	0	0	23,888	112,640	213,681	298,945	409,069	0		
Initial Evap Ponds & Mitigation - Field Costs	$ 4,533,798	0	0	0	0	0	47,409	97,130	101,865	1,107,075	3,180,319	0		
Initial Evaporation Ponds - Non-Contract	$ 2,944,597	0	0	0	0	0	68,150	275,921	561,972	861,967	1,176,587	0		
Mitigation Phase 2 - Field Costs	$ 21,922	0	0	0	0	0	0	0	0	0	7,191	14,732		
Mitigation Phase 2 - Non-Contract	$ 23,395	0	0	0	0	0	0	0	0	0	5,143	18,252		
Evaporation Ponds (Future) - Field Costs *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Evaporation Ponds - Non-Contract *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Westlands South - Totals	$ 23,652,022	0	0	0	0	0	493,150	1,379,253	2,344,922	6,454,362	12,947,352	32,983	0	0

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 19 & 20; Years 31 & 32; and Years 45 & 46
* Evap Pond Future Non-Contract Costs to occur Years 17 - 20; Years 29 - 32; and Years 43 - 46

San Luis Drain

Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - Central	Total Est. Costs	Interest During Construction Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Collection System - Field Costs	$ 20,849,046	0	0	113,588	232,712	244,057	511,880	1,731,721	2,755,104	3,369,780	5,163,294	6,726,910		
Collection System - Non-Contract	$ 8,405,534	0	0	27,861	117,444	404,871	735,719	975,897	1,168,966	1,352,874	1,672,668	1,949,235		
Reuse Areas/Irrigation - Field Costs	$ 10,334,884	0	0	304,688	624,229	654,660	736,796	1,038,890	1,305,489	1,470,972	1,904,449	2,294,712		
Reuse Areas/Irrigation - Non-Contract	$ 2,745,465	0	0	9,100	38,360	132,241	240,305	318,753	381,815	441,884	546,336	636,670		
Conveyance & Pump Plants - Field Costs	$ 916,139	0	0	0	0	0	0	49,307	116,304	157,562	252,045	340,922		
Conveyance & Pump Plants - Non-Contract	$ 350,658	0	0	0	0	0	0	47,272	57,108	66,462	82,841	96,975		
Transmission Lines - Field Costs	$ 1,010,687	0	0	0	0	0	25,401	149,198	350,787	485,301	0	0		
Transmission Lines - Non-Contract	$ 347,866	0	0	0	0	0	54,992	73,522	94,876	124,476	0	0		
Reverse Osmosis - Field Costs	$ 532,820	0	0	366	749	786	824	138,933	391,162	0	0	0		
Reverse Osmosis - Non-Contract	$ 395,466	0	0	2,368	15,247	47,833	80,033	108,146	141,839	0	0	0		
Selenium Removal Plant - Field Costs	$ 1,732,677	0	0	366	749	786	824	473,668	1,256,285	0	0	0		
Selenium Removal Plant - Non-Contract	$ 1,159,385	0	0	7,170	42,973	141,469	232,417	312,264	423,091	0	0	0		
Initial Evap Ponds & Mitigation - Field Costs	$ 10,549,460	0	0	0	74,588	152,811	1,143,846	3,588,314	5,589,902	0	0	0		
Initial Evaporation Ponds - Non-Contract	$ 4,275,477	0	0	0	100,371	461,651	921,773	1,260,726	1,530,957	0	0	0		
Mitigation Phase 2 - Field Costs	$ 34,184	0	0	0	0	0	0	0	0	0	11,213	22,972		
Mitigation Phase 2 - Non-Contract	$ 39,694	0	0	0	0	0	0	0	0	0	8,726	30,967		
Evaporation Ponds (Future) - Field Costs *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Evaporation Ponds - Non-Contract *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Westlands Central - Totals	$ 63,679,442	0	0	465,506	1,247,422	2,241,164	4,684,810	10,266,610	15,563,686	7,469,310	9,641,572	12,099,363	0	0

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 18 - 19; Years 30 & 31; and Years 44 & 45

* Evap Pond Future Non-Contract Costs to occur Years 16 - 19; Years 28 - 31; and Years 42 - 45

San Luis Drain
Project Cost Estimate by Fiscal Year - Water Needs Alternative

Westlands - North	Total Est. Costs	Interest During Construction Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Collection System - Field Costs	$ 4,572,727	0	0	0	40,219	82,398	86,415	127,995	401,141	750,035	1,293,721	1,790,803		
Collection System - Non-Contract	$ 1,987,877	0	0	0	0	23,644	112,366	203,662	281,019	367,401	461,497	538,288		
Reuse Areas/Irrigation - Field Costs	$ 3,442,293	0	0	0	131,625	269,667	282,813	307,463	400,046	515,292	687,841	847,547		
Reuse Areas/Irrigation - Non-Contract	$ 829,990	0	0	0	0	9,872	46,916	85,034	117,333	153,399	192,687	224,749		
Conveyance & Pump Plants - Field Costs	$ 390,268	0	0	0	0	0	0	0	20,440	61,199	127,672	180,957		
Conveyance & Pump Plants - Non-Contract	$ 152,494	0	0	0	0	0	0	0	25,573	33,849	42,866	50,206		
Transmission Lines - Field Costs	$ 211,376	0	0	0	0	0	0	6,327	59,057	145,992	0	0		
Transmission Lines - Non-Contract	$ 103,687	0	0	0	0	0	0	22,415	33,882	47,390	0	0		
Reverse Osmosis - Field Costs	$ 333,140	0	0	0	390	799	838	879	83,973	246,261	0	0		
Reverse Osmosis - Non-Contract	$ 190,540	0	0	0	0	4,373	11,064	31,525	60,594	82,983	0	0		
Selenium Removal Plant - Field Costs	$ 926,471	0	0	0	244	499	524	549	199,337	725,317	0	0		
Selenium Removal Plant - Non-Contract	$ 658,732	0	0	0	0	14,162	60,041	127,483	192,363	264,682	0	0		
Initial Evap Ponds & Mitigation - Field Costs	$ 1,571,460	0	0	0	29,372	60,176	63,109	1,418,803	0	0	0	0		
Initial Evaporation Ponds - Non-Contract	$ 1,002,665	0	0	0	0	103,944	311,500	587,221	0	0	0	0		
Mitigation Phase 2 - Field Costs	$ 11,519	0	0	0	0	0	0	0	0	0	3,778	7,740		
Mitigation Phase 2 - Non-Contract	$ 12,085	0	0	0	0	0	0	0	0	0	2,657	9,429		
Evaporation Ponds (Future) - Field Costs *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Evaporation Ponds - Non-Contract *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Westlands North - Totals	$ 16,397,323	0	0	0	201,849	569,533	975,586	2,919,356	1,874,758	3,393,801	2,812,720	3,649,720	0	0

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 19 & 20; Years 31 & 32; and Years 45 & 46
* Evap Pond Future Non-Contract Costs to occur Years 17 - 20; Years 29 - 32; and Years 43 - 46

Drainage Impaired Retired Lands	$ -													
Project Totals by Year	**$ 197,555,031**	**-**	**2,194,185**	**5,449,528**	**11,467,522**	**23,192,115**	**34,223,963**	**42,542,338**	**19,783,366**	**17,317,473**	**25,456,244**	**15,928,297**	$ -	$ -

Assumptions:

San Luis Drain
Project Cost Estimate by Fiscal Year - Drainage Impaired Alternative

Northerly Area	Total Est. Costs	Total Field Costs and Non-Contract Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Future Years
Collection System - Field Costs	$ 27,845,000	-	370,000	-	15,111,250	12,363,750	-	-	-					
Collection System - Non-Contract	$ 7,755,000	215,417	2,562,561	1,521,518	2,076,838	1,378,667	-	-	-					
Reuse Areas/Irrigation - Field Costs	$ 81,700,000	-	41,000,000	-	24,420,000	16,280,000	-	-						
Reuse Areas/Irrigation - Non-Contract	$ 23,300,000	647,222	7,699,248	4,571,422	6,239,886	4,142,222	-	-						
Conveyance & Pump Plants - Field Costs	$ 153,574,000	-	-	-	45,945,000	54,560,040	53,068,960	-						
Conveyance & Pump Plants - Non-Contract	$ 42,326,000	1,175,722	9,876,067	12,414,420	5,691,701	6,584,045	6,584,044	-	-					
Transmission Lines - Field Costs	$ 3,241,406	-	-	-	2,066,396	1,175,010	-	-	-	-				
Transmission Lines - Non-Contract	$ 907,594			302,531	302,531	302,532								
Reverse Osmosis - Field Costs	$ 34,390,000	-	20,000	-	-	15,312,704	17,051,265	2,006,031	-	-				
Reverse Osmosis - Non-Contract	$ 9,610,000	266,945	1,892,098	1,641,259	1,390,742	1,856,291	1,708,444	854,222	-					
Selenium Removal Plant - Field Costs	$ 103,535,000	-	15,000	-	-	50,954,397	51,357,198	1,208,405	-	-				
Selenium Removal Plant - Non-Contract	$ 26,465,000	735,139	4,695,075	5,913,305	3,321,021	4,743,127	4,704,889	2,352,444	-					
Evap. Ponds & Mitigation- Field Costs	$ 308,042,000	-	7,900,000	-	1,300,000	100,437,039	157,602,354	40,802,607	-					
Evaporation Ponds & Mitigation -Non-Contract	$ 84,458,000	2,215,500	15,703,428	14,561,594	12,952,432	14,211,446	17,724,000	7,089,600	-	-	-	-		
Mitigation - Phase 2 - Field Costs	$ 17,800,000										1,300,000		16,500,000	
Mitigation - Phase 2 - Non-Contract	$ 4,700,000										940,000	1,410,000	2,350,000	
Evaporation Ponds (Future) - Field Costs *	$ 45,780,000													45,780,000
Evaporation Ponds - Non-Contract *	$ 12,720,000													12,720,000
Northerly Totals	$ 988,149,000	5,255,945	91,733,476	40,926,048	120,817,796	284,301,270	309,801,155	54,313,309	-	-	2,240,000	1,410,000	18,850,000	58,500,000

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 17 & 18; Years 29 & 30; and Years 42 & 43
* Evap Pond Future Non-Contract Costs to occur: Years 15 - 18; Years 24 - 30; and Years 40 - 43

Drainage Impaired Retired Lands	$ 1,250,000,000	12,500,000	12,500,000	250,000,000	250,000,000	250,000,000	250,000,000	225,000,000						
Project Totals by Year	**$ 2,238,149,000**	**17,755,945**	**104,233,476**	**290,926,048**	**370,817,796**	**534,301,270**	**559,801,155**	**279,313,309**	**-**	**-**	**2,240,000**	**1,410,000**	**18,850,000**	**58,500,000**

San Luis Drain
Project Cost Estimate by Fiscal Year - Drainage Impaired Alternative

Northerly Area	Total Est. Costs	Interest During Construction Costs per Fiscal Year												
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Collection System - Field Costs	$ 1,491,529	0	9,019	18,477	387,715	1,076,319	0	0	0	0	0	0		
Collection System - Non-Contract	$ 891,268	0	72,964	176,070	272,364	369,869	0	0	0	0	0	0		
Reuse Areas/Irrigation - Field Costs	$ 9,657,647	0	999,375	2,047,470	2,742,521	3,868,282	0	0	0	0	0	0		
Reuse Areas/Irrigation - Non-Contract	$ 2,677,825	0	219,221	529,006	818,321	1,111,278	0	0	0	0	0	0		
Conveyance & Pump Plants - Field Costs	$ 11,168,682	0	0	0	1,119,909	3,624,315	6,424,458	0	0	0	0	0		
Conveyance & Pump Plants - Non-Contract	$ 4,972,786	0	0	0	1,282,713	1,644,466	2,045,606	0	0	0	0	0		
Transmission Lines - Field Costs	$ 182,202	0	0	0	50,368	131,833	0	0	0	0	0	0		
Transmission Lines - Non-Contract	$ 60,072	0	0	0	22,123	37,949	0	0	0	0	0	0		
Reverse Osmosis - Field Costs	$ 3,261,931	0	488	999	1,047	374,346	1,181,467	1,703,585	0	0	0	0		
Reverse Osmosis - Non-Contract	$ 1,683,301	0	59,133	148,142	229,269	319,592	422,062	505,103	0	0	0	0		
Selenium Removal Plant - Field Costs	$ 10,305,683	0	366	749	786	1,242,837	3,797,271	5,263,674	0	0	0	0		
Selenium Removal Plant - Non-Contract	$ 4,675,331	0	150,280	416,186	661,562	890,376	1,164,078	1,392,849	0	0	0	0		
Initial Evap Ponds & Mitigation - Field Costs	$ 28,033,635	0	192,563	394,512	445,432	2,946,988	9,380,363	14,673,777	0	0	0	0		
Initial Evaporation Ponds - Non-Contract	$ 14,563,521	0	490,777	1,252,412	1,984,121	2,742,967	3,655,113	4,438,131	0	0	0	0		
Mitigation Phase 2 - Field Costs	$ 96,607	0	0	0	0	0	0	0	0	0	31,688	64,920		
Mitigation Phase 2 - Non-Contract	$ 104,223	0	0	0	0	0	0	0	0	0	22,913	81,311		
Evaporation Ponds (Future) - Field Costs *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Evaporation Ponds - Non-Contract *	$ -	0	0	0	0	0	0	0	0	0	0	0		
Northerly Totals	$ 93,826,244	0	2,194,185	4,984,023	10,018,251	20,381,418	28,070,418	27,977,119	0	0	54,600	146,231	0	0

* Evap Pond Future Field Costs to occur in 3 add'l time periods: Years 17 & 18; Years 29 & 30; and Years 42 & 43
* Evap Pond Future Non-Contract Costs to occur: Years 15 - 18; Years 24 - 30; and Years 40 - 4

Drainage Impaired Retired Lands	$ -													
Project Totals by Year	**$ 93,826,244**	**-**	**2,194,185**	**4,984,023**	**10,018,251**	**20,381,418**	**28,070,418**	**27,977,119**	**-**	**-**	**54,600**	**146,231**	$ -	$ -

Assumptions:

Operation and Maintenance Costs – San Luis Unit

San Luis Drain Reauthorization

Annual Operations, Maintenance, and Replacements Costs by Alternative

Water Needs Alternative

Retired Lands	151000	Ac	$19	$2,869,000	
Mitigation	1040	Ac		$982,979	
Northerly Area	From Table Below			$6,178,946	
WWD South	From Table Below			$3,243,089	
WWD Central	From Table Below			$3,953,416	
WWD North	From Table Below			$2,596,790	
Total - Annual O&M Cost (Rounded)				**$19,800,000**	$19,824,220

Drainage Impaired Alternative

Retired Lands	264000	Ac	$19	$5,016,000	
Mitigation	640	Ac		$604,910	
Northerly Area	From Table Below			$6,178,946	
Total - Annual O&M Cost (Rounded)				**$11,800,000**	$11,799,856

San Luis Drain Reauthorization
Annual Operations, Maintenance, and Replacements Costs by Service Area

	Northerly Area			WWD South			WWD Central			WWD North		
	Annual Labor	Annual Materials Supplies Services	Annual Replace Cost	Annual Labor	Annual Materials Supplies Services	Annual Replace Cost	Annual Labor	Annual Materials Supplies Services	Annual Replace Cost	Annual Labor	Annual Materials Supplies Services	Annual Replace Cost
Pumping Plants	$151,380		$179,347	$138,852		$16,600	$138,852		$27,483	$138,852		$14,250
Pipeline Cpllection and Conveyance System	$151,380	$475,500		$138,852	$262,500		$138,852	$462,500		$138,852	$117,500	
Reuse Areas - Alum Pipe	$313,200	$250,000	$450,000	$203,267	$125,000	$180,000	$203,267	$160,000	$170,000	$203,267	$100,000	$80,000
RO Treatment Plant	$417,600	$1,236,000		$243,252	$196,000		$243,252	$291,000		$243,252	$141,000	
Se BioTreatment Plant	$626,400	$655,693	$624,082	$417,600	$105,746	$420,325	$417,600	$166,196	$415,990	$417,600	$54,454	$416,008
Evaporation Ponds	$46,980	$166,004		$46,980	$69,032		$46,980	$108,462		$46,980	$38,593	
Transmission Lines (O&M Provided By Utility)												
Electric & Control Equip.	$229,680		$205,700	$159,732		$519,350	$159,732		$803,250	$159,732		$286,450
Subtotal	**$1,936,620**	**$2,783,197**	**$1,459,129**	**$1,348,535**	**$758,278**	**$1,136,276**	**$1,348,535**	**$1,188,158**	**$1,416,723**	**$1,348,535**	**$451,547**	**$796,708**
	Northerly Area Total =		**$6,178,946**	WWD South Total =		**$3,243,089**	WWD Central Total		**$3,953,416**	WWD North Total =		**$2,596,790**

Personnel Requirements

	Northerly Area			WWD South			WWD Central			WWD North		
	Number Required	Hourly Wage Rate	Annual Salary	Number Required	Hourly Wage Rate	Annual Salary	Number Required	Hourly Wage Rate	Annual Salary	Number Required	Hourly Wage Rate	Annual Salary
Pumping Plants - Total $			$151,380			$138,852			$138,852			$138,852
Mechanic - Full	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Mechanic - Shared				0.33	50	$34,452	0.33	50	$34,452	0.33	50	$34,452
Mechanic - Part	0.75	30	$46,980									
Pipeline Cpllection and Conveyance System			$151,380			$138,852			$138,852			$138,852
Maintenance Person - Full	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Laborer - Part				0.33	50	$34,452	0.33	50	$34,452	0.33	50	$34,452
Laborer - Part	0.75	30	$46,980									
Reuse Areas			$313,200			$203,267			$203,267			$203,267
Ag Engineer - Full	1.00	60	$125,280	1.00	60	$125,280	1.00	60	$125,280	1.00	60	$125,280
Asst Ag Engineer - Full	1.00	45	$93,960									
Asst Ag Engineer - Share				0.33	45	$31,007	0.33	45	$31,007	0.33	45	$31,007
Laborer - Part (2 req'd)	1.50	30	$93,960	0.75	30	$46,980	0.75	30	$46,980	0.75	30	$46,980
RO Treatment Plant			$417,600			$243,252			$243,252			$243,252
Lead Operator - Full	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Operator - Full	1.00	50	$104,400									
Operator - Shared				0.67	50	$69,948	0.67	50	$69,948	0.67	50	$69,948
Laborer - Full	1.00	50	$104,400									
Laborer - Shared				0.33	50	$34,452	0.33	50	$34,452	0.33	50	$34,452
Mechanic - Full	1.00	50	$104,400									
Mechanic - Shared				0.33	50	$34,452	0.33	50	$34,452	0.33	50	$34,452
Se BioTreatment Plant			$626,400			$417,600			$417,600			$417,600
Lead Operator - Full	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Operator - Full	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Operator - Shared												
Laborer - Full	2.00	50	$208,800	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Laborer - Shared												
Mechanic - Full	2.00	50	$208,800	1.00	50	$104,400	1.00	50	$104,400	1.00	50	$104,400
Mechanic - Shared												
Evaporation Ponds			$46,980			$46,980			$46,980			$46,980
Laborer - Part	0.75	30	$46,980	0.75	30	$46,980	0.75	30	$46,980	0.75	30	$46,980
Mitigation (Included in MSS Cost)												
Transmission Lines (Handled by Utility)												
Electric & Control Equip.			$229,680			$159,732			$159,732			$159,732
Lead Control Engr - Full	1.00	60	$125,280	1.00	60	$125,280	1.00	60	$125,280	1.00	60	$125,280
Control Engr - Full	1.00	50	$104,400									
Control Engr - Shared				0.33	50	$34,452	0.33	50	$34,452	0.33	50	$34,452

Land Retirement Costs – San Luis Unit

Land Retirement Costs

Another category of costs incurred by some of the action alternatives is the removal of lands from agricultural production, or land retirement. As mentioned above, the NED cost of land retirement is the net farm income forgone as a result of retiring land rather than keeping it in irrigated agricultural production—not the actual cash outlay, or financial cost, of purchasing land to retire. The financial cost of land retirement is a transfer payment. A transfer payment is essentially a payment from one economic sector of the Nation (Federal Government) to another (current owners of drainage-impaired land) without any corresponding production or expectation of production. The analysis of alternatives formulated to provide the San Luis Unit with drainage service includes two types of land retirement scenarios: (1) retiring land for the purpose of constructing project facilities on it and (2) retiring land to avoid providing drainage service for particular land parcels.

Changes in additional irrigation management costs relative to the No Action Alternative[1] ($/year)

Subarea	In-Valley/ Water Needs Land Retirement	In-Valley/ Drainage-Impaired Area Land Retirement
Northerly Area		
Upslope Unimpaired Area (acres)	253,000	253,000
Irrigation Mgt Costs ($/acre)	$8.45	$8.45
Subtotal ($)	$2,138,000	$2,138,000
Westlands		
Upslope Unimpaired Area (acres)	126,000	126,000
Irrigation Mgt Costs ($/acre)	$8.01	$8.01
Subtotal ($)	$1,009,000	$1,009,000
Total Cost	**$3,147,000**	**$3,147,000**

[1] Irrigation improvements on all Northerly Area lands and on Westlands lands outside the drainage-impaired area are assumed in both action alternatives to reduce percolation to the regional aquifer. The costs of the improvements are shown in this table.

Irrigation management costs were indexed from 2003 to 2006 using the index for "Prices Paid by Farmers for Production Items" from the *Agricultural Prices 2005 Summary*: Released July 2007, by the NASS Agricultural Statistics Board, U.S. Department of Agriculture. ($7.18 per acre * 146/124 = $8.45 per acre for Northerly Area; $6.80 per acre * 146/124 = $8.01 per acre for Westlands).

Values represent additional costs relative to No Action. Values rounded to nearest $1,000. Totals may not add due to rounding.

Project Facilities

The first example of land retirement, which occurs in all of the action alternatives, is the purchase of lands required for project facilities, such as reuse areas, evaporation basins, and water storage, treatment, or conveyance facilities. The net revenue from these lands is lost as they are removed from agricultural production and used as sites for project facilities. The change in net farm revenue that occurs when drainage-impaired land is retired is estimated to be $56.90 ($158.39 - $101.49) per acre per year in Westlands and $12.76 ($172.79 - $160.03) per acre per year for land in the Northerly Area (the difference is due to different crop mixes on the affected lands). The values used in this analysis are indexed to fiscal year 2006 values using prices, yields, and production costs

developed for the PFR Addendum (Reclamation 2004a). The estimated NED cost of lands retired for project facilities is provided in the following table.

Changes in cost of agricultural production losses from land purchased for project facilities relative to the No Action Alternative[1] ($/year)

Subarea	In-Valley/ Water Needs Land Retirement	In-Valley/ Drainage-Impaired Area Land Retirement
Northerly Area		
Purchased for Project Facilities (acres)	4,467	4,467
Change in Net Revenue ($/acre/year)	$12.76	$12.76
Subtotal ($)	$57,000	$57,000
Westlands		
Purchased for Project Facilities (acres)	1,044	0
Change in Net Revenue ($/acre/year)	$56.90	$56.90
Subtotal ($)	$59,000	$0
Total Cost	**$116,000**	**$57,000**

[1] Estimates shown are annual figures as of the end of the 50-year planning horizon.

Values used for "Change in Net Revenue" are the difference between the loss of net farm income from land retirement and the change in net farm income with drainage service vs. without drainage service. ($172.79 - $160.03 = $12.60/acre for Northerly Area; $158.39 - $101.49 = $56.90/acre for Westlands).

Values represent additional costs relative to No Action. Values rounded to nearest $1,000. Totals may not add due to rounding.

Land Retirement

Another reason to retire land is to avoid the cost of providing drainage service to specific drainage-impaired lands. The NED cost per acre of retiring land to avoid providing drainage service to that same land is the same as the cost estimated for project facilities. The following table summarizes the changes in net farm income resulting from land retirement activities.

In addition to the loss of net revenue that occurs as land is taken out of agricultural production, an additional cost of the land retirement program is the result of management and administrative activities required to manage the alternative uses of retired lands. Specific activities assumed to be part of the land management program are dryland farming, land fallowing, and grazing. One-third of all retired land is assumed to be in one of these three program activities.

Ability-to-Pay Calculations – San Luis Unit

Ability to Pay

An ability-to-pay study assesses the financial capability of an irrigation district (or contracting entity) to pay for existing or increased Reclamation water charges and services. An ability-to-pay study is a "district-level" analysis completed subsequent to a payment capacity study. Ability to pay is the farm-level payment capacity aggregated to the entire district, minus district existing obligations, operation and maintenance (O&M) costs, power costs, and reserve fund requirements.

An ability-to-pay study determines the district's financial capability for the following 5 years. It is Reclamation's policy to review ability-to-pay determinations every 5 years for repayment and water service contracts entered into after March 25, 1994.

The determination of financial feasibility requires an evaluation of the individual district's ability to pay the project's estimated capital repayment costs and annual operations and maintenance coupled with any existing obligations, restoration fund charges and other existing charges.

Project Repayment

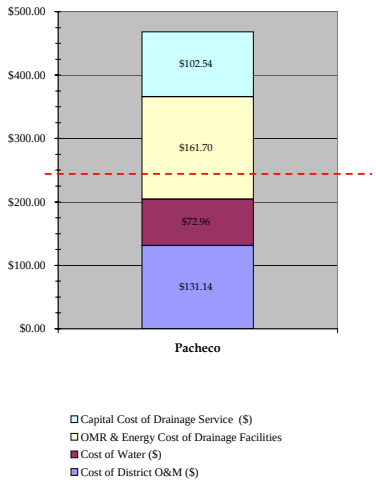
A payment capacity study was prepared to determine the financial capacity of irrigators within the San Luis Unit to repay the assigned capital costs, as well as annual operation, maintenance, replacement and energy (OMR&E) costs estimated for the two action alternatives. Results of the payment capacity study are based on current water supply conditions and do not include adjustments for possible reductions in the water supply.

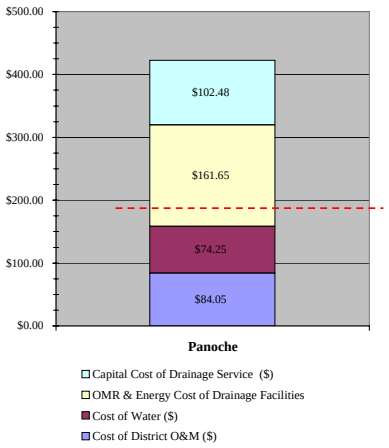
The payment capacity study provides an estimate of the total revenue available from the irrigation of San Luis Unit lands to pay for all costs related to irrigating those lands. Such costs include repayment of capital costs of storage, conveyance, and delivery of project and non-project water, OMR&E costs, existing debt payments, and any other existing obligations associated with irrigating Unit lands.

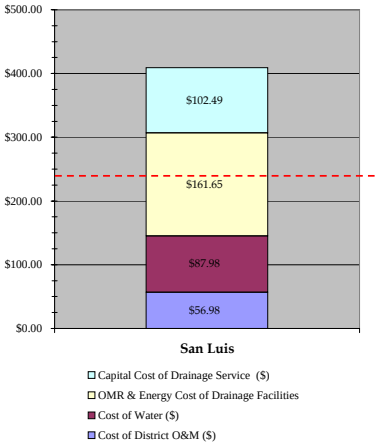
Repayment of Annual Operation, Maintenance, Replacement, & Energy Costs ($/year)
In-Valley/ Water Needs Land Retirement

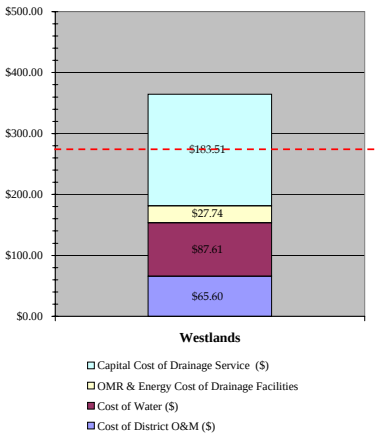
	Pacheco	Panoche	San Luis	Broadview	Westlands	Total SLU
Acres	5,071	37,050	37,927	0	321,367	401,414
Estimated Payment Capacity ($/acre)	$232.40	$192.23	$228.76	$163.00	$269.18	$257.79
Estimated Payment Capacity ($/ac-ft)	$96.87	$73.93	$78.88	$0.00	$99.70	$95.34
District Payment Capacity	$1,179,000	$7,122,000	$8,676,000	$0	$86,505,000	$103,482,000
Cost of District O&M ($)	$665,000	$3,114,000	$2,161,000	$0	$21,081,000	$27,021,000
Cost of Water ($)	$370,000	$2,751,000	$3,337,000	$0	$28,156,000	$34,614,000
Remaining Payment Capacity ($)	$144,000	$1,257,000	$3,178,000	$0	$37,268,000	$41,847,000
OMR & Energy Cost of Drainage Facilities	$820,000	$5,989,000	$6,131,000	$0	$8,915,000	$21,855,000
Revenue Available to Repay Drainage Service Capital Cost ($)	($676,000)	($4,732,000)	($2,953,000)	$0	$28,353,000	$19,992,000
Capital Cost of Drainage Service ($)	$520,000	$3,797,000	$3,887,000	$0	$58,974,000	$67,178,000
Difference ($)	($1,196,000)	($8,529,000)	($6,840,000)	$0	($30,621,000)	($47,186,000)

District Payment Capacity	$232.50	$192.23	$228.75	#DIV/0!	$269.18	$257.79
Cost of District O&M ($)	$131.14	$84.05	$56.98	#DIV/0!	$65.60	$67.31
Cost of Water ($)	$72.96	$74.25	$87.98	#DIV/0!	$87.61	$86.23
Facilities	$161.70	$161.65	$161.65	#DIV/0!	$27.74	$54.44
Capital Cost of Drainage Service ($)	$102.54	$102.48	$102.49	#DIV/0!	$183.51	$167.35





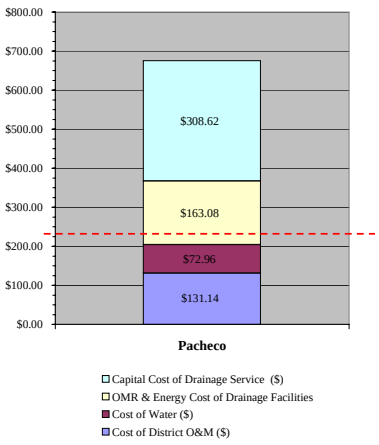


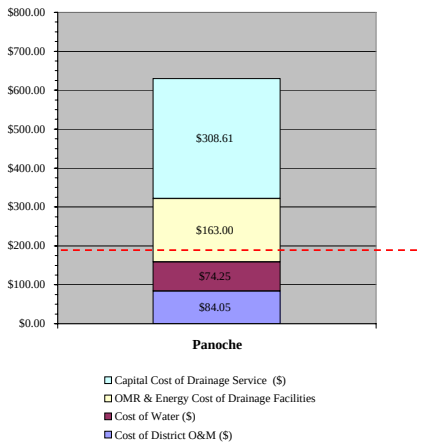


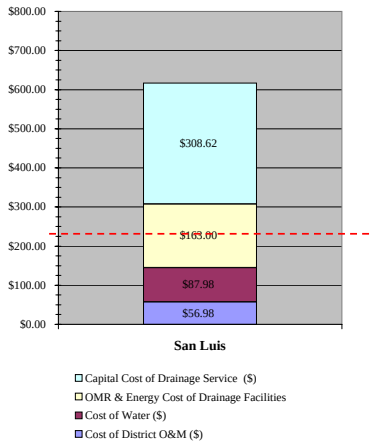
Repayment of Annual Operation, Maintenance, Replacement, & Energy Costs ($/year)
In-Valley/ Drainage-Impaired Area Land Retirement

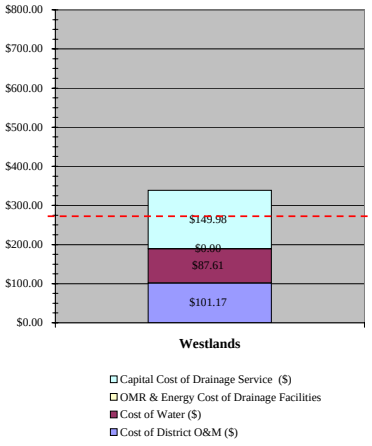
	Pacheco	Panoche	San Luis	Broadview	Westlands	Total SLU
Acres	5,071	37,050	37,927	0	208,367	288,414
Estimated Payment Capacity ($/acre)	$232.40	$192.23	$228.76	$163.00	$274.93	$257.49
Estimated Payment Capacity ($/ac-ft)	$96.87	$73.93	$78.88	$0.00	$101.83	$95.23
District Payment Capacity	$1,179,000	$7,122,000	$8,676,000	$0	$57,286,000	$74,263,000
Cost of District O&M ($)	$665,000	$3,114,000	$2,161,000	$0	$21,081,000	$27,021,000
Cost of Water ($)	$370,000	$2,751,000	$3,337,000	$0	$18,255,000	$24,713,000
Remaining Payment Capacity ($)	$144,000	$1,257,000	$3,178,000	$0	$17,950,000	$22,529,000
OMR & Energy Cost of Drainage Facilities	$827,000	$6,039,000	$6,182,000	$0	$0	$13,048,000
Revenue Available to Repay Drainage Service Capital Cost ($)	($683,000)	($4,782,000)	($3,004,000)	$0	$17,950,000	$9,481,000
Capital Cost of Drainage Service ($)	$1,565,000	$11,434,000	$11,705,000	$0	$31,250,000	$55,954,000
Difference($)	($2,248,000)	($16,216,000)	($14,709,000)	$0	($13,300,000)	($46,473,000)

District Payment Capacity	$232.50	$192.23	$228.75	#DIV/0!	$274.93	$257.49
Cost of District O&M ($)	$131.14	$84.05	$56.98	#DIV/0!	$101.17	$93.69
Cost of Water ($)	$72.96	$74.25	$87.98	#DIV/0!	$87.61	$85.69
OMR & Energy Cost of Drainage Facilities	$163.08	$163.00	$163.00	#DIV/0!	$0.00	$45.24
Capital Cost of Drainage Service ($)	$308.62	$308.61	$308.62	#DIV/0!	$149.98	$194.01









San Luis Unit Ability-to-Pay Estimates

	Pacheco	Panoche	San Luis	Broadview	Westlands	SLU Totals
Status Quo						
PC	1,179,000	7,122,000	8,676,000	1,469,000	106,793,000	125,239,000
PC/Acre	232.40	192.23	228.76	163.00	210.90	210.34
PC/AF	169.10	113.25	118.89	70.42	130.43	127.47
PC/FDR	96.87	73.93	78.88	60.39	78.11	77.79
O&M Estimate ($/ac)						39.00
Dist O&M	517,000	3,114,000	2,161,000	930,000	21,081,000	27,803,000
Drain O&M	148,000					148,000
Water	370,000	2,751,000	3,337,000	795,000	44,364,000	51,617,000
Reported Irrigable Ac					604,000	689,600
Irrigated Acres	5,071	37,050	37,927	9,010	506,367	595,424
AF	6,972	62,890	72,973	20,860	818,776	982,471
AF/Acre	1.37	1.70	1.92	2.32	1.62	1.65
FDR	2.40	2.60	2.90	2.70	2.70	2.70
Dist O&M	665,000	3,114,000	2,161,000	930,000	21,081,000	27,951,000
Dist O&M/Acre	131.14	84.05	56.98	103.22	41.63	46.94
Dist O&M/AF	95.38	49.52	29.61	44.58	25.75	28.45
Dist O&M/FDR	54.64	32.33	19.65	38.23	15.42	17.36
Water O&M	370,000	2,751,000	3,337,000	795,000	44,364,000	51,617,000
Water O&M/Acre	72.96	74.25	87.98	88.24	87.61	86.69
Water O&M/AF	53.07	43.74	45.73	38.11	54.18	52.54
Water O&M/FDR	30.40	28.56	30.34	32.68	32.45	32.06
Total Cost	1,035,000	5,865,000	5,498,000	1,725,000	65,445,000	79,568,000
Total Cost/Acre	204.10	158.30	144.96	191.45	129.24	133.63
Total Cost/AF	148.45	93.26	75.34	82.69	79.93	80.99
Total Cost/FDR	85.04	60.89	49.99	70.91	47.87	49.42
PC-Cost	144,000	1,257,000	3,178,000	-256,000	41,348,000	45,671,000
PC-Cost/Acre	28.40	33.93	83.79	-28.41	81.66	76.70
PC-Cost/AF	20.65	19.99	43.55	-12.27	50.50	46.49
PC-Cost/FDR	11.83	13.05	28.89	-10.52	30.24	28.37

San Luis Unit Ability-to-Pay Estimates

	Pacheco	Panoche	San Luis	Broadview	Westlands	SLU Totals
Water Needs Land Retirement Alternative						527,000
Retired Acres	0	0	0	10,000	185,000	195,000
Irrigated Acres	5,071	37,050	37,927	0	321,367	401,414
PC	1,179,000	7,122,000	8,676,000	0	86,505,000	103,482,000
PC/Acre	232.40	192.23	228.76	163.00	269.18	257.79
PC/FDR	96.87	73.93	78.88	0.00	99.70	95.34
Drain OMR&E	820,000	5,989,000	6,131,000	0	8,915,000	**21,855,000**
Drain O&M/Acre	161.70	161.65	161.65	0.00	27.74	54.44
Drain O&M/FDR	67.38	62.17	55.74	0.00	10.27	20.14
Drain Cap/year	520,000	3,797,000	3,887,000	0	58,974,000	**67,178,000**
Drain Cap/year/Acre	102.54	102.48	102.49	0.00	183.51	167.35
Drain Cap/year/FDR	42.73	39.42	35.34	0.00	67.97	61.89
Total Drain	1,340,000	9,786,000	10,018,000	0	67,889,000	89,033,000
Total Drain/acre	264.25	264.13	264.14	0.00	211.25	221.80
Total Drain/FDR	110.10	101.59	91.08	0.00	78.24	82.03
Dist O&M	665,000	3,114,000	2,161,000	0	21,081,000	27,951,000
Dist O&M/Acre	131.14	84.05	56.98	0.00	41.63	46.94
Dist O&M/FDR	54.64	32.33	19.65	0.00	15.42	17.36
Water O&M	370,000	2,751,000	3,337,000	0	28,156,000	34,798,000
Water O&M/Acre	72.96	74.25	87.98	0.00	87.61	86.69
Water O&M/FDR	30.40	28.56	30.34	0.00	32.45	32.06
Total Cost	2,375,000	15,651,000	15,516,000	0	117,126,000	151,782,000
Total Cost/Acre	468.35	422.43	409.10	0.00	364.46	378.12
Total Cost/FDR	195.15	162.47	141.07	0.00	134.99	139.84
PC-Total Cost	-1,196,000	-8,529,000	-6,840,000	0	-30,621,000	-48,300,000
PC-Total Cost/Acre	-235.85	-230.20	-180.34	0.00	-95.28	-120.32
PC-Total Cost/FDR	-98.27	-88.54	-62.19	0.00	-35.29	-44.50

San Luis Unit Ability-to-Pay Estimates

	Pacheco	Panoche	San Luis	Broadview	Westlands	SLU Totals
Drainage Impaired Area Land Retirement Alternative						414,000
Retired Acres	0	0	0	10,000	298,000	308,000
Irrigated Acres	5,071	37,050	37,927	0	208,367	288,414
PC	1,179,000	7,122,000	8,676,000	0	57,286,000	74,263,000
PC/Acre	232.40	192.23	228.76	163.00	274.93	257.49
PC/FDR	96.87	73.93	78.88	0.00	101.83	95.23
Drain OMR&E	827,000	6,039,000	6,182,000	0	0	**13,047,000**
Drain O&M/Acre	163.08	163.00	163.00	0.00	0.00	45.24
Drain O&M/FDR	67.95	62.69	56.21	0.00	0.00	16.73
Drain Cap/year	1,565,000	11,434,000	11,705,000	0	**31,250,000**	**55,954,000**
Drain Cap/year/Acre	308.62	308.61	308.62	0.00	149.98	194.01
Drain Cap/year/FDR	128.59	118.70	106.42	0.00	55.55	71.75
Total Drain	2,392,000	17,473,000	17,887,000	0	31,250,000	69,001,000
Total Drain/acre	471.70	471.61	471.61	0.00	149.98	239.24
Total Drain/FDR	196.54	181.39	162.62	0.00	55.55	88.48
Dist O&M	665,000	3,114,000	2,161,000	0	21,081,000	27,951,000
Dist O&M/Acre	131.14	84.05	56.98	0.00	101.17	96.91
Dist O&M/FDR	54.64	32.33	19.65	0.00	37.47	35.84
Water O&M	370,000	2,751,000	3,337,000	0	18,255,000	25,002,000
Water O&M/Acre	72.96	74.25	87.98	0.00	87.61	86.69
Water O&M/FDR	30.40	28.56	30.34	0.00	32.45	32.06
Total Cost	3,427,000	23,338,000	23,385,000	0	70,586,000	121,954,000
Total Cost/Acre	675.80	629.91	616.57	0.00	338.76	422.84
Total Cost/FDR	281.58	242.27	212.61	0.00	125.47	156.38
PC-Total Cost	-2,248,000	-16,216,000	-14,709,000	0	-13,300,000	-47,691,000
PC-Total Cost/Acre	-443.31	-437.68	-387.82	0.00	-63.83	-165.36
PC-Total Cost/FDR	-184.71	-168.34	-133.73	0.00	-23.64	-61.15

District Financial Statements – San Luis Unit

Table 8 - Special Districts Annual Report - Pacheco

	2000-01	2001-02	2002-03	2003-04	2004-05	Average	
Op Revenues							
Residential	$ 16,682	$ 19,653	$ 1,872	$ -	$ -	$ 7,641	
Irrigation	$ 801,353	$ 779,853	$ 810,469	$ 798,019	$ 899,937	$ 817,926	
Water Services	$ 148,939	$ 138,184	$ 250,590	$ 96,406	$ 120,283	$ 150,880	
Total Op Revenues	$ 966,974	$ 937,690	$ 1,062,931	$ 894,425	$ 1,020,220	$ 976,448	
Op Expenses							
Source of Supply	$ 390,515	$ 417,586	$ 416,784	$ 469,549	$ 513,238	$ 441,534	
Administratin & General	$ 248,155	$ 335,990	$ 426,338	$ 383,948	$ 347,040	$ 348,294	
Transmission & Distribution	$ 174,875	$ 97,547	$ 114,963	$ 126,619	$ 148,694	$ 132,540	
Depreciation & Armortization	$ 107,715	$ 103,026	$ 86,621	$ 67,007	$ 66,034	$ 86,081	
Total Op Expenses	$ 921,260	$ 954,149	$ 1,044,706	$ 1,047,123	$ 1,075,006	$ 1,008,449	
Operating Income (Loss)	$ 45,714	$ (16,459)	$ 18,225	$ (152,698)	$ (54,786)	$ (32,001)	
Non-Op Revenues							
Interest Income	$ 45,406	$ 41,393	$ 27,375	$ 15,266	$ 11,786	$ 28,245	
Property Assessments	$ 125,356	$ 125,356	$ 250,711	$ 154,730	$ 124,730	$ 156,177	
Other	$ 1,501	$ -	$ -	$ -	$ -	$ 300	
Total Non-Op Revenues	$ 172,263	$ 166,749	$ 278,086	$ 169,996	$ 136,516	$ 184,722	
Non-Op Expenses							
Interest Expense	$ 56,453	$ 55,412	$ 51,750	$ 46,349	$ 33,062	$ 48,605	
Other	$ -	$ -				$ -	
Total Non-Op Expenses	$ 56,453	$ 55,412	$ 51,750	$ 46,349	$ 33,062	$ 48,605	
Non-Op Income (Loss)	$ 115,810	$ 111,337	$ 226,336	$ 123,647	$ 103,454	$ 136,117	
Net Income	$ 161,524	$ 94,878	$ 244,561	$ (29,051)	$ 48,668	$ 104,116	
Percent irrigation	83%	83%	76%	89%	88%	84%	
Op Expenses							
Source of Supply	$ 323,629	$ 347,296	$ 317,792	$ 418,938	$ 452,728	$ 369,853	
Administratin & General	$ 205,652	$ 279,434	$ 325,076	$ 342,564	$ 306,124	$ 291,750	
Transmission & Distribution	$ 144,923	$ 81,127	$ 87,658	$ 112,971	$ 131,163	$ 111,022	
Depreciation & Armortization	$ 89,266	$ 85,684	$ 66,047	$ 59,785	$ 58,249	$ 72,106	
Total Op Expenses	$ 763,469	$ 793,542	$ 796,573	$ 934,258	$ 948,264	$ 844,732	
Total Op Expenses less Water	$ 439,840	$ 446,246	$ 478,781	$ 515,320	$ 495,536	$ 475,145	$ 495,536
Total Non-Op Revenues	$ 46,907	$ 41,393	$ 27,375	$ 15,266	$ 11,786	$ 28,545	$ 11,786
Total Non-Op Expenses	$ 56,453	$ 55,412	$ 51,750	$ 46,349	$ 33,062	$ 48,605	$ 33,062
Net Expenses less Water	$ 449,386	$ 460,265	$ 503,156	$ 546,403	$ 516,812	$ 495,204	$ 516,812

Table 8 - Special Districts Annual Report - Panoche

	2000-01	2001-02	2002-03	2003-04	2004-05	Average	
Op Revenues							
Residential	$ 12,122	$ 16,543	$ 22,093	$ 23,014	$ 14,908	$ 17,736	
Irrigation	$ 3,739,788	$ 2,918,680	$ 6,320,141	$ 6,696,661	$ 6,691,876	$ 5,273,429	
All Other Sales	$ 588,819	$ -	$ 237,286	$ 275,643	$ 414,452	$ 303,240	
Water Services	$ 2,138,652	$ 2,192,489	$ -	$ -	$ -	$ 866,228	
Total Op Revenues	$ 6,479,381	$ 5,127,712	$ 6,579,520	$ 6,995,318	$ 7,121,236	$ 6,460,633	
Op Expenses							
Source of Supply	$ 2,998,762	$ 2,790,657	$ 3,450,305	$ 3,479,661	$ 4,132,799	$ 3,370,437	
Pumping	$ 1,123,533	$ 1,042,357	$ 867,268	$ 978,041	$ 1,142,789	$ 1,030,798	
Administratin & General	$ 1,021,611	$ 947,406	$ 1,101,728	$ 1,197,021	$ 1,191,881	$ 1,091,929	
Transmission & Distribution	$ 689,395	$ 680,769	$ 690,143	$ 690,143	$ 662,908	$ 682,672	
Depreciation & Armortization	$ 589,780	$ 69,693	$ 288,748	$ 315,767	$ 382,158	$ 329,229	
Other	$ -	$ -	$ -			$ -	
Total Op Expenses	$ 6,423,081	$ 5,530,882	$ 6,398,192	$ 6,660,633	$ 7,512,535	$ 6,505,065	
Operating Income (Loss)	$ 56,300	$ (403,170)	$ 181,328	$ 334,685	$ (391,299)	$ (44,431)	
Non-Op Revenues							
Interest Income	$ 245,246	$ 162,102	$ 104,976	$ 56,546	$ 62,029	$ 126,180	
Property Assessments	$ 557,084	$ 563,921	$ 563,121	$ 562,459	$ 562,459	$ 561,809	
Federal	$ -	$ -	$ -	$ -	$ -	$ -	
Other	$ 21,760	$ 16,205	$ 120,657	$ 10,422	$ 98,613	$ 53,531	
Total Non-Op Revenues	$ 824,090	$ 742,228	$ 788,754	$ 629,427	$ 723,101	$ 741,520	
Non-Op Expenses							
Interest Expense	$ 268,830	$ 249,366	$ 232,258	$ 211,670	$ 98,281	$ 212,081	
Other	$ 48,252	$ 917,454	$ 48,252	$ 48,252	$ -	$ 212,442	
Total Non-Op Expenses	$ 317,082	$ 1,166,820	$ 280,510	$ 259,922	$ 98,281	$ 424,523	
Non-Op Income (Loss)	$ 507,008	$ (424,592)	$ 508,244	$ 369,505	$ 624,820	$ 316,997	
Net Income	$ 563,308	$ (827,762)	$ 689,572	$ 704,190	$ 233,521	$ 272,566	
Percent irrigation	58%	57%	96%	96%	94%	82%	
Op Expenses							
Source of Supply	$ 1,730,834	$ 1,588,435	$ 3,314,286	$ 3,331,101	$ 3,883,621	$ 2,751,086	
Pumping	$ 648,484	$ 593,307	$ 833,078	$ 936,285	$ 1,073,887	$ 841,379	
Administratin & General	$ 589,656	$ 539,261	$ 1,058,295	$ 1,145,916	$ 1,120,019	$ 891,277	
Transmission & Distribution	$ 397,907	$ 387,492	$ 662,936	$ 660,678	$ 622,939	$ 557,224	
Depreciation & Armortization	$ 340,411	$ 39,669	$ 277,365	$ 302,286	$ 359,117	$ 268,730	
Total Op Expenses	$ 3,707,293	$ 3,148,163	$ 6,145,961	$ 6,376,265	$ 7,059,582	$ 5,309,696	
Total Op Expenses less Water	$ 1,976,458	$ 1,559,729	$ 2,831,675	$ 3,045,164	$ 3,175,962	$ 3,017,600	$ 3,175,962
Total Non-Op Revenues	$ 267,006	$ 178,307	$ 225,633	$ 66,968	$ 160,642	$ 207,897	$ 160,642
Total Non-Op Expenses	$ 317,082	$ 1,166,820	$ 280,510	$ 259,922	$ 98,281	$ 285,838	$ 98,281
Net Expenses less Water	$ 2,026,534	$ 2,548,242	$ 2,886,552	$ 3,238,118	$ 3,113,601	$ 2,762,609	$ 3,113,601

Table 8 - Special Districts Annual Report - San Luis

	2000-01	2001-02	2002-03	2003-04	2004-05	Average	
Op Revenues							
Industrial	$ 47,935	$ 38,344	$ 56,201	$ 77,506	$ 68,488	$ 57,695	
Irrigation	$ 6,696,470	$ 5,347,687	$ 4,920,592	$ 5,528,306	$ 6,474,197	$ 5,793,450	
Water Services		$ 1,872,092	$ 1,702,386	$ 2,024,691	$ 1,771,268	$ 1,842,609	
Total Op Revenues	$ 6,744,405	$ 7,258,123	$ 6,679,179	$ 7,630,503	$ 8,313,953	$ 7,693,754	
Op Expenses							
Source of Supply	$ 3,829,034	$ 3,613,778	$ 5,630,304	$ 4,352,259	$ 4,731,900	$ 4,431,455	
Pumping	$ 18,351	$ 86,334	$ 110,821	$ 77,166	$ 67,237	$ 71,982	
Administratin & General	$ 1,459,168	$ 653,684	$ 638,347	$ 753,014	$ 793,681	$ 859,579	
Transmission & Distribution	$ 823,920	$ 866,834	$ 761,068	$ 740,957	$ 784,892	$ 795,534	
Depreciation & Armortization	$ 651,891	$ 611,091	$ 711,504	$ 713,786	$ 850,536	$ 707,762	
Total Op Expenses	$ 6,782,364	$ 5,831,721	$ 7,852,044	$ 6,637,182	$ 7,228,246	$ 6,866,311	
Operating Income (Loss)	$ (37,959)	$ 1,426,402	$ (1,172,865)	$ 993,321	$ 1,085,707	$ 827,443	
Non-Op Revenues							
Interest Income	$ 902,778	$ 959,600	$ 622,323	$ 446,054	$ 464,352	$ 679,021	
Rents, Leases & Franchises	$ 29,761	$ -	$ -	$ -	$ -	$ 5,952	
Property Assessments	$ 1,608,353	$ 1,602,795	$ 1,613,900	$ 1,583,424	$ 1,698,699	$ 1,621,434	
State	$ 119	$ 117	$ -	$ 99	$ 97	$ 86	
Other	$ 50,406	$ 714,614	$ 106,492	$ 37,637	$ 355,492	$ 252,928	
Total Non-Op Revenues	$ 2,591,417	$ 3,277,126	$ 2,342,715	$ 2,067,214	$ 2,518,640	$ 2,559,422	
Non-Op Expenses							
Interest Expense	$ 715,349	$ 815,644	$ 657,707	$ 625,977	$ 595,318	$ 681,999	
Other	$ -	$ 450,444	$ 462,710	$ 375,943	$ 442,074	$ 346,234	
Total Non-Op Expenses	$ 715,349	$ 1,266,088	$ 1,120,417	$ 1,001,920	$ 1,037,392	$ 1,028,233	
Non-Op Income (Loss)	$ 1,876,068	$ 2,011,038	$ 1,222,298	$ 1,065,294	$ 1,481,248	$ 1,531,189	
Net Income	$ 1,838,109	$ 3,437,440	$ 49,433	$ 2,058,615	$ 2,566,955	$ 2,358,632	
Percent irrigation	99%	74%	74%	72%	78%	75%	
Op Expenses							
Source of Supply	$ 3,801,820	$ 2,662,583	$ 4,147,879	$ 3,153,215	$ 3,684,800	$ 3,336,916	
Pumping	$ 18,221	$ 63,610	$ 81,643	$ 55,907	$ 52,358	$ 54,203	
Administratin & General	$ 1,448,797	$ 481,626	$ 470,274	$ 545,559	$ 618,051	$ 647,269	
Transmission & Distribution	$ 818,064	$ 638,672	$ 560,683	$ 536,824	$ 611,207	$ 599,043	
Depreciation & Armortization	$ 647,258	$ 450,244	$ 524,169	$ 517,139	$ 662,325	$ 532,949	
Total Op Expenses	$ 6,734,159	$ 4,296,733	$ 5,784,649	$ 4,808,644	$ 5,628,741	$ 5,170,380	
Total Op Expenses less Water	$ 2,932,340	$ 1,634,150	$ 1,636,769	$ 1,655,429	$ 1,943,941	$ 1,717,572	$ 1,943,941
Total Non-Op Revenues	$ 953,184	$ 1,674,214	$ 728,815	$ 483,691	$ 819,844	$ 746,384	$ 819,844
Total Non-Op Expenses	$ 715,349	$ 1,266,088	$ 1,120,417	$ 1,001,920	$ 1,037,392	$ 1,106,454	$ 1,037,392
Net Expenses less Water	$ 2,694,505	$ 1,226,024	$ 2,028,371	$ 2,173,658	$ 2,161,489	$ 2,077,643	$ 2,161,489

Table 8 - Special Districts Annual Report - Broadview

	2000-01	2001-02	2002-03	2003-04	2004-05	Average	
Op Revenues							
Irrigation	$ 1,373,413	$ 1,274,999	$ 1,451,131	$ 1,586,807	$ 2,292,604	$ 1,595,791	
Total Op Revenues	$ 1,373,413	$ 1,274,999	$ 1,451,131	$ 1,586,807	$ 2,292,604	$ 1,595,791	
Op Expenses							
Source of Supply	$ 574,921	$ 487,186	$ 617,389	$ 721,468	$ 1,573,998	$ 794,992	
Pumping	$ 237,536	$ 256,879	$ 227,734	$ 254,441	$ 232,027	$ 241,723	
Administratin & General	$ 603,561	$ 582,272	$ 412,305	$ 354,227	$ 578,146	$ 506,102	
Depreciation & Armortization	$ 175,944	$ 175,944	$ 146,537	$ 119,042	$ 90,148	$ 141,523	
Total Op Expenses	$ 1,591,962	$ 1,502,281	$ 1,403,965	$ 1,449,178	$ 2,474,319	$ 1,684,341	
Operating Income (Loss)	$ (218,549)	$ (227,282)	$ 47,166	$ 137,629	$ (181,715)	$ (88,550)	
Non-Op Revenues							
Interest Income	$ 64,046	$ 43,930	$ 38,345	$ 14,242	$ 12,200	$ 34,553	
Property Assessments	$ 6,671	$ -	$ -	$ -	$ -	$ 1,334	
Federal	$ 153,152	$ 119,960	$ 14,252	$ 24,428	$ 79,702	$ 78,299	
Other	$ 53,809	$ 44,440	$ 61,032	$ 31,119	$ 65,111	$ 51,102	
Total Non-Op Revenues	$ 277,678	$ 208,330	$ 113,629	$ 69,789	$ 157,013	$ 165,288	
Non-Op Expenses							
Interest Expense	$ 14,988	$ 4,219	$ -	$ -	$ -	$ 3,841	
Other	$ 86,711	$ 97,122	$ 107,856	$ 163,682	$ -	$ 91,074	
Total Non-Op Expenses	$ 101,699	$ 101,341	$ 107,856	$ 163,682	$ -	$ 94,916	
Non-Op Income (Loss)	$ 175,979	$ 106,989	$ 5,773	$ (93,893)	$ 157,013	$ 70,372	
Net Income	$ (42,570)	$ (120,293)	$ 52,939	$ 43,736	$ (24,702)	$ (18,178)	
Percent irrigation	100%	100%	100%	100%	100%	100%	
Op Expenses							
Source of Supply	$ 574,921	$ 487,186	$ 617,389	$ 721,468	$ 1,573,998	$ 794,992	
Pumping	$ 237,536	$ 256,879	$ 227,734	$ 254,441	$ 232,027	$ 241,723	
Administratin & General	$ 603,561	$ 582,272	$ 412,305	$ 354,227	$ 578,146	$ 506,102	
Depreciation & Armortization	$ 175,944	$ 175,944	$ 146,537	$ 119,042	$ 90,148	$ 141,523	
Total Op Expenses	$ 1,591,962	$ 1,502,281	$ 1,403,965	$ 1,449,178	$ 2,474,319	$ 1,684,341	
Total Op Expenses less Water	$ 1,017,041	$ 1,015,095	$ 786,576	$ 727,710	$ 900,321	$ 889,349	$ 889,349
Total Non-Op Revenues	$ 117,855	$ 88,370	$ 99,377	$ 45,361	$ 77,311	$ 77,605	$ 77,605
Total Non-Op Expenses	$ 101,699	$ 101,341	$ 107,856	$ 163,682	$ -	$ 118,645	$ 118,645
Net Expenses less Water	$ 1,000,885	$ 1,028,066	$ 795,055	$ 846,031	$ 823,010	$ 1,085,598	$ 930,388

Table 8 - Special Districts Annual Report - Westlands

	2000-01	2001-02	2002-03	2003-04	2004-05	Average	
Op Revenues							
Industrial	$ 603,180	$ 782,342	$ 847,885	$ 1,099,225	$ 2,430,247	$ 1,152,576	
Irrigation	$ 57,605,248	$ 68,152,632	$ 53,719,396	$ 56,832,586	$ 66,258,040	$ 60,513,580	
All Other Sales	$ 357,100	$ 696,074	$ 1,383,289	$ 97,443	$ 107,706	$ 528,322	
Water Services	$ 4,517,377	$ 2,065,180	$ 2,128,852	$ 1,606,687	$ 1,582,309	$ 2,380,081	
Total Op Revenues	$ 63,082,905	$ 71,696,228	$ 58,079,422	$ 59,635,941	$ 70,378,302	$ 64,574,560	
Op Expenses							
Source of Supply	$ 44,577,824	$ 49,471,679	$ 38,537,420	$ 49,118,779	$ 55,001,035	$ 47,341,347	
Pumping	$ 256,788	$ 226,645	$ 289,812	$ 287,816	$ 303,031	$ 272,818	
Administratin & General	$ 4,748,360	$ 5,893,154	$ 9,849,119	$ 5,680,415	$ 5,858,765	$ 6,405,963	
Customer Accounts	$ 1,565,743	$ 1,535,717	$ 1,662,966	$ 1,788,565	$ 1,820,486	$ 1,674,695	
Transmission & Distribution	$ 6,425,818	$ 13,209,198	$ 10,483,741	$ 4,498,879	$ 3,964,130	$ 7,716,353	
Depreciation & Armortization	$ 3,653,360	$ 3,657,431	$ 3,748,217	$ 4,444,109	$ 5,534,700	$ 4,207,563	
Other	$ -	$ 285,139	$ 581,921	$ 148,726	$ 102,559	$ 223,669	
Total Op Expenses	$ 61,227,893	$ 74,278,963	$ 65,153,196	$ 65,967,289	$ 72,584,706	$ 67,842,409	
Operating Income (Loss)	$ 1,855,012	$ (2,582,735)	$ (7,073,774)	$ (6,331,348)	$ (2,206,404)	$ (3,267,850)	
Non-Op Revenues							
Interest Income	$ 2,395,743	$ 2,024,294	$ 2,523,720	$ 1,834,021	$ 1,544,654	$ 2,064,486	
Property Assessments	$ 2,638,847	$ 6,952,304	$ 11,076,330	$ 11,377,620	$ 9,379,053	$ 8,284,831	
Other	$ 3,143,152	$ 338,194	$ 532,927	$ 4,860,085	$ 598,853	$ 1,894,642	
Total Non-Op Revenues	$ 8,177,742	$ 9,314,792	$ 14,132,977	$ 18,071,726	$ 11,522,560	$ 12,243,959	
Non-Op Expenses							
Interest Expense	$ 1,993,202	$ 1,947,062	$ 4,840,594	$ 6,697,889	$ 6,669,954	$ 4,429,740	
Other	$ 305,544	$ -	$ -	$ -	$ -	$ 61,109	
Total Non-Op Expenses	$ 2,298,746	$ 1,947,062	$ 4,840,594	$ 6,697,889	$ 6,669,954	$ 4,490,849	
Non-Op Income (Loss)	$ 5,878,996	$ 7,367,730	$ 9,292,383	$ 11,373,837	$ 4,852,606	$ 7,753,110	
Net Income	$ 7,734,008	$ 4,784,995	$ 2,218,609	$ 5,042,489	$ 2,646,202	$ 4,485,261	
Percent irrigation	91%	95%	92%	95%	94%	94%	
Op Expenses							
Source of Supply	$ 40,707,013	$ 47,026,534	$ 35,644,413	$ 46,809,813	$ 51,781,027	$ 44,364,134	
Pumping	$ 234,490	$ 215,443	$ 268,056	$ 274,286	$ 285,290	$ 255,661	
Administratin & General	$ 4,336,047	$ 5,601,884	$ 9,109,745	$ 5,413,391	$ 5,515,767	$ 6,003,103	
Customer Accounts	$ 1,429,785	$ 1,459,814	$ 1,538,127	$ 1,704,488	$ 1,713,907	$ 1,569,377	
Transmission & Distribution	$ 5,867,847	$ 12,556,332	$ 9,696,726	$ 4,287,397	$ 3,732,052	$ 7,231,085	
Depreciation & Armortization	$ 3,336,129	$ 3,476,662	$ 3,466,838	$ 4,235,201	$ 5,210,674	$ 3,942,957	
Other	$ -	$ 271,046	$ 538,236	$ 141,735	$ 96,555	$ 209,603	
Total Op Expenses	$ 55,911,312	$ 70,607,715	$ 60,262,141	$ 62,866,311	$ 68,335,271	$ 63,575,921	
Total Op Expenses less Water	$ 15,204,299	$ 23,581,181	$ 24,617,728	$ 16,056,498	$ 16,554,244	$ 15,938,347	$ 16,554,244
Total Non-Op Revenues	$ 5,538,895	$ 2,362,488	$ 3,056,647	$ 6,694,106	$ 2,143,507	$ 2,520,881	$ 2,143,507
Total Non-Op Expenses	$ 2,298,746	$ 1,947,062	$ 4,840,594	$ 6,697,889	$ 6,669,954	$ 6,683,922	$ 6,669,954
Net Expenses less Water	$ 11,964,150	$ 23,165,755	$ 26,401,675	$ 16,060,281	$ 21,080,691	$ 20,101,388	$ 21,080,691

Payment Capacity Analysis – San Luis Unit

Payment Capacity Analysis

The farm budget method of analysis was used to estimate the payment capacity of San Luis Unit lands. Enterprise budgets for crops commonly produced within the study area were generated. Criteria for preparing the enterprise budget approach followed the *Technical Guidelines for Irrigation Ability to Pay and Irrigation Payment Capacity*, May 2004.

Estimated payment capacity values for each crop budget prepared for the farm budget analysis are presented in the following table. Payment capacity is determined by subtracting the return to farm family from net farm income. Payment capacity represents the amount available to pay all district costs associated with providing project irrigation water to project land.

Estimated payment capacity by crop

Crops Represented	Payment Capacity ($/acre)
Alfalfa Hay	0.01
Alfalfa See	94.62
Almonds	335.61
Cantaloupe	317.74
Cotton	115.04
Wine Grapes	93.25
Sugar Beets	-65.23
Tomatoes, Processed	443.82
Wheat	-148.91

Payment capacity value has been computed for all lands in the San Luis Unit using the prevailing cropping pattern projected to occur under each action alternative for each district within the San Luis Unit and is shown in the following table.

Estimated payment capacity for each district in the San Luis Drainage Area

	Payment Capacity by District				
	Pacheco	Panoche	San Luis	Westlands	Weighted Total
Weighted Payment Capacity – In-Valley Water Needs Land Retirement					
$/acre (includes negative payment capacity)	232.40	192.23	228.76	269.18	257.79
$/acre-ft	96.87	73.93	78.88	99.7	95.34
Weighted Payment Capacity – In Valley Drainage Impaired Land Retirement					
$/acre (includes negative payment capacity)	232.40	192.23	228.76	274.93	257.49
$/acre-ft	96.87	73.93	78.88	101.83	95.23

District O&M and Cost of Water

The contractors in this study all have the ability to deliver irrigation water throughout their service area. The cost of providing this service is the combination of the district cost of O&M and their cost of water. The district cost of O&M includes all costs associated with district operations, except water costs, as reported on the financial reports of each district. The district's cost of water likewise is the cost, reported on each district's financial reports for water. Included in the district's cost of water are any payments to Reclamation for O&M, existing capital repayment, and Restoration Fund charges, in addition to the costs of any addition water supplied to the district from alternate sources. Both the district cost of O&M and cost of water reflect five year averages to minimize the impacts of one time expenditures.

Repayment of Drainage Service

In order for a project to be considered financially feasible, Reclamation policy requires that irrigated lands generate, as a minimum, at least enough revenue to pay annual OMR&E costs. Current expenses estimated for each district are compared to district payment capacity to determine the remaining payment capacity available to repay annual OMR&E costs of each alternative.

Based on the values estimated in the following table, only San Luis and Westlands Water Districts are capable of generating adequate agricultural revenues to pay their existing District O&M and assigned annual OMR&E costs of drainage service under the In-Valley/Water Needs Land Retirement Alternative. In addition, none of the water districts have the ability to fully repay its assigned capital costs of drainage service facilities under this alternative after paying for water.

SAN LUIS IRRIGATION DISTRICTS
FRESNO COUNTY, CALIFORNIA

PAYMENT CAPACITY ANALYSIS

Prepared by:

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Denver, Colorado

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INTRODUCTION

This study was conducted to determine the payment capacity of the San Luis Unit Irrigation Districts within the San Luis Drainage study area. Irrigation Districts included in this payment capacity study include; Broadview Irrigation District, Panoche Irrigation District, Pacheco Irrigation District, San Luis Irrigation District, and Westlands Irrigation District. The results of this preliminary analysis are based on current water supply conditions and do not include adjustments for future, possible reductions in the water supply.

This study provides a weighted estimate of the residual, per-acre net farm income. The weighted residual income is calculated from a series of enterprise budgets prepared for the primary crops grown within the San Luis Drainage Study area. Farm-level revenues, expenses, and allowances for returns to investment, family labor, and management are accounted for in this process. The difference between net farm income and return to farm family is the estimated payment capacity.

The farm budget method of analysis was used to estimate the weighted payment capacity for the Districts. Enterprise budgets for the main crops within the study area characterized the production, management, and marketing strategies commonly used.

Information relating to this study was entered in a computer-based, budget-generator software package developed at Reclamation. Results from using the budget generator package are presented, along with discussions of input data.

After all calculations were completed, there was no payment capacity for the district as a whole. Individually, Broadview Irrigation District and San Luis Irrigation District had an estimated payment capacity of $12.03 per acre and $87.38 per acre, respectively.

SAN LUIS UNIT IRRIGATION DISTRICTS

The San Luis Drainage Study area Irrigation Districts have project lands extending about 70 miles north and south, from Mendota, California to Kettleman, California. The Unit is about 15 miles in width and lies within Fresno and Kings Counties.

Land Use and Crops

There are many diverse crops grown in the area. For this analysis, an evaluation of the entire cropping distribution for each district was completed. Then, the crop distribution was aggregated into 10 primary crops. The 10 primary crops are used to represent other crops within the same general classification of crop production. For example, the costs and returns for alfalfa hay are used as a proxy for the costs and returns of irrigated pasture, silage, other forage crops, and other hay. All the acres of land producing any of these named crops are added into the acreage total for alfalfa hay. This allows the analysis to be less bulky and to be completed in a more expeditious manner.

The 10 primary crops in the district selected for analysis are: 1) alfalfa hay, 2) alfalfa seed, 3) almonds, 4) cantaloupe, 5) cotton, 6) wine grapes, 7) lettuce, 8) sugar beets, 9) tomatoes, and 10) wheat. The aggregation scheme for all the crops grown in the area into the 10 primary crops is shown in Table 1. Additionally, Table 1 shows the number of acres of each crop by Irrigation District and the 3-year average used in the analysis.

Table 1. Cropping Pattern Distribution for San Luis Unit.

Budget	Crops Represented	SAN LUIS UNIT BROADVIEW 96-98	PACHECO 02-05	PANOCHE 91-93	SAN LUIS 91-93	WESTLANDS 02-04	TOTAL	
		Acres	Acres	Acres	Acres	Acres	Acres	%
Alfalfa Hay	Alfalfa Hay	0	108	898	765	12,047	13,818	2.14%
Irrig. Pasture	Irrig Pasture	0	0	0	0	1,267	1,267	0.20%
(included w/	Silage	0	0	271	194	0	465	0.07%
Alfalfa Hay)	Other Forage	0	47	0	0	0	47	0.01%
	Other Hay	102	108	569	0	0	779	0.12%
		102	263	1,738	959	13,314	16,376	2.54%
Alfalfa Seed	Grass (All Kinds)	0	0	0	0	0	0	0.00%
	Clover Seed (All Kinds)	0	0	0	0	0	0	0.00%
	Corn	0	0	0	0	0	0	0.00%
	Alfalfa Seed	851	0	446	12	971	2,280	0.35%
Vine Seed --	Lettuce	0	72	0	0	0	72	0.01%
(included w/	Potato (All Kinds)	0	0	0	0	0	0	0.00%
Alfalfa Seed)	Onion	0	0	0	0	0	0	0.00%
	Sugar Beet	0	0	0	0	0	0	0.00%
	Other Seed	0	0	0	161	1,639	1,800	0.28%
	Pea	0	0	0	0	0	0	0.00%
		851	72	446	173	2,610	4,152	0.64%
Almonds	Almonds	0	0	869	1,871	37,483	40,223	6.23%
	Pecans	0	0	0	0	10	10	0.00%
	Walnuts	0	0	20	62	392	474	0.07%
	Other Nuts	0	0	0	80	10,806	10,886	1.69%
Oranges	Oranges & Tangerines	0	0	0	218	584	802	0.12%
	Nectarines					168	168	
(included w/	Lemons & Limes	0	0	0	0	0	0	0.00%
Almonds)	Grapefruit	0	0	0	0	38	38	0.01%
Olives	Olives	0	0	0	0	312	312	0.05%
Peaches	Cherries	0	0	0	0	234	234	0.04%
(included w/	Apricot	0	0	0	413	511	924	0.14%
Almonds)	Other Fruit	0	0	0	28	0	28	0.00%
	Peaches	0	0	0	0	1,226	1,226	0.19%
	Berries (All Kinds)	0	0	0	0	0	0	0.00%
Pears	Pears	0	0	0	0	0	0	0.00%
(included w/	Apples	0	0	0	298	382	680	0.11%
Almonds)	Prunes & Plums	0	0	0	405	406	811	0.13%
		0	0	889	3,375	52,552	56,816	8.80%
Cantaloupe	Cantaloupe	910	434	1,566	2,916	16,228	22,054	3.42%
	Watermelon	0	0	420	0	1,744	2,164	0.34%
	Honey Ball, Honeydew, ect	0	28	1,711	0	3,488	5,227	0.81%
	Cucumbers	0	0	0	0	459	459	0.07%
		910	462	3,697	2,916	21,919	29,904	4.63%

Table 1, Continued

Cotton	Cotton, Lint (Upland)	5,631	1,263	13,911	11,767	164,208	196,780	30.48%
	Cotton, Seed (Upland)	0	0	5,455	0	0	5,455	0.84%
		5,631	1,263	19,366	11,767	164,208	202,235	31.33%
Grapes, Wine	Grapes, Other	0	0	703	0	7,973	8,676	1.34%
	Grapes, Table	0	0	0	948	955	1,903	0.29%
		0	0	703	948	8,928	10,579	1.64%
Lettuce	Carrots	0	0	0	0	236	236	0.04%
	Cauliflower	0	0	290	0	47	337	0.05%
	Greens (Kale, ect)	0	0	0	0	494	494	0.08%
	Celery	0	0	0	0	0	0	0.00%
	Cabbage	0	0	0	0	39	39	0.01%
	Broccili	0	25	0	0	5,718	5,743	0.89%
	Garlic			524		17,222	17,746	
	Lettuce	0	0	0	0	24,442	24,442	3.79%
		0	25	814	0	48,198	49,037	7.60%
Rice	Rice	0	0	0	0	0	0	0.00%
Sugar Beets	Other Misc Field Crops	0	70	0	250	646	966	0.15%
	Sugar Beets	0	0	63	42	4,929	5,034	0.78%
		0	70	63	292	5,575	6,000	0.93%
Tomatoes, Proc	Peas, Green (Fresh Mkt)	0	0	0	0	0	0	0.00%
	Peppers (All Kinds)	0	0	0	0	1,696	1,696	0.26%
	Potatoes, Early	0	0	0	0	0	0	0.00%
	Asparagus	0	0	869	1,521	584	2,974	0.46%
	Nursery	0	0	0	0	0	0	0.00%
	Squash	0	0	0	0	20	20	0.00%
	Potatoes, Late	0	0	0	0	0	0	0.00%
	Beans (Proc)	0	60	0	2,230	0	2,290	0.35%
	Beans, Dry	0	0	393	0	955	1,348	0.21%
	Soybeans	0	0	0	0	0	0	0.00%
	Tomatoes (Fresh Mkt)	0	0	1,644	0	3,533	5,177	0.80%
	Corn, Sweet (Proc)	0	0	0	0	0	0	0.00%
	Corn	0	0	0	0	646	646	0.10%
	Onions, Dry	0	0	343	511	9,618	10,472	1.62%
	Tomatoes (Canning)	1,142	240	3,977	1,142	90,268	96,769	14.99%
	Other Vegetables	0	0	0	545	254	799	0.12%
	Beans (Fresk Mkt)	0	0	0	0	0	0	0.00%
	Onions, Green	0	0	0	0	3,482	3,482	0.54%
	Corn, Sweet Fresh Mkt)	0	0	0	0	5,694	5,694	0.88%
	Peas, Green (Proc)	0	108	150	0	151	409	0.06%
		1,142	408	7,376	5,949	116,901	131,776	20.41%
Wheat	Barley	20	0	391	544	6,807	7,762	1.20%
	Other Cereals	0	0	0	0	0	0	0.00%
	Wheat	354	0	1,232	207	45,134	46,927	7.27%
	Sorghum	0	0	0	0	853	853	0.13%
	Oats	0	0	107	0	2,533	2,640	0.41%
		374	0	1,730	751	55,327	58,182	9.01%
Fallow Land	Fallow Land					80,526	80,526	12.47%
	TOTAL	9,010	2,563	36,822	27,130	570,058	645,583	100.00%

Crop yields were obtained for each of the primary crops. These are shown in Table 2 and were obtained from the Agricultural Commissioner Reports published for Fresno County. A 5-year average of yields was used in the analysis.

Following a trend set in the 1996 farm bill, the direct payments made to farmers are decoupled from current year production levels and are based on the average program yield for a farm. This means that regardless of production levels, farmers will receive the amounts per crop shown in Table 4. These payments will be made on 85 percent of the base acres. The average yield from Table 2 is assumed to be the program yield.

Table 4. Government Payment Rates for 2002-07, Including Direct Payment Rate, Target Price, and Loan Rate.

Eligible Crop	Yield Unit	Direct Payment	Target Price	Loan Rate
Cotton	Lb	$0.0667	$.724	$0.52
Wheat	Bu	$0.52	$3.92	$2.75

Source: Lubben, Bradley D., "The New Farm Bill and Commodity Programs: As Simple as 1,2,3?

Counter-cyclical payments are available to eligible commodities under the 2002 Farm Act whenever the effective commodity price is less than the target price. The amount of the counter-cyclical payment equals the target price minus the effective price. The calculations below show that the effective price for upland cotton and wheat are both above the target price; a counter-cyclical payment is therefore not allowed.

The target price for wheat and upland cotton is set at $2.75 per bushel and $0.52 per pound, respectively. The effective price is equal to the sum of 1) the higher of the national average farm price for the marketing year, or the commodity national loan rate and 2) the direct payment rate for the commodity. The loan rate for the years 2004-2007 is fixed in legislation and is set at $0.52 per pound for cotton and $2.75 per bushel for wheat. Therefore, for cotton, the effective price is equal to the market price received plus the direct payment ($0.67 + $0.0667 = $.7367 per pound of lint). The effective price for wheat equals $3.74 + $0.52 = $4.26.

Buildings and Irrigation Improvements

Farm investment in real estate includes land, buildings, and irrigation improvements. Currently, the average market value for irrigated cropland in the District is $2,925 per acre.

Machinery sheds and shop were valued at $60,000 for the analysis.

The value of irrigation equipment ranged from about $200 per irrigated acre to over $1,000 per irrigated acre, depending upon the crop and irrigation system selected. Prices for the irrigation equipment were obtained from a local irrigation equipment dealer.

FARM INCOME

Farm income is derived from the sale of crop products. Table 5 shows the gross returns from the sale of crops for each of the selected enterprise budgets. Included in the table is the farm size for each of the enterprise budgets.

Additional income from government payments was included in the budget calculations. Participation in the farm program is assumed to be at 100 percent. The base acres for the two program crops were assumed to equal the total acreage for that crop. Government payments are received for 85 percent of the base acres.

Table 5. Revenues for Each Crop Budgeted.

Crop	Yield	Yld Units	Acres	Production	Price	Revenue
Alfalfa	7.90	Ton	500	3,950	$111.40	$440,030.00
Alfalfa Estab	0.00		125	0	0.00	0.00
Alfalfa Seed	807.00	lb	300	242,100	$1.40	$338,940.00
Alfalfa Seed Estab	0.00		75	0	0.00	0.00
Almonds	1.00	Ton	100	100	$2,763.40	$276,340.00
Almonds Hulls	1.92	Ton	100	192	76.00	14,592.00
Cantaloupe	14.00	ton	400	5,600	$327.60	$1,834,560.00
Cotton Lint	1,498.00	Lbs	400	599,200	$0.67	$401,464.00
Cotton Seed	1.10	ton	400	440	166.40	73,216.00
Cotton Govt Pmt	12.73	Lbs	400	5,092	6.67	33,963.64
Grapes	10.30	Ton	95	979	$198.20	$193,938.70
Lettuce	15.80	ton	400	6,320	$281.80	$1,780,975.88
Sugar Beets	36.60	Ton	300	10,980	$37.00	$406,260.00
Tomatoes	40.00	ton	400	16,000	$51.00	$816,000.00
Wheat	103.00	bu	400	41,200	$3.74	$154,088.00
Wheat Govt Pmt	88.00	bu	400	35,200	0.52	18,304.00
Bare Land	0.00	cwt	1000	0	$0.00	$0.00

Table 2. County Average Crop Yields for San Luis Unit Irrigation Districts, 2000 - 2004.

Crop	Units	2000	2001	2002	2003	2004	AVG 2000-04
Alfalfa	Ton	7.6	7.6	8.2	7.8	8.1	7.9
Alfalfa Seed	Lbs	560.0	750.0	816.0	911.0	1,000.0	807.4
Almonds	Ton	0.8	1.1	1.2	1.1	1.0	1.0
Cantaloupe	Ton	13.2	13.9	14.5	13.0	15.2	14.0
Cotton	Lbs	1,293.0	1,172.0	1,670.0	1,380.0	1,979.0	1,498.8
CottonSeed	Ton	0.9	0.8	1.2	1.1	1.4	1.1
Wine Grapes	Ton	11.1	9.3	10.6	10.9	9.7	10.3
Lettuce	Ton	14.8	18.5	12.8	17.1	15.9	15.8
Sugarbeets	Ton	35.8	39.0	37.1	31.7	39.3	36.6
Tomatoes	Ton	40.2	34.7	40.3	40.1	44.5	40.0
Wheat	Ton	3.0	3.1	3.2	3.1	3.1	3.1

Prices Received

Prices received for the crop products are shown in Table 3. Prices for all crop products were an average price published in the Agricultural Commissioners Report for Fresno County.

Table 3. Prices Received by Crop, 2000-2004.

Crop Prices

Crop	Units	2000	2001	2002	2003	2004	AVG 2000-04
Alfalfa	Ton	$98.00	$105.00	$118.00	$121.00	$115.00	$111.40
Alfalfa Seed	Lbs	$1.50	$1.36	$1.41	$1.40	$1.33	$1.40
Almonds	Ton	$2,340.00	$2,720.00	$4,337.00	$2,120.00	$2,300.00	$2,763.40
Cantaloupe	Ton	$342.00	$378.00	$334.00	$308.00	$276.00	$327.60
Cotton	Lbs	$0.66	$0.87	$0.69	$0.50	$0.65	$0.67
CottonSeed	Ton	$151.00	$157.00	$167.00	$185.00	$172.00	$166.40
Wine Grapes	Ton	$228.00	$188.00	$180.00	$185.00	$210.00	$198.20
Lettuce	Ton	$264.00	$383.00	$221.00	$223.00	$318.00	$281.80
Sugarbeets	Ton	$35.00	$38.00	$39.00	$36.00	$37.00	$37.00
Tomatoes	Ton	$51.00	$57.00	$50.00	$48.00	$49.00	$51.00
Wheat	Ton	$119.00	$128.00	$136.00	$115.00	$126.00	$124.80

Payment capacity budgets prepared by Reclamation personnel attempt to capture all relevant sources of on-farm revenues and expenses for the selected representative farm. Revenues are primarily generated by the sale of crop or livestock products. A supplemental source of income for a typical farm comes from direct government payments funded through a continuing series of Farm Bills (The latest of which is the Farm Security and Rural Investment Act of 2002). Farmers can either elect to participate in the government programs, or not. If they participate, they receive payments based on the acreage and yields of their included program crops. Farmers may also receive additional payments subject to the relationship of market prices to a defined target price. This analysis assumes participation in the farm program and that government payments for program crops (cotton and wheat) are received.

FARM EXPENSES

Farm production expenses were obtained from extension personnel and published enterprise budgets for crops. Expenses will be discussed in the order that they appear on the budget summary. Details for each of the expense categories for each budgeted crop can be viewed in the appendices to this study.

Labor

Labor requirements are satisfied mostly by the owner-operator and family in this analysis. Additional labor needs are satisfied by hired labor. Labor rates for the farm operator, family supplied labor and hired labor were obtained from the Bureau of Labor Statistics internet site.

The owner supplies most of the labor, with the spouse helping when needed and the children helping during school breaks. The operator receives an hourly wage of $13.00, the spouse and children are assumed to receive $8.00 per hour. Hired labor is also paid at the rate of $8.00 per hour. The hourly labor rates for the operator and family labor are used to calculate a return to operator labor shown in the "return to family farm" category in the budget summary.

Labor requirements by month are calculated for each enterprise for both machinery and hand labor. Crop enterprise labor needs are calculated for each farming operation and then added together.

Machinery Costs

New machinery prices are used in the analysis. Machinery prices were obtained from the reports published by the University of California at Davis. Cash and non-cash expenses are calculated. Machinery cash expenses include fuel, oil, and repairs. Depreciation, the non-cash cost of owning a machine, is calculated by the sinking fund method.

Tractors for each enterprise budget were obtained from the respective enterprise budget published by the University of California at Davis.

Implements are assumed to be owned unless they are only used a few hours per year. Farming operations requiring a specialized implement are assumed to be custom operations.

Equipment prices were all indexed to 2004, the base year for this analysis.

Buildings and Equipment

Farm buildings are represented by a machine shed. Replacement cost for the farm sheds are estimated at $60,000.

Custom Operations

Rates for custom operations were obtained from University of California at Davis publications and are specific to the custom operations for each crop budgeted.

Seed, Fertilizer, and Chemicals

Annual costs for these crop inputs can be examined in the appendices of this report.

Property Taxes

Real estate taxes are assessed in California on land and improvements. Lands within the San Luis Drainage area are assumed to be under the Williamson Land Act. Additionally, Proposition 13 limits the amount of tax that can be collected.

License plates for on-road vehicles must be purchased annually.

Land . - Taxable value for irrigated cropland in the District is estimated as 75 percent of the market price of irrigated land. Irrigated cropland has a current market value of $2,925; taxable value is estimated at $2,195. Land taxes were calculated by multiplying the taxable value by the mill levy by total acres of land.

Buildings . - Taxes on buildings are based on multiplying the value of the building by the mill levy. Market values for buildings were obtained from the Marshall and Swift Valuation Service. Replacement cost for the machine sheds is estimated at $60,000.

Machinery . - License plates must be purchased for vehicles used on the highway. Fees for motorized vehicles vary depending on the age of the vehicle. The pickup is assumed older than 5 years of age for licensing purposes. License plates and vehicle taxes cost $260 per year.

Interest Rates

There are outstanding balances for loans on land and annual operating costs. Based on published interest rates for the last 5 years, short-term loans are charged 6.58 percent interest. Long-term interest rates were calculated from *Economic Indicators of the Farm Sector 1999-2003* and take into account all sources of long-term loan funds. The interest rate used is 7.36 percent.

Farm debt-load is based on California state average debt/asset ratios for 2000-2004. Average real estate debt-loads for the state are 14.41 percent. Non-real estate debt-loads averaged 54.59 percent for the same time period.

Telephone and Electricity

Farm utility expenses were estimated from data published in the U.S. Bureau of Census Statistical Abstract and current price data obtained from local utility companies wherever possible.

The average yearly cost for telephone use in California is estimated at $1,104 per year. One-half of the telephone bill was assumed to be associated with farm use and the other half was for private use. Thus, the estimated yearly telephone bill for farm use was $552 per year. Additionally, a cell phone allowance of $360 per year was added, making the total phone bill $912

The U.S. Bureau of Census Statistical Abstract was also used to estimate residential electricity costs. For this study, the average residential electricity cost was $1,220 per year.

Electricity costs for irrigation pumping were estimated using accepted engineering coefficients within the farm budget. There is an annual $16 hook-up fee and irrigators are assumed to participate in a load-control program where electrical power can be interrupted during peak load periods. The rate used in the study is $0.010 per kilowatt hour.

Insurance

Insurance rates were obtained from a local Insurance agent. A whole-farm policy was used to estimate annual insurance costs. Machines were insured for fire, wind, and hail damage. The yearly cost for this package was quoted at $800 for vehicles, liability insurance was $1,000 and building insurance was estimated at $4 per $1,000 of coverage.

RETURN TO FARM FAMILY

The farm operator and farm family are entitled to income from the farm as a result of their investment, management skill, and labor.

Return to Equity

Return to equity is a return to investment, that is, returns to the equity portion of land. Reclamation uses a standard rate of return of 3.0 percent on the equity portion of real estate, machinery, and livestock.

Return to Management

Return to management rewards the operator for skills in managing and operating the farm in an efficient, profitable manner. A rate of 10 percent of net income is used for calculating return to management in this study.

Return to Labor

The owner-operator and family are entitled to income for labor performed on the farm. Return to labor is the wage earned by the operator and/or farm family. Operator wages were $13.00 per hour and farm family wages are set at $8.00 per hour.

RESULTS OF THE STUDY

Payment capacity is determined by subtracting the return to farm family from net farm income. This is really the return to water and is the amount available for paying district costs. The estimated payment capacity for each enterprise budget is first shown in Table 6. Then, in Table 7, the adjusted payment capacity for each district is shown.

Table 6. Estimated Payment Capacity by Crop.

Crops Represented	Payment Capacity ($/acre)
Alfalfa Hay	0.01
Alfalfa Seed	94.62
Almonds	335.61
Cantaloupe	317.74
Cotton	115.04
Wine Grapes	93.25
Sugar Beets	**(65.23)**
Tomatoes, Proc	443.82
Wheat	**(148.91)**

Table 7. Estimated Payment Capacity for Each District in the San Luis Drainage Area.

	PAYMENT CAPACITY BY DISTRICT				
Weighted Payment Capacity	Pacheco	Panoche	San Luis	Westlands	Wtd. Total
Includes negative values (except for lettuce budget)					
$/Acre	$232.40	$192.23	$228.76	$210.90	$227.86
Adjusted for Water Needs Land Retirement Alternative					
$/Acre	$232.40	$192.23	$228.76	$269.18	$257.79
Adjusted for Drainage-Impaired Land Retirement Alternative					
$/Acre	$232.40	$192.23	$228.76	$274.93	$257.49

Farm Budgets – San Luis Unit

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	540	
Total cropped acres	500	2,925.00
Farmstead, roads, waste	40	2,925.00

Note: all 'per acre' totals based upon 540 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 540 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	500	2,925.00
Alfalfa	500	2,925.00
Non-irrigated land	0	0.00
Alfalfa Est	125	2,925.00

Summary of Farm Investment

Item	Total	Per acre
Land	1,945,125	3,602.08
Land development	0	0.00
Improvements		
Irrigation system	281,250	520.83
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	131,803	244.08
Farmstead, waste arces	0	0.00
Equipment		
Power implements	111,662	206.78
Non-power implements	57,542	106.56
Vehicles	21,621	40.04
Small tools	1,151	2.13
Total farm investment	**$2,550,154**	**$4,722.51**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	1,534	2.84
Farm family	130	0.24
Hired labor	0	0.00

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$161,117.38	$298.37
Fertilizer	9,375.00	17.36
Herbicides	38,512.50	71.32
Insect control	11,282.50	20.89
Seed	10,350.00	19.17
Disease control	0.00	0.00
Misc. crop expenses	0.00	0.00
On-farm irrigation pumping	34,541.24	63.97
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	0.00	0.00
Workmen's compensation	0.00	0.00
Social Security	0.00	0.00
Repairs	8,970.98	16.61
Fuel, grease & oil	3,845.89	7.12
Telephone	912.00	1.69
Electricity	1,220.00	2.26
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	5,602.55	10.38
Interest on operating capital	5,740.07	10.63
Subtotal - variable expenses	**$291,470.13**	**$539.76**
Fixed expenses		
Depreciation	$15,767.63	$29.20
Taxes	14,277.05	26.44
Insurance	3,879.13	7.18
Interest on debt	28,969.98	53.65
Subtotal - fixed expenses	**$62,893.79**	**$116.47**
Farm income analysis		
Crop sales	$440,030.00	$814.87
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$440,030.00**	**$814.87**
Total farm expenses	$354,363.91	$656.23
Net farm income	**$85,666.09**	**$158.64**
Return to family farm		
Return to equity	$56,940.75	$105.45
Return to management	8,566.61	15.86
Return to labor	20,151.79	37.32
Total return to farm family	**$85,659.14**	**$158.63**
Payment Capacity analysis		
Net returns	**$6.95**	
per acre	**$0.01**	(540 acres)
per acre-foot	**$0.00**	(3250 AF)

Crop revenues

Crop	Yield per acre	units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Alfalfa	7.90	Ton	500	3,950		3,950	$111.40	$440,030.00
Alfalfa Est	0.00		125	0		0	0.00	0.00
							Total	**$440,030.00**

Livestock revenue

	Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
				Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	40
Total vehicle taxes	$260	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
150 HP MFWD tractor	$102,012	2002	2004	$111,662	$11,166	12000	800	$11.11	$2.65

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Brillion Seeder, 18'	$1,800	2002	2004	$1,970	$197	2000	300	$0.00
Chisel Plow, Heavy 15'	8,000	2000	2004	9,324	932	2000	300	0.00
Disk, Finish 18'	17,100	2002	2004	18,718	1,872	2000	300	0.00
Disk, Stubble 14'	13,000	2000	2004	15,151	1,515	2000	300	22.66
Disc, Border	2,100	2000	2004	2,447	245	2000	300	0.00
Harrow, Spike 18'	722	2000	2004	841	84	2000	300	0.06
Ditcher, V	7,800	2000	2004	9,091	909	2000	300	5.51

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup, 3/4 Ton	$22,000	2002	2004	$21,621	$2,752	100000	20000	$0.15	$0.07	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Hay Shed	$60,000	2002	2004	$65,902	$0	40	$300.00
Machine shed	60,000	2002	2004	65,902	0	40	600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$24.00
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Alfalfa	0	0	0	10	10	20	20	20	10	10	0	0
Alfalfa Est	0	0	0	16	16	16	16	0	36	0	0	0
Operator labor distribution %												
Alfalfa	0	1	2	14	13	14	13	14	13	14	1	1
Alfalfa Est	1	1	1	15	15	15	15	14	22	1	0	0

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation Labor	Alfalfa	500	1.82	hr.	910
Irrigation Labor	Alfalfa Est	125	1	Hours	125
				Total	**1,035.00**

Custom work

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Air Application	Alfalfa	500	2	acre	2002	$9.00	$9.98	$19.96	$9,980.00
Ground Application	Alfalfa	500	3	acre	2002	8.50	9.43	28.29	14,145.00
Swath, Rake, Bale	Alfalfa	500	7.9	ton	2002	25.00	27.73	219.07	109,533.50
Roadside	Alfalfa	500	7.9	ton	2002	3.30	3.66	28.91	14,457.00
Broadcast Fertilizer	Alfalfa	500	0.5	acre	2002	5.50	6.10	3.05	1,525.00
Laser Level	Alfalfa Est	125	1	acre	2003	75.00	79.84	79.84	9,980.00
Broadcast Fertilizer	Alfalfa Est	125	0.5	acre	2003	5.50	5.85	2.92	365.63
Ground Application	Alfalfa Est	125	1	acre	2003	8.50	9.05	9.05	1,131.25
								Total	**$161,117.38**

Fertilizer

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
11-52-0	Alfalfa	500	75	lb.	2002	$0.16	$0.16	$12.00	$6,000.00
11-52-0	Alfalfa Est	125	150	lb.	2003	0.16	0.18	27.00	3,375.00
								Total	**$9,375.00**

Herbicide

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Treflan TR-10	Alfalfa	500	20	lb.	2002	$1.05	$1.06	$21.20	$10,600.00
Prism	Alfalfa	500	1	pint	2002	19.62	19.78	19.78	9,890.00
Velpar L	Alfalfa	500	2	pint	2002	9.50	9.58	19.16	9,580.00
Karmex DF	Alfalfa	500	1.5	lb.	2002	5.59	5.64	8.46	4,230.00
Raptor	Alfalfa Est	125	4	oz.	2003	4.77	4.73	18.92	2,365.00
Butyrac (2,4-DB)	Alfalfa Est	125	2	pint	2003	4.75	4.71	9.42	1,177.50
No Foam A	Alfalfa Est	125	2	pint	2003	2.70	2.68	5.36	670.00
								Total	**$38,512.50**

Insect control

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Lorsban 4 E	Alfalfa	500	2	pint	2002	$6.19	$6.24	$12.48	$6,240.00
Lannate 90 SP	Alfalfa	500	0.5	lb.	2002	20.00	20.17	10.09	5,042.50
								Total	**$11,282.50**

Seed cost

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Alfalfa Seed	Alfalfa Est	125	30	lb.	2003	$2.60	$2.67	$80.10	$10,012.50
Inoculum	Alfalfa Est	125	30	seed lb.	2003	0.09	0.09	2.70	337.50
								Total	**$10,350.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

All costs are indexed to year 2004

Crop expenses by crop

Alfalfa

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Lorsban 4 E	insect control	500	2 pint	2002	$6.19	$6.24	$12.48	$6,240.00
Lannate 90 SP	insect control	500	0.5 lb.	2002	20.00	20.17	10.09	5,042.50
Air Application	custom work	500	2 acre	2002	9.00	9.98	19.96	9,980.00
Ground Application	custom work	500	3 acre	2002	8.50	9.43	28.29	14,145.00
Swath, Rake, Bale	custom work	500	7.9 ton	2002	25.00	27.73	219.07	109,533.50
Roadside	custom work	500	7.9 ton	2002	3.30	3.66	28.91	14,457.00
Broadcast Fertilizer	custom work	500	0.5 acre	2002	5.50	6.10	3.05	1,525.00
Treflan TR-10	herbicide	500	20 lb.	2002	1.05	1.06	21.20	10,600.00
Prism	herbicide	500	1 pint	2002	19.62	19.78	19.78	9,890.00
Velpar L	herbicide	500	2 pint	2002	9.50	9.58	19.16	9,580.00
Karmex DF	herbicide	500	1.5 lb.	2002	5.59	5.64	8.46	4,230.00
11-52-0	fertilizer	500	75 lb.	2002	0.16	0.16	12.00	6,000.00
							Total	**$201,223.01**

Alfalfa Est

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Laser Level	custom work	125	1 acre	2003	$75.00	$79.84	$79.84	$9,980.00
Broadcast Fertilizer	custom work	125	0.5 acre	2003	5.50	5.85	2.92	365.63
Ground Application	custom work	125	1 acre	2003	8.50	9.05	9.05	1,131.25
11-52-0	fertilizer	125	150 lb.	2003	0.16	0.18	27.00	3,375.00
Alfalfa Seed	seed cost	125	30 lb.	2003	2.60	2.67	80.10	10,012.50
Inoculum	seed cost	125	30 seed lb.	2003	0.09	0.09	2.70	337.50
Raptor	herbicide	125	4 oz.	2003	4.77	4.73	18.92	2,365.00
Butyrac (2,4-DB)	herbicide	125	2 pint	2003	4.75	4.71	9.42	1,177.50
No Foam A	herbicide	125	2 pint	2003	2.70	2.68	5.36	670.00
							Total	**$29,414.37**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	12		$192.00
Demand charge	$2.90 per HP	12	127.40265	$4,433.61

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	291291.44	$29,915.63
			Total	$34,541.24

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa	4	500	200	10	0	75093.34	7712.086
Alfalfa Est	0.8	125	60	10	10	5380.063	552.5325
						Total	8264.618

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa	0.65	500	200	10	260	149548.7	15358.65
Alfalfa Est	0.2	125	60	10	260	11503.75	1181.435
						Total	16540.09

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa	1.85	500	100	10	10	49765.59	5110.926
						Total	5110.926

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops Alfalfa	Alfalfa Est
Custom work	$161,117.38	$3,236.71	$1,097.45	$149,640.50	$11,476.88
Fertilizer	9,375.00	188.34	63.86	6,000.00	3,375.00
Herbicide	38,512.50	773.68	262.33	34,300.00	4,212.50
Insect control	11,282.50	226.66	76.85	11,282.50	0.00
Seed cost	10,350.00	207.92	70.50	0.00	10,350.00
Disease control	0.00	0.00	0.00	0.00	0.00
Miscellaneous	0.00	0.00	0.00	0.00	0.00
Irrigation pumping	34,541.24	693.90	235.28	28,181.66	1,733.97
Livestock purchases	0.00	0.00	0.00		
Purchased feed	0.00	0.00	0.00		
Livestock marketing	0.00	0.00	0.00		
Hired labor	0.00	0.00	0.00	7,179.90	982.50
Fuel	3,845.89	77.26	26.20	2,047.10	1,798.79
Equipment repairs	2,445.98	49.14	16.66	1,227.50	1,218.48
Other repairs	6,525.00	131.08	44.45		
Telephone	912.00	18.32	6.21		
Electricity	1,220.00	24.51	8.31		
Other farm expenses	0.00	0.00	0.00		
Misc. (2% add-on)	5,602.55	112.55	38.16		
Total	**$285,730.06**	**$5,740.07**	**$1,946.25**	**$239,859.17**	**$35,148.11**

Notes: Irrigation pumping expense includes meter charges ($192.00) and demand charges ($4,433.61) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 540 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$1,945,125.00	$49,944.97	$92.49
Land development	0.00	0.00	0.00
Improvements	65,901.64	1,692.16	3.13
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	140,625.00	1,915.73	3.55
Non-power equipment	31,648.13	431.14	0.80
Power equipment	61,413.87	836.64	1.55
Vehicles	12,186.21	166.01	0.31
Livestock	0.00	0.00	0.00
Small tools	575.42	7.84	0.01
Total	**$2,257,475.25**	**$54,994.50**	**$101.84**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	1,185,300.00	1.00	$1,185,300.00	1.00000%	$11,853.00
Improvement taxes	131,803.28	1.00	131,803.28	1.00000%	1,318.03
Equipment taxes	169,204.06	0.50	84,602.03	1.00000%	846.02
Vehicle taxes					260.00
Livestock taxes					0.00
				Total taxes	**$14,277.05**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$131.80	$879.13
Machinery insurance	0.00	233.69	0.00
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$3,879.13**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	1,534.06	2.1	6.3	10.5	201.1	196.9	240.0	240.0	240.0	236.3	152.3	4.2	4.2
Family	130.14	0.0	0.0	0.0	0.0	0.0	52.1	47.9	30.1	0.0	0.0	0.0	0.0
Hired	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,664.20	2.1	6.3	10.5	201.1	196.9	292.1	287.9	270.1	236.3	152.3	4.2	4.2

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa	1,333.50	0.0	4.2	8.5	150.3	146.1	241.3	237.1	241.3	146.1	150.3	4.2	4.2
Alfalfa Est	330.70	2.1	2.1	2.1	50.9	50.9	50.9	50.9	28.8	90.3	2.1	0.0	0.0
Total	1,664.20	2.1	6.3	10.5	201.1	196.9	292.1	287.9	270.1	236.3	152.3	4.2	4.2

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa	423.50	0.0	4.2	8.5	59.3	55.1	59.3	55.1	59.3	55.1	59.3	4.2	4.2
Alfalfa Est	205.70	2.1	2.1	2.1	30.9	30.9	30.9	30.9	28.8	45.3	2.1	0.0	0.0
Total	629.20	2.1	6.3	10.5	90.1	85.9	90.1	85.9	88.1	100.3	61.3	4.2	4.2

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa	910.00	0.0	0.0	0.0	91.0	91.0	182.0	182.0	182.0	91.0	91.0	0.0	0.0
Alfalfa Est	125.00	0.0	0.0	0.0	20.0	20.0	20.0	20.0	0.0	45.0	0.0	0.0	0.0
Total	1,035.00	0.0	0.0	0.0	111.0	111.0	202.0	202.0	182.0	136.0	91.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
0.00	$7.50	$0.00

	Rate	
Social Security	0.0765	$0.00
Worker's Comp.	$ 24/$100	0.00
		$0.00

Return to Labor

	Hours	Wage	**Total**
Farm operator	1,534.06	$12.50	$19,175.71
Farm family	130.14	7.50	976.07
			$20,151.79

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 540 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Per acre
Real Estate Investment Costs					
Land	$1,945,125.00		$1,945,125.00	$18,443.25	$34.15
Improvement costs					
Hay Shed	$65,901.64	$0.00	$32,950.82	$312.43	$0.58
Machine shed	65,901.64	0.00	32,950.82	312.43	0.58
Sub-total	**$131,803.28**	**$0.00**	**$65,901.64**	**$624.86**	**$1.16**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$281,250.00	$0.00	$140,625.00	$5,650.06	$10.46
Sub-total	**$281,250.00**	**$0.00**	**$140,625.00**	**$5,650.06**	**$10.46**
Non-power equipment					
Brillion Seeder, 18'	$1,970.27	$197.03	$1,083.65	$43.54	$0.08
Chisel Plow, Heavy 15'	9,323.74	932.37	5,128.06	206.04	0.38
Disk, Finish 18'	18,717.57	1,871.76	10,294.67	413.62	0.77
Disk, Stubble 14'	15,151.08	1,515.11	8,333.09	334.81	0.62
Disc, Border	2,447.48	244.75	1,346.11	54.08	0.10
Harrow, Spike 18'	841.47	83.91	462.69	18.59	0.03
Ditcher, V	9,090.65	909.06	4,999.85	200.89	0.37
Small tools	1,150.85		575.42	23.12	0.04
Sub-total	**$58,693.10**	**$5,753.99**	**$32,223.55**	**$1,294.69**	**$2.40**
Power equipment					
150 HP MFWD tractor	$111,661.78	$11,165.96	$61,413.87	$2,467.50	$4.57
Sub-total	**$111,661.78**	**$11,165.96**	**$61,413.87**	**$2,467.50**	**$4.57**
Vehicles					
Pickup, 3/4 Ton	$21,620.69	$2,751.72	$12,186.21	$489.62	$0.91
Sub-total	**$21,620.69**	**$2,751.72**	**$12,186.21**	**$489.62**	**$0.91**
Total	**$2,550,153.75**	**$19,671.67**	**$2,257,475.25**	**$28,969.98**	**$53.65**

Note: Investment value is based upon the number required,
not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 540 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
150 HP MFWD tractor	262.6	$2.65	$11.11	$695.96	$2,917.76	$2,348.81	$5,962.53	$11.04
Brillion Seeder, 18'	32.5	0.00		0.00		41.44	41.44	0.08
Chisel Plow, Heavy 15'	23.8	0.00		0.00		196.13	196.13	0.36
Disk, Finish 18'	18.8	0.00		0.00		393.72	393.72	0.73
Disk, Stubble 14'	33.8	22.66		764.78		318.70	1,083.48	2.01
Disc, Border	11.3	0.00		0.00		51.48	51.48	0.10
Harrow, Spike 18'	18.8	0.06		1.13		17.71	18.83	0.03
Ditcher, V	100.0	5.51		551.00		269.10	820.10	1.52
Pickup, 3/4 Ton	6,187.5	0.07	0.15	433.13	928.13	1,557.10	2,918.35	5.40
Hay Shed				300.00		661.45	961.45	1.78
Machine shed				600.00		661.45	1,261.45	2.34
Irrigation system				5,625.00		9,250.52	14,875.52	27.55
			Total	**$8,970.98**	**$3,845.89**	**$15,767.63**	**$28,584.50**	**$52.93**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
150 HP MFWD tracto	$111,662	$11,166	12000	800	262.6	1	25	0.0234	$2,348.81
Brillion Seeder, 18'	1,970	197	2000	300	32.5	1	25	0.0234	41.44
Chisel Plow, Heavy 1	9,324	932	2000	300	23.8	1	25	0.0234	196.13
Disk, Finish 18'	18,718	1,872	2000	300	18.8	1	25	0.0234	393.72
Disk, Stubble 14'	15,151	1,515	2000	300	33.8	1	25	0.0234	318.70
Disc, Border	2,447	245	2000	300	11.3	1	25	0.0234	51.48
Harrow, Spike 18'	841	84	2000	300	18.8	1	25	0.0234	17.71
Ditcher, V	9,091	909	2000	300	100.0	1	20	0.0329	269.10
Pickup, 3/4 Ton	21,621	2,752	100000	20000	6,187.5	1	10	0.0825	1,557.10
Hay Shed	65,902	0					40	0.0100	661.45
Machine shed	65,902	0					40	0.0100	661.45
Irrigation system	281,250	0					20	0.0329	9,250.52
Return flow system	0	0					20	0.0329	0.00
								Total	**$15,767.63**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

			Acres:	500	125	
			Hours used per acre		**Times over land**	
Equipment	**Total Use (hours)**	**Assigned Power Equipment**	Alfalfa	Alfalfa Est	Alfalfa	Alfalfa Est
Brillion Seeder, 18'	32.50	150 HP MFWD tractor	-	0.26	-	1
Chisel Plow, Heavy 15'	23.75	150 HP MFWD tractor	-	0.19	-	1
Disk, Finish 18'	18.75	150 HP MFWD tractor	-	0.15	-	1
Disk, Stubble 14'	33.75	150 HP MFWD tractor	-	0.27	-	1
Disc, Border	11.25	150 HP MFWD tractor	-	0.09	-	1
Harrow, Spike 18'	18.75	150 HP MFWD tractor	-	0.15	-	1
Ditcher, V	100.00	150 HP MFWD tractor	0.10	-	2	-
Power equipment*						
150 HP MFWD tractor	262.63		-	-	-	-
Vehicles (use units in miles)						
Pickup, 3/4 Ton	6,187.5		10	5	1	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	220	
Total cropped acres	200	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 220 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 220 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	200	2,925.00
Alfalfa Seed	200	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	643,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	90,000	409.09
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	299.55
Farmstead, waste arces	0	0.00
Equipment		
Power implements	192,322	874.19
Non-power implements	51,739	235.18
Vehicles	25,552	116.14
Small tools	1,035	4.70
Total farm investment	**$1,070,050**	**$4,863.86**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	990	4.50
Farm family	0	0.00
Hired labor	0	0.00

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$85,831.60	$390.14
Fertilizer	0.00	0.00
Herbicides	2,950.00	13.41
Insect control	15,738.00	71.54
Seed	0.00	0.00
Disease control	0.00	0.00
Misc. crop expenses	0.00	0.00
On-farm irrigation pumping	7,885.05	35.84
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	0.00	0.00
Workmen's compensation	0.00	0.00
Social Security	0.00	0.00
Repairs	7,796.82	35.44
Fuel, grease & oil	2,581.04	11.73
Telephone	912.00	4.15
Electricity	1,220.00	5.55
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	2,498.29	11.36
Interest on operating capital	2,559.61	11.63
Subtotal - variable expense	**$129,972.41**	**$590.78**
Fixed expenses		
Depreciation	$11,310.01	$51.41
Taxes	6,968.32	31.67
Insurance	3,439.56	15.63
Interest on debt	14,198.73	64.54
Subtotal - fixed expenses	**$35,916.63**	**$163.26**
Farm income analysis		
Crop sales	$225,960.00	$1,027.09
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$225,960.00**	**$1,027.09**
Total farm expenses	$165,889.03	$754.04
Net farm income	**$60,070.97**	**$273.05**
Return to family farm		
Return to equity	$20,876.64	$94.89
Return to management	6,007.10	27.30
Return to labor	12,371.25	56.23
Total return to farm family	**$39,254.98**	**$178.43**

Payment Capacity analysis		
Net returns	**$20,815.99**	
per acre	**$94.62** (220 acres)	
per acre-foot	**$52.04** (400 AF)	

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Alfalfa Seed	807.00 lb	200	161,400		161,400	$1.40	$225,960.00
						Total	**$225,960.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$260	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
Tractor,130 Hp	$90,841	1998	2004	$111,487	$11,149	10000	600	$6.77	$4.01
Swather/Conditioner-14 ft	65,866	1998	2004	80,836	8,084	5000	400	3.74	6.68

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Harrow	$700	1998	2004	$859	$86	2000	200	$0.06
Disk, Border	1,035	1998	2004	1,270	128	2000	300	0.16
Disk, Stubble, 14 ft	13,000	1998	2004	15,955	1,595	2000	300	22.66
Brillion Seeder	8,379	1998	2004	10,283	1,028	2000	300	3.60
Rake, 20 ft	19,044	1998	2004	23,372	2,337	2000	300	4.50

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$22,000	2002	2004	$21,621	$2,064	100000	20000	$0.15	$0.07	20
ATV	4,000	2002	2004	3,931	393	10000	3000	0.07	0.03	10

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine shed/shop	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$24.00
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Alfalfa Seed	0	0	0	10	10	20	20	20	10	10	0	0
Operator labor distribution %												
Alfalfa Seed	0	1	2	14	13	14	13	14	13	14	1	1

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation Labor	Alfalfa Seed	200	1.5	Hour	300
				Total	**300.00**

Custom work

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Custom Application	Alfalfa Seed	200	1 Acre	1998	$6.00	$6.47	$6.47	$1,294.00
Custom Application	Alfalfa Seed	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Pollination	Alfalfa Seed	200	1 Acre	1998	200.00	215.65	215.65	43,130.00
Custom Application	Alfalfa Seed	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Custom Application	Alfalfa Seed	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Combine seed	Alfalfa Seed	200	1 Acre	1998	60.00	64.70	64.70	12,940.00
Haul Seed	Alfalfa Seed	200	0.4 Ton	1998	20.00	21.57	8.63	1,725.60
Windrow	Alfalfa Seed	200	1 Acre	1998	25.00	26.96	26.96	5,392.00
Bee Colonies	Alfalfa Seed	200	1 Acre	1998	81.00	87.34	87.34	17,468.00
							Total	**$85,831.60**

Fertilizer

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Weed Spray	Alfalfa Seed	200	1 Pint	1998	$15.00	$14.75	$14.75	$2,950.00
							Total	**$2,950.00**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Dodder Control	Alfalfa Seed	200	1 Acre	1998	$25.00	$24.59	$24.59	$4,918.00
Lygus Control	Alfalfa Seed	200	1 Acre	1998	20.00	19.67	19.67	3,934.00
Aphid, Mite control	Alfalfa Seed	200	1 Acre	1998	35.00	34.43	34.43	6,886.00
							Total	**$15,738.00**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

All costs are indexed to year2004

Crop expenses by crop

Alfalfa Seed

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Weed Spray	herbicide	200	1 Pint	1998	$15.00	$14.75	$14.75	$2,950.00
Custom Application	custom work	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Dodder Control	insect control	200	1 Acre	1998	25.00	24.59	24.59	4,918.00
Custom Application	custom work	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Pollination	custom work	200	1 Acre	1998	200.00	215.65	215.65	43,130.00
Lygus Control	insect control	200	1 Acre	1998	20.00	19.67	19.67	3,934.00
Custom Application	custom work	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Aphid, Mite control	insect control	200	1 Acre	1998	35.00	34.43	34.43	6,886.00
Custom Application	custom work	200	1 Acre	1998	6.00	6.47	6.47	1,294.00
Combine seed	custom work	200	1 Acre	1998	60.00	64.70	64.70	12,940.00
Haul Seed	custom work	200	0.4 Ton	1998	20.00	21.57	8.63	1,725.60
Windrow	custom work	200	1 Acre	1998	25.00	26.96	26.96	5,392.00
Bee Colonies	custom work	200	1 Acre	1998	81.00	87.34	87.34	17,468.00
							Total	**$104,519.60**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	6		$96.00
Demand charge	$2.90 per HP	6	71.19429	$1,238.78

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	63780.57	$6,550.26
			Total	$7,885.05

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)
Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)
Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)
Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)
Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)
Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)
Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa Seed	1	200	60	10	10	10760.13	1105.065
						Total	1105.065

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa Seed	0.5	200	60	10	260	46014.98	4725.739
						Total	4725.739

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Alfalfa Seed	0.5	200	60	10	20	7005.46	719.4608
						Total	719.4608

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops
				Alfalfa Seed
Custom work	$85,831.60	$1,724.28	$584.64	$85,831.60
Fertilizer	0.00	0.00	0.00	0.00
Herbicide	2,950.00	59.26	20.09	2,950.00
Insect control	15,738.00	316.16	107.20	15,738.00
Seed cost	0.00	0.00	0.00	0.00
Disease control	0.00	0.00	0.00	0.00
Miscellaneous	0.00	0.00	0.00	0.00
Irrigation pumping	7,885.05	158.40	53.71	6,550.26
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	0.00	0.00	0.00	2,808.00
Fuel	2,581.04	51.85	17.58	2,581.04
Equipment repairs	5,396.82	108.42	36.76	5,396.82
Other repairs	2,400.00	48.21	16.35	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	2,498.29	50.19	17.02	
Total	**$127,412.80**	**$2,559.61**	**$867.87**	**$121,855.73**

Notes: Irrigation pumping expense includes meter charges ($96.00) and demand charges ($1,238.78) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 220 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$643,500.00	$16,523.15	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	3.85
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	45,000.00	613.04	2.79
Non-power equipment	28,456.77	387.67	1.76
Power equipment	105,777.41	1,441.01	6.55
Vehicles	14,004.31	190.78	0.87
Livestock	0.00	0.00	0.00
Small tools	517.39	7.05	0.03
Total	**$870,206.69**	**$20,008.76**	**$90.95**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	482,900.00	1.00	$482,900.00	1.00000%	$4,829.00
Improvement taxes	65,901.64	1.00	65,901.64	1.00000%	659.02
Equipment taxes	244,061.63	0.50	122,030.81	1.00000%	1,220.31
Vehicle taxes					260.00
Livestock taxes					0.00
				Total taxes	**$6,968.32**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	0.00	179.23	0.00
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$3,439.56**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	989.70	0.0	6.9	13.8	126.6	119.7	156.6	149.7	156.6	119.7	126.6	6.9	6.9
Family	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hired	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	989.70	0.0	6.9	13.8	126.6	119.7	156.6	149.7	156.6	119.7	126.6	6.9	6.9

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Seed	989.70	0.0	6.9	13.8	126.6	119.7	156.6	149.7	156.6	119.7	126.6	6.9	6.9
Total	989.70	0.0	6.9	13.8	126.6	119.7	156.6	149.7	156.6	119.7	126.6	6.9	6.9

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Seed	689.70	0.0	6.9	13.8	96.6	89.7	96.6	89.7	96.6	89.7	96.6	6.9	6.9
Total	689.70	0.0	6.9	13.8	96.6	89.7	96.6	89.7	96.6	89.7	96.6	6.9	6.9

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Alfalfa Seed	300.00	0.0	0.0	0.0	30.0	30.0	60.0	60.0	60.0	30.0	30.0	0.0	0.0
Total	300.00	0.0	0.0	0.0	30.0	30.0	60.0	60.0	60.0	30.0	30.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
0.00	$7.06	$0.00

	Rate	
Social Security	0.0765	$0.00
Worker's Comp.	$ 24/$100	0.00
		$0.00

Return to Labor

	Hours	Wage	**Total**
Farm operator	989.70	$12.50	$12,371.25
Farm family	0.00	7.50	0.00
			$12,371.25

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 220 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Interest on debt Per acre
Real Estate Investment Costs					
Land	$643,500.00		$643,500.00	$6,101.53	$27.73
Improvement costs					
Machine shed/shop	$65,901.64	$0.00	$32,950.82	$312.43	$1.42
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$1.42**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$90,000.00	$0.00	$45,000.00	$1,808.02	$8.22
Sub-total	**$90,000.00**	**$0.00**	**$45,000.00**	**$1,808.02**	**$8.22**
Non-power equipment					
Harrow	$859.09	$85.91	$472.50	$18.98	$0.09
Disk, Border	1,270.23	127.64	698.93	28.08	0.13
Disk, Stubble, 14 ft	15,954.55	1,595.45	8,775.00	352.56	1.60
Brillion Seeder	10,283.32	1,028.45	5,655.89	227.24	1.03
Rake, 20 ft	23,372.18	2,336.73	12,854.46	516.47	2.35
Small tools	1,034.79		517.39	20.79	0.09
Sub-total	**$52,774.16**	**$5,174.18**	**$28,974.17**	**$1,164.13**	**$5.29**
Power equipment					
Tractor,130 Hp	$111,486.69	$11,148.55	$61,317.62	$2,463.63	$11.20
Swather/Conditioner-14 ft	80,835.55	8,084.05	44,459.80	1,786.32	8.12
Sub-total	**$192,322.23**	**$19,232.60**	**$105,777.41**	**$4,249.95**	**$19.32**
Vehicles					
Pickup	$21,620.69	$2,063.79	$11,842.24	$475.80	$2.16
ATV	3,931.03	393.10	2,162.06	86.87	0.39
Sub-total	**$25,551.72**	**$2,456.89**	**$14,004.31**	**$562.67**	**$2.56**
Total	**$1,070,049.75**	**$26,863.67**	**$870,206.69**	**$14,198.73**	**$64.54**

Note: Investment value is based upon the number required,
not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 220 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
Tractor,130 Hp	242.0	$4.01	$6.77	$970.42	$1,638.34	$2,345.13	$4,953.89	$22.52
Swather/Conditioner-14	55.0	6.68	3.74	367.40	205.70	1,700.37	2,273.47	10.33
Harrow	40.0	0.06		2.40		18.07	20.47	0.09
Disk, Border	0.0	0.16		0.00		26.70	26.70	0.12
Disk, Stubble, 14 ft	160.0	22.66		3,625.60		944.72	4,570.32	20.77
Brillion Seeder	0.0	3.60		0.00		216.31	216.31	0.98
Rake, 20 ft	20.0	4.50		90.00		491.65	581.65	2.64
Disk, Border	0.0	0.16						
Brillion Seeder	0.0	3.60						
Pickup	4,400.0	0.07	0.15	308.00	660.00	1,613.87	2,581.87	11.74
ATV	1,100.0	0.03	0.07	33.00	77.00	331.58	441.58	2.01
Machine shed/shop				600.00		661.45	1,261.45	5.73
Irrigation system				1,800.00		2,960.17	4,760.17	21.64
			Total	**$7,796.82**	**$2,581.04**	**$11,310.01**	**$21,687.87**	**$98.58**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
Tractor,130 Hp	$111,487	$11,149	10000	600	242.0	1	25	0.0234	$2,345.13
Swather/Conditioner-	80,836	8,084	5000	400	55.0	1	25	0.0234	1,700.37
Harrow	859	86	2000	200	40.0	1	25	0.0234	18.07
Disk, Stubble, 14 ft	15,955	1,595	2000	300	160.0	1	12	0.0658	944.72
Rake, 20 ft	23,372	2,337	2000	300	20.0	1	25	0.0234	491.65
Disk, Border	1,270	128	2000	300	0.0	1	25	0.0234	26.70
Brillion Seeder	10,283	1,028	2000	300	0.0	1	25	0.0234	216.31
Pickup	21,621	2,064	100000	20000	4,400.0	1	10	0.0825	1,613.87
ATV	3,931	393	10000	3000	1,100.0	1	9	0.0937	331.58
Machine shed/shop	65,902	0					40	0.0100	661.45
Irrigation system	90,000	0					20	0.0329	2,960.17
Return flow system	0	0					20	0.0329	0.00
								Total	**$11,310.01**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 200

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre Alfalfa Seed	Times over land Alfalfa Seed
Harrow	40.00	Tractor,130 Hp	0.10	2
Disk, Stubble, 14 ft	160.00	Tractor,130 Hp	0.40	2
Rake, 20 ft	20.00	Tractor,130 Hp	0.10	1
Disk, Border	0			
Brillion Seeder	0			
Power equipment*				
Tractor,130 Hp	242.00		-	-
Swather/Conditioner-14 ft	55.00		0.25	1
Vehicles (use units in miles)				
Pickup	4,400.0		20	1
ATV	1,100.0		5	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	105	
Total cropped acres	100	2,925.00
Farmstead, roads, waste	5	2,925.00

Note: all 'per acre' totals based upon 105 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 105 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	100	2,925.00
Almonds	100	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	307,125	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	151,875	1,446.43
Livestock	0	0.00
Permanent plantings	413,710	3,940.10
Buildings and fences	67,315	641.10
Farmstead, waste arces	0	0.00
Equipment		
Power implements	45,194	430.42
Non-power implements	33,523	319.27
Vehicles	21,621	205.91
Small tools	1,341	12.77
Total farm investment	**$1,041,704**	**$9,920.99**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	1,651	15.72
Farm family	88	0.84
Hired labor	157	1.50

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$81,973.00	$780.70
Fertilizer	11,222.00	106.88
Herbicides	7,567.90	72.08
Insect control	16,883.40	160.79
Seed	0.00	0.00
Disease control	7,394.50	70.42
Misc. crop expenses	21,797.00	207.59
On-farm irrigation pumping	6,342.38	60.40
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	1,108.76	10.56
Workmen's compensation	105.89	1.01
Social Security	84.82	0.81
Repairs	4,200.08	40.00
Fuel, grease & oil	4,134.81	39.38
Telephone	912.00	8.69
Electricity	1,220.00	11.62
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	3,298.93	31.42
Interest on operating capital	3,379.90	32.19
Subtotal - variable expenses	**$171,625.38**	**$1,634.53**
Fixed expenses		
Depreciation	$23,119.95	$220.19
Taxes	3,501.49	33.35
Insurance	3,448.99	32.85
Interest on debt	10,483.37	99.84
Subtotal - fixed expenses	**$40,553.80**	**$386.23**
Farm income analysis		
Crop sales	$290,932.00	$2,770.78
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$290,932.00**	**$2,770.78**
Total farm expenses	$212,179.17	$2,020.75
Net farm income	**$78,752.83**	**$750.03**
Return to family farm		
Return to equity	$14,345.90	$136.63
Return to management	7,875.28	75.00
Return to labor	21,292.37	202.78
Total return to farm family	**$43,513.55**	**$414.41**
Payment Capacity analysis		
Net returns	**$35,239.27**	
per acre	**$335.61**	(105 acres)
per acre-foot	**$81.95**	(430 AF)

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Almonds	1.00 Ton	100	100		100	$2,763.40	$276,340.00
Almonds Hulls	1.92 Ton	100	192		192	76.00	14,592.00
						Total	**$290,932.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	5
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
66 HP 2WD Tractor	$29,708	2002	2004	$32,518	$3,252	10000	800	$4.07	$1.20
ATV 4WD	5,790	2002	2004	12,675	1,268	3000	500	1.82	0.43

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Spot Sprayer	$225	2002	2004	$246	$0	2000	300	$0.06
Mower-Chopper, 8 ft	6,713	2002	2004	7,348	734	2000	400	2.78
Orchard Sprayer-500 Gal	19,741	2002	2004	21,608	2,161	2000	300	3.02
Weed Sprayer 100 Gal	3,947	2002	2004	4,320	432	2000	300	1.06

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$22,000	2002	2004	$21,621	$1,966	100000	20000	$0.15	$0.07	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/shop	$60,000	2002	2004	$65,902	$0	30	$600.00
Pruning Equipment	1,287	2002	2004	1,414	0	10	25.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$9.55
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Almonds	0	0	0	8	15	21	21	15	12	8	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
Operator labor distribution %												
Almonds	4	16	7	5	8	5	6	10	3	3	29	4

All costs are indexed to year 2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Labor	Almonds	100	2.85	Hour	285
				Total	**285.00**

Custom work

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Shake and Sweep Nu	Almonds	100	1 acre	2002	$78.00	$86.52	$86.52	$8,652.00
Pickup Nuts	Almonds	100	1 Ton	2002	39.00	43.26	43.26	4,326.00
Haul Nuts	Almonds	100	1 Ton	2002	39.00	43.26	43.26	4,326.00
Hull and Shell Nuts	Almonds	100	1 Ton	2002	120.00	133.11	133.11	13,311.00
Winter Sanitation writ	Almonds	100	1 acre	2002	463.00	513.58	513.58	51,358.00
							Total	**$81,973.00**

Fertilizer

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Un-32	Almonds	100	240 Lb-N	2002	$0.31	$0.40	$96.00	$9,600.00
ZnS04 Solution 12%	Almonds	100	108 Lb	2002	0.12	0.13	14.04	1,404.00
Boron (Solubar)	Almonds	100	2 Lb	2002	0.98	1.09	2.18	218.00
							Total	**$11,222.00**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Roundup Ultra Max	Almonds	100	3.25 Pint	2002	$4.09	$4.12	$13.39	$1,339.00
Goal 2 XL	Almonds	100	1.62 Pt	2002	16.35	16.49	26.71	2,671.38
Surflan 4 AS	Almonds	100	2.16 Pt	2002	16.33	16.47	35.58	3,557.52
							Total	**$7,567.90**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Volteck Supreme Oil	Almonds	100	6 Gal	2002	$5.00	$5.04	$30.24	$3,024.00
Clinch	Almonds	100	1 Lb	2002	13.19	13.30	13.30	1,330.00
Asana XL	Almonds	100	4 Oz	2002	1.04	1.05	4.20	420.00
Imidan 70 WSB	Almonds	100	4.3 Lb	2002	9.00	9.08	39.04	3,904.40
Omite 30-WS	Almonds	100	7.5 Lb	2002	7.89	7.96	59.70	5,970.00
Rodent Gopher Bait	Almonds	100	3 Lb	2002	3.09	3.12	9.36	936.00
Rodent Squirrel Bait	Almonds	100	3 Lb	2002	4.29	4.33	12.99	1,299.00
							Total	**$16,883.40**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Rovral 4F	Almonds	100	1 Pt	2002	$26.52	$26.74	$26.74	$2,674.00
Ziram WDG 76	Almonds	100	8 Lb	2002	3.03	3.06	24.48	2,448.00
Vangard WG	Almonds	100	7.5 Oz	2002	3.00	3.03	22.73	2,272.50
							Total	**$7,394.50**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Pollination Fee	Almonds	100	3 Hive	2002	$55.00	$61.01	$183.03	$18,303.00
Consultants	Almonds	100	1 Acre	2002	31.50	34.94	34.94	3,494.00
							Total	**$21,797.00**

All costs are indexed to year 2004

Crop expenses by crop

Almonds

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Un-32	fertilizer	100	240 Lb-N	2002	$0.31	$0.40	$96.00	$9,600.00
Volteck Supreme Oil	insect control	100	6 Gal	2002	5.00	5.04	30.24	3,024.00
Clinch	insect control	100	1 Lb	2002	13.19	13.30	13.30	1,330.00
Asana XL	insect control	100	4 Oz	2002	1.04	1.05	4.20	420.00
Imidan 70 WSB	insect control	100	4.3 Lb	2002	9.00	9.08	39.04	3,904.40
Omite 30-WS	insect control	100	7.5 Lb	2002	7.89	7.96	59.70	5,970.00
Pollination Fee	misc cost	100	3 Hive	2002	55.00	61.01	183.03	18,303.00
Consultants	misc cost	100	1 Acre	2002	31.50	34.94	34.94	3,494.00
ZnS04 Solution 12%	fertilizer	100	108 Lb	2002	0.12	0.13	14.04	1,404.00
Rodent Gopher Bait	insect control	100	3 Lb	2002	3.09	3.12	9.36	936.00
Rodent Squirrel Bait	insect control	100	3 Lb	2002	4.29	4.33	12.99	1,299.00
Rovral 4F	disease control	100	1 Pt	2002	26.52	26.74	26.74	2,674.00
Ziram WDG 76	disease control	100	8 Lb	2002	3.03	3.06	24.48	2,448.00
Vangard WG	disease control	100	7.5 Oz	2002	3.00	3.03	22.73	2,272.50
Roundup Ultra Max	herbicide	100	3.25 Pint	2002	4.09	4.12	13.39	1,339.00
Goal 2 XL	herbicide	100	1.62 Pt	2002	16.35	16.49	26.71	2,671.38
Surflan 4 AS	herbicide	100	2.16 Pt	2002	16.33	16.47	35.58	3,557.52
Boron (Solubar)	fertilizer	100	2 Lb	2002	0.98	1.09	2.18	218.00
Shake and Sweep Nuts	custom work	100	1 acre	2002	78.00	86.52	86.52	8,652.00
Pickup Nuts	custom work	100	1 Ton	2002	39.00	43.26	43.26	4,326.00
Haul Nuts	custom work	100	1 Ton	2002	39.00	43.26	43.26	4,326.00
Hull and Shell Nuts	custom work	100	1 Ton	2002	120.00	133.11	133.11	13,311.00
Winter Sanitation write up	custom work	100	1 acre	2002	463.00	513.58	513.58	51,358.00
							Total	**$146,837.80**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	12		$192.00
Demand charge	$2.90 per HP	12	48.502464	$1,687.89

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	43451.734	$4,462.49
			Total	$6,342.38

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFI) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)
Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)
Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)
Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)
Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)
Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)
Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Almonds	3.8	100	60	10	10	20444.24	2099.624
						Total	2099.624

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Almonds	0.5	100	60	10	260	23007.49	2362.869
						Total	2362.869

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Almonds	0	100	60	10	20	0	0
						Total	0

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops							
				Almonds	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom work	$81,973.00	$1,646.77	$558.36	$81,973.00							
Fertilizer	11,222.00	225.44	76.44	11,222.00							
Herbicide	7,567.90	152.03	51.55	7,567.90							
Insect control	16,883.40	339.17	115.00	16,883.40							
Seed cost	0.00	0.00	0.00	0.00							
Disease control	7,394.50	148.55	50.37	7,394.50							
Miscellaneous	21,797.00	437.88	148.47	21,797.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Irrigation pumping	6,342.38	127.41	43.20	4,462.49							
Livestock purchases	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purchased feed	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Livestock marketing	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hired labor	1,299.46	26.11	8.85	2,248.65							
Fuel	4,134.81	83.06	28.16	4,134.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equipment repairs	2,375.08	47.71	16.18	2,375.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other repairs	1,825.00	36.66	12.43								
Telephone	912.00	18.32	6.21								
Electricity	1,220.00	24.51	8.31								
Other farm expenses	0.00	0.00	0.00								
Misc. (2% add-on)	3,298.93	66.27	22.47								
Total	**$168,245.47**	**$3,379.90**	**$1,146.00**	**$160,058.84**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

Notes: Total hired labor expense includes 157.0 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($190.71) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($192.00) and demand charges ($1,687.89) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 105 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$307,125.00	$7,886.05	$75.11
Land development	0.00	0.00	0.00
Improvements	33,657.62	864.23	8.23
Permanent plantings	206,855.00	5,311.42	50.58
Non-real estate investment			
Irrigation and return flow system	75,937.50	1,034.50	9.85
Non-power equipment	18,425.30	251.01	2.39
Power equipment	24,856.60	338.62	3.22
Vehicles	11,793.10	160.66	1.53
Livestock	0.00	0.00	0.00
Small tools	670.46	9.13	0.09
Total	**$679,320.56**	**$13,199.90**	**$125.71**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	230,475.00	1.00	$230,475.00	1.00000%	$2,304.75
Improvement taxes	67,315.23	1.00	67,315.23	1.00000%	673.15
Equipment taxes	78,716.66	0.50	39,358.33	1.00000%	393.58
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$3,501.49**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$67.32	$448.99
Machinery insurance	0.00	119.22	0.00
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$3,448.99**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	1,650.78	64.4	240.0	112.7	103.3	171.6	140.4	156.5	203.8	82.5	71.1	240.0	64.4
Family	87.68	0.0	17.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0
Hired	157.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	157.0	0.0
Total	1,895.51	64.4	257.7	112.7	103.3	171.6	140.4	156.5	203.8	82.5	71.1	467.0	64.4

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Almonds	1,895.51	64.4	257.7	112.7	103.3	171.6	140.4	156.5	203.8	82.5	71.1	467.0	64.4
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,895.51	64.4	257.7	112.7	103.3	171.6	140.4	156.5	203.8	82.5	71.1	467.0	64.4

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Almonds	1,610.51	64.4	257.7	112.7	80.5	128.8	80.5	96.6	161.1	48.3	48.3	467.0	64.4
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,610.51	64.4	257.7	112.7	80.5	128.8	80.5	96.6	161.1	48.3	48.3	467.0	64.4

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Almonds	285.00	0.0	0.0	0.0	22.8	42.8	59.8	59.8	42.8	34.2	22.8	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	285.00	0.0	0.0	0.0	22.8	42.8	59.8	59.8	42.8	34.2	22.8	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
157.05	$7.06	$1,108.76

	Rate	
Social Security	0.0765	$84.82
Worker's Comp.	$ 9.55/$100	105.89
		$1,299.46

Return to Labor

	Hours	Wage	**Total**
Farm operator	1,650.78	$12.50	$20,634.76
Farm family	87.68	7.50	657.61
			$21,292.37

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 105 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Per acre
Real Estate Investment Costs					
Land	$307,125.00		$307,125.00	$2,912.09	$27.73
Improvement costs					
Machine Shed/shop	$65,901.64	$0.00	$32,950.82	$312.43	$2.98
Pruning Equipment	1,413.59	0.00	706.79	6.70	0.06
Permanent plantings	413,710.00		206,855.00	1,961.35	18.68
Sub-total	**$481,025.25**	**$0.00**	**$240,512.63**	**$2,280.49**	**$21.72**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$151,875.00	$0.00	$75,937.50	$3,051.04	$29.06
Sub-total	**$151,875.00**	**$0.00**	**$75,937.50**	**$3,051.04**	**$29.06**
Non-power equipment					
Spot Sprayer	$246.28	$0.00	$123.14	$4.95	$0.05
Mower-Chopper, 8 ft	7,348.01	734.47	4,041.24	162.37	1.55
Orchard Sprayer-500 Gal	21,608.39	2,160.73	11,884.56	477.50	4.55
Weed Sprayer 100 Gal	4,320.36	432.36	2,376.36	95.48	0.91
Small tools	1,340.92		670.46	26.94	0.26
Sub-total	**$34,863.96**	**$3,327.56**	**$19,095.76**	**$767.23**	**$7.31**
Power equipment					
66 HP 2WD Tractor	$32,518.22	$3,252.04	$17,885.13	$718.59	$6.84
ATV 4WD	12,675.40	1,267.54	6,971.47	280.10	2.67
Sub-total	**$45,193.62**	**$4,519.58**	**$24,856.60**	**$998.69**	**$9.51**
Vehicles					
Pickup	$21,620.69	$1,965.52	$11,793.10	$473.83	$4.51
Sub-total	**$21,620.69**	**$1,965.52**	**$11,793.10**	**$473.83**	**$4.51**
Total	**$1,041,703.50**	**$9,812.66**	**$679,320.56**	**$10,483.37**	**$99.84**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs			All 'per acre' totals based upon 105 acres	
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
66 HP 2WD Tractor	393.8	$1.20	$4.07	$472.56	$1,602.77	$684.02	$2,759.34	$26.28
ATV 4WD	575.3	0.43	1.82	247.38	1,047.05	941.39	2,235.82	21.29
Spot Sprayer	23.0	0.06		1.38		5.76	7.14	0.07
Mower-Chopper, 8 ft	126.0	2.78		350.28		298.21	648.49	6.18
Orchard Sprayer-500 G	186.0	3.02		561.72		1,427.14	1,988.86	18.94
Weed Sprayer 100 Gal	46.0	1.06		48.76		90.87	139.63	1.33
Pickup	9,900.0	0.07	0.15	693.00	1,485.00	1,621.97	3,799.97	36.19
Machine Shed/shop				600.00		1,136.31	1,736.31	16.54
Pruning Equipment				25.00		116.65	141.65	1.35
Irrigation system				1,200.00		4,995.28	6,195.28	59.00
			Total	**$4,200.08**	**$4,134.81**	**$11,317.61**	**$19,652.50**	**$187.17**

Note: This total depreciation does not include $11802.34 for plants.

Depreciation Table

			Use units (hours, miles if vehicle, years if building)						
Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
66 HP 2WD Tractor	$32,518	$3,252	10000	800	393.8	1	25	0.0234	$684.02
ATV 4WD	12,675	1,268	3000	500	575.3	2	10	0.0825	941.39
Spot Sprayer	246	0	2000	300	23.0	1	25	0.0234	5.76
Mower-Chopper, 8 ft	7,348	734	2000	400	126.0	1	16	0.0451	298.21
Orchard Sprayer-500	21,608	2,161	2000	300	186.0	1	11	0.0734	1,427.14
Weed Sprayer 100 G	4,320	432	2000	300	46.0	1	25	0.0234	90.87
Pickup	21,621	1,966	100000	20000	9,900.0	1	10	0.0825	1,621.97
Machine Shed/shop	65,902	0					30	0.0172	1,136.31
Pruning Equipment	1,414	0					10	0.0825	116.65
Almonds perm. planti	413,710	0					22	0.0285	11,802.34
Irrigation system	151,875	0					20	0.0329	4,995.28
Return flow system	0	0					20	0.0329	0.00
								Total	**$23,119.95**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 100

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre	Times over land
			Almonds	Almonds
Spot Sprayer	23.00	ATV 4WD	0.23	1
Mower-Chopper, 8 ft	126.00	66 HP 2WD Tractor	0.18	7
Orchard Sprayer-500 Gal	186.00	66 HP 2WD Tractor	0.31	6
Weed Sprayer 100 Gal	46.00	66 HP 2WD Tractor	0.23	2
Power equipment*				
66 HP 2WD Tractor	393.80		-	-
ATV 4WD	575.30		1.00	5
Vehicles (use units in miles)				
Pickup	9,900.0		45	2

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	420	
Total cropped acres	400	0.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 420 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 420 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	400	0.00
Cantaloupe	400	0.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	**Total**	**Per acre**
Land	58,500	139.29
Land development	0	0.00
Improvements		
Irrigation system	197,028	469.11
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	156.91
Farmstead, waste arces	0	0.00
Equipment		
Power implements	187,512	446.46
Non-power implements	88,226	210.06
Vehicles	21,621	51.48
Small tools	1,765	4.20
Total farm investment	**$620,553**	**$1,477.51**

Summary of Farm Work

Work by (in hours):	**Total**	**Per acre**
Farm operator	1,910	4.55
Farm family	700	1.67
Hired labor	6,200	14.76

Financial Summary

Variable expenses	**Total**	**Per acre**
Crop expenses		
Custom work	$1,214,070.00	$2,890.64
Fertilizer	14,400.00	34.29
Herbicides	16,400.00	39.05
Insect control	48,000.00	114.29
Seed	111,619.99	265.76
Disease control	8,000.00	19.05
Misc. crop expenses	37,324.00	88.87
On-farm irrigation pumping	2,461.99	5.86
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	43,772.71	104.22
Workmen's compensation	5,283.37	12.58
Social Security	3,348.61	7.97
Repairs	6,598.98	15.71
Fuel, grease & oil	2,323.29	5.53
Telephone	912.00	2.17
Electricity	1,220.00	2.90
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	30,314.70	72.18
Interest on operating capital	51,764.63	123.25
Subtotal - variable expenses	**$1,597,814.25**	**$3,804.32**
Fixed expenses		
Depreciation	$15,622.22	$37.20
Taxes	2,167.71	5.16
Insurance	800.00	1.90
Interest on debt	11,428.83	27.21
Subtotal - fixed expenses	**$30,018.76**	**$71.47**
Farm income analysis		
Crop sales	$1,834,560.00	$4,368.00
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$1,834,560.00**	**$4,368.00**
Total farm expenses	$1,627,833.00	$3,875.79
Net farm income	**$206,727.00**	**$492.21**
Return to family farm		
Return to equity	$23,480.81	$55.91
Return to management	20,672.70	49.22
Return to labor	29,123.75	69.34
Total return to farm family	**$73,277.26**	**$174.47**
Payment Capacity analysis		
Net returns	**$133,449.75**	
per acre	**$317.74**	(420 acres)
per acre-foot	**$250.85**	(532 AF)

Appendix L
Cantaloupe Budget

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Cantaloupe	14.00 ton	400	5,600		5,600	$327.60	$1,834,560.00
						Total	**$1,834,560.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	10				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$0	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$800	Meter or other change	$16.00
Building insurance rate	$0	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$0	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
110 HP 2WD Tractor	$70,050	2000	2004	$81,641	$8,217	10000	700	$9.25	$2.43
130 HP 2WD Tractor	90,840	2000	2004	105,871	10,587	10000	700	10.93	2.81

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Chisel, 16 ft	$8,000	2000	2004	$18,647	$1,865	2000	300	$2.00
Cultivator	5,362	2000	2004	6,249	625	2000	300	1.07
Disk, 18 ft	14,000	2000	2004	16,317	1,632	2000	400	2.20
Bed Shaper-3 Row	9,700	2000	2004	11,305	1,131	2000	300	1.93
Ditcher-V	7,800	2000	2004	9,091	909	2000	300	5.51
Landplane	20,000	2000	2004	23,309	2,331	2000	300	2.50
Lister, 3 row-16'	2,838	2000	2004	3,308	331	2000	300	0.88

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$22,000	2002	2004	$21,621	$1,966	100000	20000	$0.15	$0.10	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/Shop	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$12.07
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Cantaloupe	0	0	15	15	15	15	15	15	10	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0
Operator labor distribution %												
Cantaloupe	2	2	10	15	10	7	7	11	21	11	2	2

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Ventilate plastic	Cantaloupe	400	2	hour	800
Remove plastic	Cantaloupe	400	3	hour	1200
Thin and weed	Cantaloupe	400	9	hour	3600
Irrigation labor	Cantaloupe	400	5	hours	2000
				Total	**7,600.00**

Custom work

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Application	Cantaloupe	400	1 acre	2000	$10.50	$11.95	$11.95	$4,780.00
Lay plastic mulch	Cantaloupe	400	1 acre	2000	55.00	62.59	62.59	25,036.00
Application	Cantaloupe	400	1 acre	2000	8.50	9.67	9.67	3,868.00
Pollination	Cantaloupe	400	1.5 hives	2000	25.00	28.45	42.68	17,070.00
application	Cantaloupe	400	2 acre	2000	8.00	9.10	18.20	7,280.00
application	Cantaloupe	400	1 acre	2000	8.00	9.10	9.10	3,640.00
Harvest	Cantaloupe	400	14 ton	2000	180.00	204.83	2,867.62	1,147,048.00
Inject fertilizer	Cantaloupe	400	1 acre	2000	11.75	13.37	13.37	5,348.00
							Total	**$1,214,070.00**

Fertilizer

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Fertilizer	Cantaloupe	400	80 lb	2000	$0.35	$0.45	$36.00	$14,400.00
							Total	**$14,400.00**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Prefer	Cantaloupe	400	1 acre	2000	$41.00	$41.00	$41.00	$16,400.00
							Total	**$16,400.00**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Insect control	Cantaloupe	400	2 acre	2000	$60.00	$60.00	$120.00	$48,000.00
							Total	**$48,000.00**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Seed	Cantaloupe	400	1 acre	2000	$219.00	$279.05	$279.05	$111,619.99
							Total	**$111,619.99**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Disease control	Cantaloupe	400	1 acre	2000	$20.00	$20.00	$20.00	$8,000.00
							Total	**$8,000.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Plastic mulch	Cantaloupe	400	1 acre	2000	$82.00	$93.31	$93.31	$37,324.00
							Total	**$37,324.00**

All costs are indexed to year 2004

Crop expenses by crop

Cantaloupe

Item	Category	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Seed	seed cost	400	1	acre	2000	$219.00	$279.05	$279.05	$111,619.99
Prefer	herbicide	400	1	acre	2000	41.00	41.00	41.00	16,400.00
Application	custom work	400	1	acre	2000	10.50	11.95	11.95	4,780.00
Plastic mulch	misc cost	400	1	acre	2000	82.00	93.31	93.31	37,324.00
Lay plastic mulch	custom work	400	1	acre	2000	55.00	62.59	62.59	25,036.00
Fertilizer	fertilizer	400	80	lb	2000	0.35	0.45	36.00	14,400.00
Application	custom work	400	1	acre	2000	8.50	9.67	9.67	3,868.00
Pollination	custom work	400	1.5	hives	2000	25.00	28.45	42.68	17,070.00
Insect control	insect control	400	2	acre	2000	60.00	60.00	120.00	48,000.00
application	custom work	400	2	acre	2000	8.00	9.10	18.20	7,280.00
Disease control	disease control	400	1	acre	2000	20.00	20.00	20.00	8,000.00
application	custom work	400	1	acre	2000	8.00	9.10	9.10	3,640.00
Harvest	custom work	400	14	ton	2000	180.00	204.83	2,867.62	1,147,048.00
Inject fertilizer	custom work	400	1	acre	2000	11.75	13.37	13.37	5,348.00
								Total	**$1,449,814.00**

On-farm irrigation pumping expenses

	Monthly charge		Months	Total HP	Charge
Meter charge	$16.00		6		$96.00
Demand charge	$2.90	per HP	6	11.747058	$204.40

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	21047.59	$2,161.59
			Total	$2,461.99

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted rat $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cantaloupe	1	400	120	10	0	15018.67	1542.417
						Total	1542.417

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cantaloupe	0	400	120	10	260	0	0
						Total	0

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cantaloupe	0.33	400	120	10	5	6028.923	619.1704
						Total	619.1704

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops				
				Cantaloupe	0.00	0.00	0.00	1.00
Custom work	##########	$40,649.33	$13,782.73	$1,214,070.00				
Fertilizer	14,400.00	482.14	163.48	14,400.00				
Herbicide	16,400.00	549.10	186.18	16,400.00				
Insect control	48,000.00	1,607.13	544.92	48,000.00				
Seed cost	111,619.99	3,737.25	1,267.17	111,619.99				
Disease control	8,000.00	267.85	90.82	8,000.00				
Miscellaneous	37,324.00	1,249.68	423.72	37,324.00	$0.00	$0.00	$0.00	$0.00
Irrigation pumping	2,461.99	82.43	27.95	2,161.59				
Livestock purchases	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Purchased feed	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Livestock marketing	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Hired labor	52,404.68	1,754.61	594.92	65,512.00				
Fuel	2,323.29	77.79	26.38	2,323.29	0.00	0.00	0.00	0.00
Equipment repairs	2,398.98	80.32	27.23	2,398.98	0.00	0.00	0.00	0.00
Other repairs	4,200.00	140.62	47.68					
Telephone	912.00	30.54	10.35					
Electricity	1,220.00	40.85	13.85					
Other farm expenses	0.00	0.00	0.00					
Misc. (2% add-on)	30,314.70	1,014.99	344.15					
Total	**##########**	**$51,764.63**	**$17,551.53**	**$1,522,209.88**	**$0.00**	**$0.00**	**$0.00**	**$0.00**

Notes: Total hired labor expense includes 6,200.1 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($8,631.98) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($96.00) and demand charges ($204.40) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 420 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$58,500.00	$1,502.10	$3.58
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	2.01
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	98,514.00	1,342.06	3.20
Non-power equipment	48,524.24	661.05	1.57
Power equipment	103,157.88	1,405.32	3.35
Vehicles	11,793.10	160.66	0.38
Livestock	0.00	0.00	0.00
Small tools	882.26	12.02	0.03
Total	**$354,322.31**	**$5,929.28**	**$14.12**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	0.00	1.00	$0.00	1.00000%	$0.00
Improvement taxes	65,901.64	1.00	65,901.64	1.00000%	659.02
Equipment taxes	275,738.00	0.50	137,869.00	1.00000%	1,378.69
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$2,167.71**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	0.00	$65.90	$0.00
Machinery insurance	0.00	250.20	0.00
Liability insurance			0.00
Vehicle insurance			800.00
		Total insurance	**$800.00**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	1,909.90	24.2	24.2	240.0	240.0	240.0	240.0	240.0	240.0	240.0	133.1	24.2	24.2
Family	700.00	0.0	0.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	0.0	0.0	0.0
Hired	6,200.10	0.0	0.0	951.0	1,011.5	951.0	844.7	844.7	893.1	704.1	0.0	0.0	0.0
Total	8,810.00	24.2	24.2	1,261.0	1,321.5	1,261.0	1,224.7	1,224.7	1,273.1	1,014.1	133.1	24.2	24.2

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cantaloupe	8,810.00	24.2	24.2	1,261.0	1,321.5	1,261.0	1,224.7	1,224.7	1,273.1	1,014.1	133.1	24.2	24.2
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	8,810.00	24.2	24.2	1,261.0	1,321.5	1,261.0	1,224.7	1,224.7	1,273.1	1,014.1	133.1	24.2	24.2

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cantaloupe	1,210.00	24.2	24.2	121.0	181.5	121.0	84.7	84.7	133.1	254.1	133.1	24.2	24.2
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,210.00	24.2	24.2	121.0	181.5	121.0	84.7	84.7	133.1	254.1	133.1	24.2	24.2

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cantaloupe	7,600.00	0.0	0.0	1,140.0	1,140.0	1,140.0	1,140.0	1,140.0	1,140.0	760.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	7,600.00	0.0	0.0	1,140.0	1,140.0	1,140.0	1,140.0	1,140.0	1,140.0	760.0	0.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
6,200.10	$7.06	$43,772.71

	Rate	
Social Security	0.0765	$3,348.61
Worker's Comp.	$ 12.07/$100	5,283.37
		$52,404.68

Return to Labor

	Hours	Wage	**Total**
Farm operator	1,909.90	$12.50	$23,873.75
Farm family	700.00	7.50	5,250.00
			$29,123.75

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 420 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Per acre
Real Estate Investment Costs					
Land	$58,500.00		$58,500.00	$554.68	$1.32
Improvement costs					
Machine Shed/Shop	$65,901.64	$0.00	$32,950.82	$312.43	$0.74
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$0.74**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$197,028.00	$0.00	$98,514.00	$3,958.12	$9.42
Sub-total	**$197,028.00**	**$0.00**	**$98,514.00**	**$3,958.12**	**$9.42**
Non-power equipment					
Chisel, 16 ft	$18,647.48	$1,864.74	$10,256.11	$412.07	$0.98
Cultivator	6,249.24	624.69	3,436.97	138.09	0.33
Disk, 18 ft	16,316.55	1,631.65	8,974.10	360.56	0.86
Bed Shaper-3 Row	11,305.04	1,130.50	6,217.77	249.82	0.59
Ditcher-V	9,090.65	909.06	4,999.85	200.89	0.48
Landplane	23,309.35	2,330.94	12,820.14	515.09	1.23
Lister, 3 row-16'	3,307.60	330.99	1,819.30	73.10	0.17
Small tools	1,764.52		882.26	35.45	0.08
Sub-total	**$89,990.43**	**$8,822.57**	**$49,406.50**	**$1,985.07**	**$4.73**
Power equipment					
110 HP 2WD Tractor	$81,641.01	$8,216.55	$44,928.78	$1,805.16	$4.30
130 HP 2WD Tractor	105,871.08	10,587.11	58,229.09	2,339.54	5.57
Sub-total	**$187,512.09**	**$18,803.66**	**$103,157.88**	**$4,144.70**	**$9.87**
Vehicles					
Pickup	$21,620.69	$1,965.52	$11,793.10	$473.83	$1.13
Sub-total	**$21,620.69**	**$1,965.52**	**$11,793.10**	**$473.83**	**$1.13**
Total	**$620,552.88**	**$29,591.75**	**$354,322.31**	**$11,428.83**	**$27.21**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 420 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
130 HP 2WD Tractor	61.6	$2.81	$10.93	$173.10	$673.29	$2,227.00	$3,073.38	$7.32
110 HP 2WD Tractor	0.0	2.43	9.25					
Chisel, 16 ft	368.0	2.00		736.00		1,231.58	1,967.58	4.68
Cultivator	76.0	1.07		81.32		131.46	212.78	0.51
Disk, 18 ft	0.0	2.20		0.00		343.22	343.22	0.82
Bed Shaper-3 Row	0.0	1.93		0.00		237.80	237.80	0.57
Ditcher-V	56.0	5.51		308.56		191.22	499.78	1.19
Landplane	0.0	2.50		0.00		490.31	490.31	1.17
Lister, 3 row-16'	0.0	0.88		0.00		69.57	69.57	0.17
Disk, 18 ft	0.0	2.20						
Bed Shaper-3 Row	0.0	1.93						
Landplane	0.0	2.50						
Lister, 3 row-16'	0.0	0.88						
Pickup	11,000.0	0.10	0.15	1,100.00	1,650.00	1,842.11	4,592.11	10.93
Machine Shed/Shop				600.00		661.45	1,261.45	3.00
Irrigation system				3,600.00		6,480.40	10,080.40	24.00
			Total	**$6,598.98**	**$2,323.29**	**$15,622.22**	**$24,544.49**	**$58.44**

Depreciation Table

				Use units (hours, miles if vehicle, years if building)					
Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
130 HP 2WD Tractor	$105,871	$10,587	10000	700	61.6	1	25	0.0234	$2,227.00
110 HP 2WD Tractor	81,641	8,217	10000	700	0.0	1	25	0.0234	1,716.09
Chisel, 16 ft	18,647	1,865	2000	300	368.0	2	11	0.0734	1,231.58
Cultivator	6,249	625	2000	300	76.0	1	25	0.0234	131.46
Ditcher-V	9,091	909	2000	300	56.0	1	25	0.0234	191.22
Disk, 18 ft	16,317	1,632	2000	400	0.0	1	25	0.0234	343.22
Bed Shaper-3 Row	11,305	1,131	2000	300	0.0	1	25	0.0234	237.80
Landplane	23,309	2,331	2000	300	0.0	1	25	0.0234	490.31
Lister, 3 row-16'	3,308	331	2000	300	0.0	1	25	0.0234	69.57
Pickup	21,621	1,966	100000	20000	11,000.0	1	9	0.0937	1,842.11
Machine Shed/Shop	65,902	0					40	0.0100	661.45
Irrigation system	197,028	0					20	0.0329	6,480.40
Return flow system	0	0					20	0.0329	0.00
								Total	**$15,622.22**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 400

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre Cantaloupe	Times over land Cantaloupe
Chisel, 16 ft	368.00	, 130 HP 2WD Tractor	0.00	0
Cultivator	76.00		1.00	0.05
Ditcher-V	56.00		1.00	0.14
Disk, 18 ft	0			
Bed Shaper-3 Row	0			
Landplane	0			
Lister, 3 row-16'	0			
Power equipment*				
130 HP 2WD Tractor	61.60		-	-
110 HP 2WD Tractor	-			
Vehicles (use units in miles)				
Pickup	11,000.0		25	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	420	
Total cropped acres	400	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 420 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 420 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	400	2,925.00
Cotton	400	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	1,228,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	197,028	469.11
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	156.91
Farmstead, waste arces	0	0.00
Equipment		
Power implements	646,905	1,540.25
Non-power implements	180,791	430.45
Vehicles	19,826	47.20
Small tools	3,616	8.61
Total farm investment	**$2,342,568**	**$5,577.54**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	2,005	4.77
Farm family	653	1.55
Hired labor	1,945	4.63

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$86,856.95	$206.80
Fertilizer	25,308.00	60.26
Herbicides	40,294.04	95.94
Insect control	24,505.00	58.35
Seed	9,900.00	23.57
Disease control	0.00	0.00
Misc. crop expenses	9,174.00	21.84
On-farm irrigation pumping	10,502.21	25.01
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	13,734.76	32.70
Workmen's compensation	2,061.59	4.91
Social Security	1,050.71	2.50
Repairs	23,876.06	56.85
Fuel, grease & oil	24,621.74	58.62
Telephone	912.00	2.17
Electricity	1,220.00	2.90
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	5,480.34	13.05
Interest on operating capital	5,614.86	13.37
Subtotal - variable expenses	**$285,112.25**	**$678.84**
Fixed expenses		
Depreciation	$38,741.28	$92.24
Taxes	14,146.50	33.68
Insurance	2,239.56	5.33
Interest on debt	34,738.83	82.71
Subtotal - fixed expenses	**$89,866.17**	**$213.97**
Farm income analysis		
Crop sales	$508,643.63	$1,211.06
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$508,643.63**	**$1,211.06**
Total farm expenses	$374,978.44	$892.81
Net farm income	**$133,665.19**	**$318.25**
Return to family farm		
Return to equity	$42,017.29	$100.04
Return to management	13,366.52	31.83
Return to labor	29,966.09	71.35
Total return to farm family	**$85,349.90**	**$203.21**
Payment Capacity analysis		
Net returns	**$48,315.29**	
per acre	**$115.04**	(420 acres)
per acre-foot	**$34.51**	(1400 AF)

Crop revenues

Crop	Yield per acre	units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Cotton	1,498.00	Lbs	400	599,200		599,200	$0.67	$401,464.00
Cotton Cotton seed	1.10	ton	400	440		440	166.40	73,216.00
Cotton Direct payme	12.73	Cwt	400	5,092		5,092	6.67	33,963.64
							Total	**$508,643.63**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$800	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
105 HP 2WD Tractor	$62,000	2002	2004	$67,865	$7,717	10000	600	$7.78	$2.81
150 HP 4WD Tractor	110,000	2002	2004	120,405	12,041	10000	600	11.11	2.86
230 HP Crawler	154,000	2002	2004	168,568	16,857	10000	600	17.04	4.00
Cotton Harvestor, 4 row	265,000	2002	2004	290,068	29,007	4000	300	19.26	38.51

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Cultivator, Rolling, 6 row	$6,800	2002	2004	$7,443	$744	2000	300	$0.65
Disk, Finish, 21'	19,595	2002	2004	21,449	2,144	2000	300	3.11
Disk, Stubble, 18'	42,000	2002	2004	45,973	4,597	2000	300	6.79
Ditcher	7,800	2002	2004	8,538	854	2000	300	1.19
Flail Chopper	14,445	2002	2004	15,811	1,582	2000	300	6.33
Lister, 6 row	5,500	2002	2004	6,020	602	2000	300	1.10
Module builder	24,000	2002	2004	26,270	2,627	2000	300	3.25
Rear Blade, 10'	2,581	2002	2004	2,825	282	2000	300	0.37
Saddle Tank	3,218	2002	2004	3,522	352	2000	300	0.02
Spray Boom, 20'	913	2002	2004	999	100	2000	350	0.25
Subsoiler. 8'	14,800	2002	2004	16,200	1,620	2000	300	3.34
Uncapper, 6 row	8,500	2002	2004	9,304	930	2000	300	1.73
Planter	15,015	2002	2004	16,435	1,644	2000	300	2.96

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$20,000	2003	2004	$19,826	$1,983	100000	20000	$0.15	$0.10	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/Shop	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$15.01
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Cotton	0	20	0	0	0	20	40	20	0	0	0	0
Operator labor distribution %												
Cotton	2	4.4	4.5	12.1	10.1	12.7	6.9	2	2	2	39.3	2

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation	Cotton	400	5	hour	2000
				Total	**2,000.00**

Custom work

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Air Application	Cotton	400	7 Acre	2002	$7.50	$7.75	$54.25	$21,700.00
Haul and Gin Cotton	Cotton	400	35.26 Cwt Total \	2002	3.85	3.98	140.33	56,133.92
Compression Fee	Cotton	400	3.12 Bale	2002	7.00	7.23	22.56	9,023.04
							Total	**$86,856.95**

Fertilizer

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
UN-32	Cotton	400	180 Lb-N	2002	$0.26	$0.34	$61.20	$24,480.00
Applicator Rent	Cotton	400	1 Acre	2002	2.00	2.07	2.07	828.00
							Total	**$25,308.00**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Treflan	Cotton	400	1.5 Pint	2002	$3.50	$3.53	$5.30	$2,118.00
Staple	Cotton	400	0.38 Oz	2002	48.23	48.64	18.48	7,393.28
Caparol	Cotton	400	1.5 Qt	2002	10.57	10.66	15.99	6,396.00
Prep	Cotton	400	2 Pint	2002	6.24	6.29	12.58	5,032.00
Gramoxone Max	Cotton	400	1.31 Pint	2002	5.78	5.83	7.64	3,054.92
Defol 6: Defoliant	Cotton	400	1 Pint	2002	10.00	10.08	10.08	4,032.00
Assessments	Cotton	400	3.12 Bale	2002	9.75	9.83	30.67	12,267.84
							Total	**$40,294.04**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Zepher: miticide	Cotton	400	6 Oz	2002	$6.00	$6.05	$36.30	$14,520.00
Warrior	Cotton	400	3.2 Oz	2002	2.73	2.75	8.80	3,520.00
Provado	Cotton	400	3.75 Oz	2002	4.27	4.31	16.16	6,465.00
							Total	**$24,505.00**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Cotton Seed	Cotton	400	15 LB	2002	$1.48	$1.65	$24.75	$9,900.00
							Total	**$9,900.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Pix: Grow Reg.	Cotton	400	1.5 Pint	2002	$15.16	$15.29	$22.93	$9,174.00
							Total	**$9,174.00**

All costs are indexed to year 2004

Crop expenses by crop

Cotton

Item	Category	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Treflan	herbicide	400	1.5	Pint	2002	$3.50	$3.53	$5.30	$2,118.00
Staple	herbicide	400	0.38	Oz	2002	48.23	48.64	18.48	7,393.28
Caparol	herbicide	400	1.5	Qt	2002	10.57	10.66	15.99	6,396.00
Cotton Seed	seed cost	400	15	LB	2002	1.48	1.65	24.75	9,900.00
Zepher: miticide	insect control	400	6	Oz	2002	6.00	6.05	36.30	14,520.00
Air Application	custom work	400	7	Acre	2002	7.50	7.75	54.25	21,700.00
Warrior	insect control	400	3.2	Oz	2002	2.73	2.75	8.80	3,520.00
Provado	insect control	400	3.75	Oz	2002	4.27	4.31	16.16	6,465.00
Pix: Grow Reg.	misc cost	400	1.5	Pint	2002	15.16	15.29	22.93	9,174.00
UN-32	fertilizer	400	180	Lb-N	2002	0.26	0.34	61.20	24,480.00
Prep	herbicide	400	2	Pint	2002	6.24	6.29	12.58	5,032.00
Applicator Rent	fertilizer	400	1	Acre	2002	2.00	2.07	2.07	828.00
Gramoxone Max	herbicide	400	1.31	Pint	2002	5.78	5.83	7.64	3,054.92
Defol 6: Defoliant	herbicide	400	1	Pint	2002	10.00	10.08	10.08	4,032.00
Assessments	herbicide	400	3.12	Bale	2002	9.75	9.83	30.67	12,267.84
Haul and Gin Cotton	custom work	400	35.26	Cwt Total '	2002	3.85	3.98	140.33	56,133.92
Compression Fee	custom work	400	3.12	Bale	2002	7.00	7.23	22.56	9,023.04
								Total	**$196,038.00**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	12		$192.00
Demand charge	$2.90 per HP	12	54.799999	$1,907.04

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	81822.469	$8,403.17
			Total	$10,502.21

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFI) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cotton	2.5	400	100	10	10	53800.63	5525.325
						Total	5525.325

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cotton	0	400	100	10	260	0	0
						Total	0

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Cotton	1	400	100	10	20	28021.84	2877.843
						Total	2877.843

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops Cotton
Custom work	$86,856.95	$1,744.88	$591.63	$86,856.95
Fertilizer	25,308.00	508.42	172.39	25,308.00
Herbicide	40,294.04	809.47	274.46	40,294.04
Insect control	24,505.00	492.28	166.92	24,505.00
Seed cost	9,900.00	198.88	67.43	9,900.00
Disease control	0.00	0.00	0.00	0.00
Miscellaneous	9,174.00	184.30	62.49	9,174.00
Irrigation pumping	10,502.21	210.98	71.54	8,403.17
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	16,847.06	338.44	114.75	15,780.00
Fuel	24,621.74	494.63	167.71	24,621.74
Equipment repairs	19,676.06	395.27	134.02	19,676.06
Other repairs	4,200.00	84.37	28.61	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	5,480.34	110.10	37.33	
Total	**$279,497.41**	**$5,614.86**	**$1,903.80**	**$264,518.97**

Notes: Total hired labor expense includes 1,945.4 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($3,112.30) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($192.00) and demand charges ($1,907.04) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 420 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$1,228,500.00	$31,544.19	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	2.01
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	98,514.00	1,342.06	3.20
Non-power equipment	99,435.16	1,354.61	3.23
Power equipment	356,263.19	4,853.37	11.56
Vehicles	10,904.35	148.55	0.35
Livestock	0.00	0.00	0.00
Small tools	1,807.91	24.63	0.06
Total	**$1,828,375.38**	**$40,113.49**	**$95.51**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	921,900.00	1.00	$921,900.00	1.00000%	$9,219.00
Improvement taxes	65,901.64	1.00	65,901.64	1.00000%	659.02
Equipment taxes	827,696.19	0.50	413,848.09	1.00000%	4,138.48
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$14,146.50**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	0.00	554.21	0.00
Liability insurance			1,000.00
Vehicle insurance			800.00
		Total insurance	**$2,239.56**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,005.49	52.1	240.0	117.2	240.0	240.0	240.0	240.0	240.0	52.1	52.1	240.0	52.1
Family	653.00	0.0	70.0	0.0	70.0	23.0	140.0	140.0	140.0	0.0	0.0	70.0	0.0
Hired	1,945.43	0.0	204.6	0.0	5.1	0.0	350.7	599.7	72.1	0.0	0.0	713.3	0.0
Total	4,603.92	52.1	514.6	117.2	315.1	263.0	730.7	979.7	452.1	52.1	52.1	1,023.3	52.1

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cotton	4,603.92	52.1	514.6	117.2	315.1	263.0	730.7	979.7	452.1	52.1	52.1	1,023.3	52.1
Total	4,603.92	52.1	514.6	117.2	315.1	263.0	730.7	979.7	452.1	52.1	52.1	1,023.3	52.1

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cotton	2,603.92	52.1	114.6	117.2	315.1	263.0	330.7	179.7	52.1	52.1	52.1	1,023.3	52.1
Total	2,603.92	52.1	114.6	117.2	315.1	263.0	330.7	179.7	52.1	52.1	52.1	1,023.3	52.1

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cotton	2,000.00	0.0	400.0	0.0	0.0	0.0	400.0	800.0	400.0	0.0	0.0	0.0	0.0
Total	2,000.00	0.0	400.0	0.0	0.0	0.0	400.0	800.0	400.0	0.0	0.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
1,945.43	$7.06	$13,734.76

	Rate	
Social Security	0.0765	$1,050.71
Worker's Comp.	$ 15.01/$100	2,061.59
		$16,847.06

Return to Labor

	Hours	Wage	**Total**
Farm operator	2,005.49	$12.50	$25,068.62
Farm family	653.00	7.50	4,897.47
			$29,966.09

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 420 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Per acre
Real Estate Investment Costs					
Land	$1,228,500.00		$1,228,500.00	$11,648.37	$27.73
Improvement costs					
Machine Shed/Shop	$65,901.64	$0.00	$32,950.82	$312.43	$0.74
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$0.74**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$197,028.00	$0.00	$98,514.00	$3,958.12	$9.42
Sub-total	**$197,028.00**	**$0.00**	**$98,514.00**	**$3,958.12**	**$9.42**
Non-power equipment					
Cultivator, Rolling, 6 row	$7,443.24	$744.32	$4,093.78	$164.48	$0.39
Disk, Finish, 21'	21,448.58	2,144.31	11,796.45	473.96	1.13
Disk, Stubble, 18'	45,972.97	4,597.30	25,285.13	1,015.91	2.42
Ditcher	8,537.84	853.78	4,695.81	188.67	0.45
Flail Chopper	15,811.42	1,581.69	8,696.55	349.41	0.83
Lister, 6 row	6,020.27	602.03	3,311.15	133.04	0.32
Module builder	26,270.27	2,627.03	14,448.65	580.52	1.38
Rear Blade, 10'	2,825.15	282.41	1,553.78	62.43	0.15
Saddle Tank	3,522.41	352.46	1,937.43	77.84	0.19
Spray Boom, 20'	999.36	99.61	549.48	22.08	0.05
Subsoiler. 8'	16,200.00	1,620.00	8,910.00	357.99	0.85
Uncapper, 6 row	9,304.05	930.41	5,117.23	205.60	0.49
Planter	16,435.34	1,644.08	9,039.71	363.20	0.86
Small tools	3,615.82		1,807.91	72.64	0.17
Sub-total	**$184,406.72**	**$18,079.43**	**$101,243.07**	**$4,067.77**	**$9.69**
Power equipment					
105 HP 2WD Tractor	$67,864.87	$7,716.89	$37,790.88	$1,518.37	$3.62
150 HP 4WD Tractor	120,405.41	12,040.54	66,222.98	2,660.72	6.34
230 HP Crawler	168,567.56	16,856.76	92,712.16	3,725.01	8.87
Cotton Harvestor, 4 row	290,067.56	29,006.76	159,537.16	6,409.92	15.26
Sub-total	**$646,905.38**	**$65,620.95**	**$356,263.19**	**$14,314.03**	**$34.08**
Vehicles					
Pickup	$19,826.09	$1,982.61	$10,904.35	$438.12	$1.04
Sub-total	**$19,826.09**	**$1,982.61**	**$10,904.35**	**$438.12**	**$1.04**
Total	**$2,342,567.75**	**$85,682.98**	**$1,828,375.38**	**$34,738.83**	**$82.71**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 420 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
105 HP 2WD Tractor	585.2	$2.81	$7.78	$1,644.41	$4,552.86	$2,494.85	$8,692.12	$20.70
150 HP 4WD Tractor	541.2	2.86	11.11	1,547.83	6,012.73	4,148.51	11,709.07	27.88
230 HP Crawler	404.8	4.00	17.04	1,619.20	6,897.79	3,545.82	12,062.81	28.72
Cotton Harvestor, 4 row	286.0	38.51	19.26	11,013.86	5,508.36	14,077.23	30,599.45	72.86
Cultivator, Rolling, 6 row	260.0	0.65		169.00		721.85	890.85	2.12
Disk, Finish, 21'	128.0	3.11		398.08		870.45	1,268.53	3.02
Disk, Stubble, 18'	80.0	6.79		543.20		967.04	1,510.24	3.60
Ditcher	24.0	1.19		28.56		179.59	208.15	0.50
Flail Chopper	52.0	6.33		329.16		332.58	661.74	1.58
Lister, 6 row	40.0	1.10		44.00		126.64	170.64	0.41
Module builder	68.0	3.25		221.00		552.60	773.60	1.84
Rear Blade, 10'	24.0	0.37		8.88		59.43	68.31	0.16
Saddle Tank	80.0	0.02		1.60		74.09	75.69	0.18
Spray Boom, 20'	320.0	0.25		80.00		134.97	214.97	0.51
Subsoiler. 8'	160.0	3.34		534.40		959.25	1,493.65	3.56
Uncapper, 6 row	56.0	1.73		96.88		195.71	292.59	0.70
Planter	100.0	2.96		296.00		486.50	782.50	1.86
Pickup	11,000.0	0.10	0.15	1,100.00	1,650.00	1,672.32	4,422.32	10.53
Machine Shed/Shop				600.00		661.45	1,261.45	3.00
Irrigation system				3,600.00		6,480.40	10,080.40	24.00
			Total	**$23,876.06**	**$24,621.74**	**$38,741.28**	**$87,239.08**	**$207.71**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
105 HP 2WD Tractor	$67,865	$7,717	10000	600	585.2	1	17	0.0415	$2,494.85
150 HP 4WD Tractor	120,405	12,041	10000	600	541.2	1	18	0.0383	4,148.51
230 HP Crawler	168,568	16,857	10000	600	404.8	1	25	0.0234	3,545.82
Cotton Harvestor, 4 r	290,068	29,007	4000	300	286.0	1	14	0.0539	14,077.23
Cultivator, Rolling, 6 r	7,443	744	2000	300	260.0	1	8	0.1078	721.85
Disk, Finish, 21'	21,449	2,144	2000	300	128.0	1	16	0.0451	870.45
Disk, Stubble, 18'	45,973	4,597	2000	300	80.0	1	25	0.0234	967.04
Ditcher	8,538	854	2000	300	24.0	1	25	0.0234	179.59
Flail Chopper	15,811	1,582	2000	300	52.0	1	25	0.0234	332.58
Lister, 6 row	6,020	602	2000	300	40.0	1	25	0.0234	126.64
Module builder	26,270	2,627	2000	300	68.0	1	25	0.0234	552.60
Rear Blade, 10'	2,825	282	2000	300	24.0	1	25	0.0234	59.43
Saddle Tank	3,522	352	2000	300	80.0	1	25	0.0234	74.09
Spray Boom, 20'	999	100	2000	350	320.0	1	6	0.1500	134.97
Subsoiler. 8'	16,200	1,620	2000	300	160.0	1	12	0.0658	959.25
Uncapper, 6 row	9,304	930	2000	300	56.0	1	25	0.0234	195.71
Planter	16,435	1,644	2000	300	100.0	1	20	0.0329	486.50
Pickup	19,826	1,983	100000	20000	11,000.0	1	9	0.0937	1,672.32
Machine Shed/Shop	65,902	0					40	0.0100	661.45
Irrigation system	197,028	0					20	0.0329	6,480.40
Return flow system	0	0					20	0.0329	0.00
								Total	**$38,741.28**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

			Acres:	400	
				Hours used per acre	**Times over land**
Equipment	**Total Use (hours)**	**Assigned Power Equipment**		Cotton	Cotton
Cultivator, Rolling, 6 row	260.00	150 HP 4WD Tractor		0.13	5
Disk, Finish, 21'	128.00	230 HP Crawler		0.16	2
Disk, Stubble, 18'	80.00	230 HP Crawler		0.10	2
Ditcher	24.00	150 HP 4WD Tractor		0.06	1
Flail Chopper	52.00	105 HP 2WD Tractor		0.13	1
Lister, 6 row	40.00	150 HP 4WD Tractor		0.10	1
Module builder	68.00	150 HP 4WD Tractor		0.17	1
Rear Blade, 10'	24.00	105 HP 2WD Tractor		0.06	1
Saddle Tank	80.00	105 HP 2WD Tractor		0.20	1
Spray Boom, 20'	320.00	105 HP 2WD Tractor		0.20	4
Subsoiler. 8'	160.00	230 HP Crawler		0.40	1
Uncapper, 6 row	56.00	105 HP 2WD Tractor		0.14	1
Planter	100.00	150 HP 4WD Tractor		0.25	1
Power equipment*					
105 HP 2WD Tractor	585.20			-	-
150 HP 4WD Tractor	541.20			-	-
230 HP Crawler	404.80			-	-
Cotton Harvestor, 4 row	286.00			0.65	1
Vehicles (use units in miles)					
Pickup	11,000.0			25	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	100	
Total cropped acres	95	2,925.00
Farmstead, roads, waste	5	2,925.00

Note: all 'per acre' totals based upon 100 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 100 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	95	2,925.00
Grapes	95	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	292,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	123,120	1,231.20
Livestock	0	0.00
Permanent plantings	773,190	7,731.90
Buildings and fences	65,902	659.02
Farmstead, waste arces	0	0.00
Equipment		
Power implements	72,545	725.45
Non-power implements	44,651	446.51
Vehicles	19,160	191.60
Small tools	893	8.93
Total farm investment	**$1,391,960**	**$13,919.60**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	2,804	28.04
Farm family	182	1.82
Hired labor	0	0.00

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$41,081.89	$410.82
Fertilizer	2,284.75	22.85
Herbicides	10,989.90	109.90
Insect control	7,389.10	73.89
Seed	0.00	0.00
Disease control	0.00	0.00
Misc. crop expenses	1,011.75	10.12
On-farm irrigation pumping	5,230.87	52.31
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	0.00	0.00
Workmen's compensation	0.00	0.00
Social Security	0.00	0.00
Repairs	7,783.39	77.83
Fuel, grease & oil	4,787.93	47.88
Telephone	912.00	9.12
Electricity	1,220.00	12.20
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	1,653.83	16.54
Interest on operating capital	1,694.43	16.94
Subtotal - variable expenses	**$86,039.84**	**$860.40**
Fixed expenses		
Depreciation	$19,835.29	$198.35
Taxes	3,570.00	35.70
Insurance	2,239.56	22.40
Interest on debt	12,256.77	122.57
Subtotal - fixed expenses	**$37,901.63**	**$379.02**
Farm income analysis		
Crop sales	$193,938.70	$1,939.39
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$193,938.70**	**$1,939.39**
Total farm expenses	$123,941.46	$1,239.41
Net farm income	**$69,997.24**	**$699.97**
Return to family farm		
Return to equity	$15,761.07	$157.61
Return to management	6,999.72	70.00
Return to labor	37,911.73	379.12
Total return to farm family	**$60,672.53**	**$606.73**
Payment Capacity analysis		
Net returns	**$9,324.71**	
per acre	**$93.25**	(100 acres)
per acre-foot	**$32.72**	(285 AF)

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Grapes	10.30 Ton	95	979		979	$198.20	$193,938.70
						Total	**$193,938.70**

Livestock revenue

	Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
				Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	5
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$800	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
Tractor 75 HP	$30,200	1996	2004	$39,139	$3,914	12000	700	$3.30	$1.07
ATV 4WD	3,861	1997	2004	4,887	489	3000	300	1.38	0.89
Pruning Equipmant	1,200	1997	2004	1,519	0	1100	110	0.00	1.00
Tractor 50 HP	22,500	1999	2004	27,000	2,700	12000	700	2.25	0.74

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Disk, Offset 8'	$9,000	1997	2004	$11,391	$1,139	2000	200	$1.42
Duster-3 Pt	2,520	1997	2004	3,189	392	2000	200	0.38
Mower/Chopper 8'	3,675	1997	2004	4,651	464	2000	200	1.69
Vineyard Sprayer-500 Gal	17,746	1997	2004	22,460	2,246	2000	300	2.16
Weed Sprayer-100 Gal	2,339	1997	2004	2,960	415	2000	200	1.64

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$20,000	1998	2004	$19,160	$1,916	100000	20000	$0.15	$0.16	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
machine shed/shop and equ	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$13.00	Percent added to machine labor	10.00%
Family	$8.00	Percent added to machine usage	10.00%
Hired	$8.00	Worker's compensation rate/$100	$9.55
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Grapes	0	10	10	10	10	10	10	10	10	10	10	0
Operator labor distribution %												
Grapes	10	8	8	8	8	8	8	8	8	8	8	10

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation Labor	Grapes	95	10.15	Hours	964.2499
				Total	**964.25**

Custom work

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Mechanical Pruning	Grapes	95	1	/Acre	2003	$85.00	$89.05	$89.05	$8,459.75
Machine Harvest	Grapes	95	1	/Acre	2003	225.00	235.55	235.55	22,377.25
Haul to Crusher	Grapes	95	10.3	Ton	2003	10.00	10.47	107.84	10,244.90
								Total	**$41,081.89**

Fertilizer

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
UN 32	Grapes	95	40	Lb N	2003	$0.41	$0.47	$18.80	$1,786.00
Neutral Zinc	Grapes	95	5	Lb	2003	0.92	1.05	5.25	498.75
								Total	**$2,284.75**

Herbicide

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Roundup	Grapes	95	1.66	Pint	2003	$8.56	$8.49	$14.09	$1,338.87
Goal 2XL	Grapes	95	1	Pint	2003	16.21	16.08	16.08	1,527.60
Surflan 4 AS	Grapes	95	2.64	Pint	2003	16.96	16.82	44.40	4,218.46
Wettable Sulfur	Grapes	95	6	Lb	2003	0.21	0.21	1.26	119.70
Dusting Sulfur	Grapes	95	30	Lb	2003	0.18	0.18	5.40	513.00
Rubigan EC	Grapes	95	4	Fluid Oz	2003	2.50	2.48	9.92	942.40
Flint	Grapes	95	1.5	Fluid Oz	2003	16.49	16.35	24.53	2,329.88
								Total	**$10,989.90**

Insect control

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Lorsban 4E	Grapes	95	4	Pint	2003	$6.86	$6.80	$27.20	$2,584.00
Kryocide	Grapes	95	6	Lb	2003	3.00	2.98	17.88	1,698.60
Provado 1.6 Solupak	Grapes	95	0.75	Oz	2003	43.96	43.60	32.70	3,106.50
								Total	**$7,389.10**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Trellis Materials	Grapes	95	1	/Acre	2003	$10.00	$10.65	$10.65	$1,011.75
								Total	**$1,011.75**

All costs are indexed to year2004

Crop expenses by crop

Grapes

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Trellis Materials	misc cost	95	1 /Acre	2003	$10.00	$10.65	$10.65	$1,011.75
Mechanical Pruning	custom work	95	1 /Acre	2003	85.00	89.05	89.05	8,459.75
Machine Harvest	custom work	95	1 /Acre	2003	225.00	235.55	235.55	22,377.25
Haul to Crusher	custom work	95	10.3 Ton	2003	10.00	10.47	107.84	10,244.90
Roundup	herbicide	95	1.66 Pint	2003	8.56	8.49	14.09	1,338.87
Goal 2XL	herbicide	95	1 Pint	2003	16.21	16.08	16.08	1,527.60
Surflan 4 AS	herbicide	95	2.64 Pint	2003	16.96	16.82	44.40	4,218.46
Wettable Sulfur	herbicide	95	6 Lb	2003	0.21	0.21	1.26	119.70
Dusting Sulfur	herbicide	95	30 Lb	2003	0.18	0.18	5.40	513.00
Rubigan EC	herbicide	95	4 Fluid Oz	2003	2.50	2.48	9.92	942.40
Flint	herbicide	95	1.5 Fluid Oz	2003	16.49	16.35	24.53	2,329.88
UN 32	fertilizer	95	40 Lb N	2003	0.41	0.47	18.80	1,786.00
Neutral Zinc	fertilizer	95	5 Lb	2003	0.92	1.05	5.25	498.75
Lorsban 4E	insect control	95	4 Pint	2003	6.86	6.80	27.20	2,584.00
Kryocide	insect control	95	6 Lb	2003	3.00	2.98	17.88	1,698.60
Provado 1.6 Solupak	insect control	95	0.75 Oz	2003	43.96	43.60	32.70	3,106.50
							Total	**$62,757.40**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	6		$96.00
Demand charge	$2.90 per HP	6	15.128397	$263.23

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	47435.582	$4,871.63
			Total	$5,230.87

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Grapes	3	95	210	40	10	47435.58	4871.634
						Total	4871.634

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Grapes	0	95	210	40	260	0	0
						Total	0

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Grapes	0	95	210	10	20	0	0
						Total	0

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops Grapes
Custom work	$41,081.89	$825.30	$279.83	$41,081.89
Fertilizer	2,284.75	45.90	15.56	2,284.75
Herbicide	10,989.90	220.78	74.86	10,989.90
Insect control	7,389.10	148.44	50.33	7,389.10
Seed cost	0.00	0.00	0.00	0.00
Disease control	0.00	0.00	0.00	0.00
Miscellaneous	1,011.75	20.33	6.89	1,011.75
Irrigation pumping	5,230.87	105.08	35.63	4,871.63
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	0.00	0.00	0.00	7,906.85
Fuel	4,787.93	96.19	32.61	4,787.93
Equipment repairs	4,808.39	96.60	32.75	4,808.39
Other repairs	2,975.00	59.77	20.26	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	1,653.83	33.22	11.27	
Total	**$84,345.41**	**$1,694.43**	**$574.52**	**$85,132.20**

Notes: Irrigation pumping expense includes meter charges ($96.00) and demand charges ($263.23) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 100 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$292,500.00	$7,510.52	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	8.46
Permanent plantings	386,594.91	9,926.60	99.27
Non-real estate investment			
Irrigation and return flow system	61,560.00	838.63	8.39
Non-power equipment	24,654.37	335.87	3.36
Power equipment	39,823.49	542.52	5.43
Vehicles	10,537.82	143.56	1.44
Livestock	0.00	0.00	0.00
Small tools	446.51	6.08	0.06
Total	**$849,067.94**	**$15,186.55**	**$151.87**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	219,500.00	1.00	$219,500.00	1.00000%	$2,195.00
Improvement taxes	65,901.64	1.00	65,901.64	1.00000%	659.02
Equipment taxes	117,195.78	0.50	58,597.89	1.00000%	585.98
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$3,570.00**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	0.00	126.04	0.00
Liability insurance			1,000.00
Vehicle insurance			800.00
		Total insurance	**$2,239.56**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,804.39	202.2	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	202.2
Family	181.83	0.0	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	0.0
Hired	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	2,986.22	202.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	202.2

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Grapes	2,986.22	202.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	202.2
Total	2,986.22	202.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	258.2	202.2

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Grapes	2,021.97	202.2	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	202.2
Total	2,021.97	202.2	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	161.8	202.2

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Grapes	964.25	0.0	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	0.0
Total	964.25	0.0	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
0.00	$8.00	$0.00

	Rate	
Social Security	0.0765	$0.00
Worker's Comp.	$ 9.55/$100	0.00
		$0.00

Return to Labor

	Hours	Wage	**Total**
Farm operator	2,804.39	$13.00	$36,457.12
Farm family	181.83	8.00	1,454.61
			$37,911.73

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 100 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Interest on debt Per acre
Real Estate Investment Costs					
Land	$292,500.00		$292,500.00	$2,773.42	$27.73
Improvement costs					
machine shed/shop and equ	$65,901.64	$0.00	$32,950.82	$312.43	$3.12
Permanent plantings	773,189.81		386,594.91	3,665.61	36.66
Sub-total	**$839,091.44**	**$0.00**	**$419,545.72**	**$3,978.04**	**$39.78**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$123,120.00	$0.00	$61,560.00	$2,473.37	$24.73
Sub-total	**$123,120.00**	**$0.00**	**$61,560.00**	**$2,473.37**	**$24.73**
Non-power equipment					
Disk, Offset 8'	$11,390.62	$1,139.06	$6,264.84	$251.71	$2.52
Duster-3 Pt	3,189.38	392.34	1,790.86	71.95	0.72
Mower/Chopper 8'	4,651.17	464.48	2,557.82	102.77	1.03
Vineyard Sprayer-500 Gal	22,459.78	2,246.48	12,353.13	496.33	4.96
Weed Sprayer-100 Gal	2,960.30	415.12	1,687.71	67.81	0.68
Small tools	893.03		446.51	17.94	0.18
Sub-total	**$45,544.27**	**$4,657.48**	**$25,100.88**	**$1,008.51**	**$10.09**
Power equipment					
Tractor 75 HP	$39,139.20	$3,913.92	$21,526.56	$864.90	$8.65
ATV 4WD	4,886.58	488.53	2,687.55	107.98	1.08
Pruning Equipmant	1,518.75	0.00	759.38	30.51	0.31
Tractor 50 HP	27,000.00	2,700.00	14,850.00	596.65	5.97
Sub-total	**$72,544.53**	**$7,102.45**	**$39,823.49**	**$1,600.04**	**$16.00**
Vehicles					
Pickup	$19,159.66	$1,915.97	$10,537.82	$423.39	$4.23
Sub-total	**$19,159.66**	**$1,915.97**	**$10,537.82**	**$423.39**	**$4.23**
Total	**$1,391,959.88**	**$13,675.90**	**$849,067.94**	**$12,256.77**	**$122.57**

Note: Investment value is based upon the number required,
not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (nours, miles if	Cost per unit of use		Annual costs		All 'per acre' totals based upon 100 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
Tractor 75 HP	303.0	$1.07	$3.30	$324.26	$1,000.06	$823.29	$2,147.62	$21.48
ATV 4WD	156.8	0.89	1.38	139.51	216.32	155.86	511.68	5.12
Pruning Equipmant	104.5	1.00	0.00	104.50	0.00	111.45	215.95	2.16
Tractor 50 HP	333.4	0.74	2.25	246.68	750.05	567.95	1,564.68	15.65
Disk, Offset 8'	40.9	1.42		58.01		239.60	297.61	2.98
Duster-3 Pt	68.4	0.38		25.99		65.37	91.37	0.91
Mower/Chopper 8'	163.4	1.69		276.15		275.45	551.60	5.52
Vineyard Sprayer-500 Gal	234.6	2.16		506.84		1,894.42	2,401.26	24.01
Weed Sprayer-100 Gal	71.3	1.64		116.85		59.49	176.34	1.76
Pickup	18,810.0	0.16	0.15	3,009.60	2,821.50	3,170.95	9,002.05	90.02
machine shed/shop and equ				600.00		661.45	1,261.45	12.61
Irrigation system				2,375.00		4,049.51	6,424.51	64.25
			Total	**$7,783.39**	**$4,787.93**	**$12,074.80**	**$24,646.12**	**$246.46**

Note: This total depreciation does not include $7760.50 for plants.

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
Tractor 75 HP	$39,139	$3,914	12000	700	303.0	1	25	0.0234	$823.29
ATV 4WD	4,887	489	3000	300	156.8	1	19	0.0354	155.86
Pruning Equipmant	1,519	0	1100	110	104.5	1	11	0.0734	111.45
Tractor 50 HP	27,000	2,700	12000	700	333.4	1	25	0.0234	567.95
Disk, Offset 8'	11,391	1,139	2000	200	40.9	1	25	0.0234	239.60
Duster-3 Pt	3,189	392	2000	200	68.4	1	25	0.0234	65.37
Mower/Chopper 8'	4,651	464	2000	200	163.4	1	12	0.0658	275.45
Vineyard Sprayer-50(	22,460	2,246	2000	300	234.6	1	9	0.0937	1,894.42
Weed Sprayer-100 G	2,960	415	2000	200	71.3	1	25	0.0234	59.49
Pickup	19,160	1,916	100000	20000	18,810.0	1	5	0.1839	3,170.95
machine shed/shop a	65,902	0					40	0.0100	661.45
Grapes perm. plantin	773,190	0					40	0.0100	7,760.50
Irrigation system	123,120	0					20	0.0329	4,049.51
Return flow system	0	0					20	0.0329	0.00
								Total	**$19,835.29**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 95

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre Grapes	Times over land Grapes
Disk, Offset 8'	40.85	Tractor 75 HP	0.43	1
Duster-3 Pt	68.40	Tractor 50 HP	0.18	4
Mower/Chopper 8'	163.40	Tractor 50 HP	0.43	4
Vineyard Sprayer-500 Gal	234.65	Tractor 75 HP	0.38	6.5
Weed Sprayer-100 Gal	71.25	Tractor 50 HP	0.25	3
Power equipment*				
Tractor 75 HP	303.05		-	-
ATV 4WD	156.75		1.50	1
Pruning Equipmant	104.50		1.00	1
Tractor 50 HP	333.36		-	-
Vehicles (use units in miles				
Pickup	18,810.0		180	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	420	
Total cropped acres	400	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 420 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 420 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	400	2,925.00
lettuce	400	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	1,228,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	209,784	499.49
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	156.91
Farmstead, waste arces	0	0.00
Equipment		
Power implements	187,512	446.46
Non-power implements	61,951	147.50
Vehicles	19,160	45.62
Small tools	1,239	2.95
Total farm investment	**$1,774,048**	**$4,223.92**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	1,972	4.70
Farm family	700	1.67
Hired labor	10,867	25.87

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$1,528,789.00	$3,639.97
Fertilizer	118,440.00	282.00
Herbicides	16,000.00	38.10
Insect control	70,000.00	166.67
Seed	60,140.00	143.19
Disease control	70,000.00	166.67
Misc. crop expenses	0.00	0.00
On-farm irrigation pumping	14,149.69	33.69
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	76,718.80	182.66
Workmen's compensation	9,259.96	22.05
Social Security	5,868.99	13.97
Repairs	8,930.57	21.26
Fuel, grease & oil	10,902.23	25.96
Telephone	912.00	2.17
Electricity	1,220.00	2.90
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	39,826.63	94.83
Interest on operating capital	40,804.18	97.15
Subtotal - variable expenses	**$2,071,962.00**	**$4,933.24**
Fixed expenses		
Depreciation	$16,958.81	$40.38
Taxes	10,925.83	26.01
Insurance	5,054.53	12.03
Interest on debt	22,137.18	52.71
Subtotal - fixed expenses	**$55,076.34**	**$131.13**
Farm income analysis		
Crop sales	$1,780,975.88	$4,240.42
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$1,780,975.88**	**$4,240.42**
Total farm expenses	$2,127,038.25	$5,064.38
Net farm income	**-$346,062.38**	**-$823.96**
Return to family farm		
Return to equity	$49,675.95	$118.28
Return to management	-34,606.24	-82.40
Return to labor	29,905.41	71.20
Total return to farm family	**$44,975.12**	**$107.08**
Payment Capacity analysis		
Net returns	**-$391,037.50**	
per acre	**-$931.04**	(420 acres)
per acre-foot	**-$380.39**	(1028 AF)

Appendix L
Lettuce budget

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
lettuce	15.80 ton	400	6,320		6,320	$281.80	$1,780,975.88
						Total	**$1,780,975.88**

Livestock revenue

	Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
				Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	0.50
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$7	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
110 HP 2WD Tractor	$70,050	2000	2004	$81,641	$8,217	10000	700	$9.25	$2.43
130 HP 2WD Tractor	90,840	2000	2004	105,871	10,587	10000	700	10.93	2.81

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Chisel, 16 ft	$8,000	2000	2004	$9,324	$932	2000	300	$2.00
Cultivator	5,362	2000	2004	6,249	625	2000	300	1.07
Disk, 18 ft	14,000	2000	2004	16,317	1,632	2000	400	2.20
Bed Shaper-3 Row	9,700	2000	2004	11,305	1,131	2000	300	1.93
Rolling cultivartor, 6 row	4,676	1998	2004	5,739	574	2000	300	0.92
Lilliston cultivator, 6 rw	5,000	2001	2004	5,625	563	2000	300	0.75
Lister, 3 row-16'	2,838	2000	2004	3,308	331	2000	300	0.88
Sprayer	3,228	1997	2004	4,085	409	2000	300	0.85

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$20,000	1998	2004	$19,160	$1,916	100000	20000	$0.15	$0.10	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/Shop	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$12.07
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
lettuce	0	0	15	15	15	15	15	15	10	0	0	0
Operator labor distribution %												
lettuce	2	2	10	15	10	7	7	11	21	11	2	2

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation labor	lettuce	400	12	hour	4800
Thin and weed	lettuce	400	18	hour	7200
				Total	**12,000.00**

Custom work

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Cut,pack,haul,cool,se	lettuce	400	632	ctn	2000	$5.25	$5.97	$3,773.04	$1,509,216.00
Laser level	lettuce	400	0.25	acre	2000	160.00	182.07	45.52	18,207.00
Landplane	lettuce	400	0.25	acre	2000	12.00	13.66	3.41	1,366.00
								Total	**$1,528,789.00**

Fertilizer

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Soil ammendments	lettuce	400	1	acre	2000	$50.00	$64.09	$64.09	$25,636.00
Preplant fertilizer	lettuce	400	1	acre	2000	60.00	76.91	76.91	30,764.00
Fertilizer	lettuce	400	1	acre	2000	92.00	117.93	117.93	47,172.00
Fertilizer	lettuce	400	1	acre	2000	29.00	37.17	37.17	14,868.00
								Total	**$118,440.00**

Herbicide

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Herbicide	lettuce	400	1	acre	2000	$40.00	$40.00	$40.00	$16,000.00
								Total	**$16,000.00**

Insect control

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Insect Control	lettuce	400	1	acre	2000	$175.00	$175.00	$175.00	$70,000.00
								Total	**$70,000.00**

Seed cost

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Seed	lettuce	400	1	acre	2000	$118.00	$150.35	$150.35	$60,140.00
								Total	**$60,140.00**

Disease control

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Disease Control	lettuce	400	1	acre	2000	$175.00	$175.00	$175.00	$70,000.00
								Total	**$70,000.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

All costs are indexed to year2004

Crop expenses by crop

lettuce

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Soil ammendments	fertilizer	400	1 acre	2000	$50.00	$64.09	$64.09	$25,636.00
Preplant fertilizer	fertilizer	400	1 acre	2000	60.00	76.91	76.91	30,764.00
Seed	seed cost	400	1 acre	2000	118.00	150.35	150.35	60,140.00
Fertilizer	fertilizer	400	1 acre	2000	92.00	117.93	117.93	47,172.00
Herbicide	herbicide	400	1 acre	2000	40.00	40.00	40.00	16,000.00
Fertilizer	fertilizer	400	1 acre	2000	29.00	37.17	37.17	14,868.00
Insect Control	insect control	400	1 acre	2000	175.00	175.00	175.00	70,000.00
Disease Control	disease control	400	1 acre	2000	175.00	175.00	175.00	70,000.00
Cut,pack,haul,cool,sell	custom work	400	632 ctn	2000	5.25	5.97	3,773.04	1,509,216.00
Laser level	custom work	400	0.25 acre	2000	160.00	182.07	45.52	18,207.00
Landplane	custom work	400	0.25 acre	2000	12.00	13.66	3.41	1,366.00
							Total	**$1,863,369.00**

On-farm irrigation pumping expenses

	Monthly charge		Months	Total HP	Charge
Meter charge	$16.00		12		$192.00
Demand charge	$2.90	per HP	12	52.707577	$1,834.22

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	118047.38	$12,123.47
			Total	$14,149.69

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)
Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)
Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)
Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)
Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)
Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)
Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted rat $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
lettuce	2.1	400	150	10	0	31539.2	3239.076
						Total	3239.076

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
lettuce	0.47	400	150	10	260	86508.17	8884.39
						Total	8884.39

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
lettuce	0	400	150	10	20	0	0
						Total	0

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops
				lettuce
Custom work	$1,528,789.00	$30,712.03	$10,413.35	$1,528,789.00
Fertilizer	118,440.00	2,379.36	806.75	118,440.00
Herbicide	16,000.00	321.43	108.98	16,000.00
Insect control	70,000.00	1,406.24	476.80	70,000.00
Seed cost	60,140.00	1,208.16	409.64	60,140.00
Disease control	70,000.00	1,406.24	476.80	70,000.00
Miscellaneous	0.00	0.00	0.00	0.00
Irrigation pumping	14,149.69	284.25	96.38	12,123.47
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	91,847.75	1,845.14	625.62	103,440.00
Fuel	10,902.23	219.02	74.26	10,902.23
Equipment repairs	4,730.57	95.03	32.22	4,730.57
Other repairs	4,200.00	84.37	28.61	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	39,826.63	800.08	271.28	
Total	**$2,031,157.88**	**$40,804.18**	**$13,835.23**	**$1,994,565.25**

Notes: Total hired labor expense includes 3,666.7 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($15,128.95) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($192.00) and demand charges ($1,834.22) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 420 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$1,228,500.00	$31,544.19	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	2.01
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	104,892.01	1,428.94	3.40
Non-power equipment	34,073.60	464.18	1.11
Power equipment	103,157.88	1,405.32	3.35
Vehicles	10,537.82	143.56	0.34
Livestock	0.00	0.00	0.00
Small tools	619.51	8.44	0.02
Total	**$1,514,731.63**	**$35,840.72**	**$85.34**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	921,900.00	1.00	$921,900.00	1.00000%	$9,219.00
Improvement taxes	65,901.64	0.50	32,950.82	1.00000%	329.51
Equipment taxes	249,463.42	0.50	124,731.71	1.00000%	1,247.32
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$10,925.83**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	6.67	242.12	1,614.96
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$5,054.53**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	1,972.43	30.8	30.8	240.0	240.0	240.0	240.0	240.0	240.0	240.0	169.3	30.8	30.8
Family	700.00	0.0	0.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	0.0	0.0	0.0
Hired	10,866.69	0.0	0.0	1,643.9	1,720.9	1,643.9	1,527.7	1,527.7	1,589.3	1,213.2	0.0	0.0	0.0
Total	13,539.12	30.8	30.8	1,953.9	2,030.9	1,953.9	1,907.7	1,907.7	1,969.3	1,523.2	169.3	30.8	30.8

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
lettuce	13,539.12	30.8	30.8	1,953.9	2,030.9	1,953.9	1,907.7	1,907.7	1,969.3	1,523.2	169.3	30.8	30.8
Total	13,539.12	30.8	30.8	1,953.9	2,030.9	1,953.9	1,907.7	1,907.7	1,969.3	1,523.2	169.3	30.8	30.8

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
lettuce	1,539.12	30.8	30.8	153.9	230.9	153.9	107.7	107.7	169.3	323.2	169.3	30.8	30.8
Total	1,539.12	30.8	30.8	153.9	230.9	153.9	107.7	107.7	169.3	323.2	169.3	30.8	30.8

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
lettuce	12,000.00	0.0	0.0	1,800.0	1,800.0	1,800.0	1,800.0	1,800.0	1,800.0	1,200.0	0.0	0.0	0.0
Total	12,000.00	0.0	0.0	1,800.0	1,800.0	1,800.0	1,800.0	1,800.0	1,800.0	1,200.0	0.0	0.0	0.0

Appendix L
Lettuce budget

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
10,866.69	$7.06	$76,718.80

	Rate	
Social Security	0.0765	$5,868.99
Worker's Comp.	$ 12.07/$100	9,259.96
		$91,847.75

Return to Labor

	Hours	Wage	**Total**
Farm operator	1,972.43	$12.50	$24,655.41
Farm family	700.00	7.50	5,250.00
			$29,905.41

Farm investment expenses

	Land	Equipment
Interest rate	6.58%	7.36%
Debt/Asset ratio	14.41%	54.59%

All 'per acre' totals based upon 420 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Interest on debt Per acre
Real Estate Investment Costs					
Land	$1,228,500.00		$1,228,500.00	$11,648.37	$27.73
Improvement costs					
Machine Shed/Shop	$65,901.64	$0.00	$32,950.82	$312.43	$0.74
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$0.74**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$209,784.02	$0.00	$104,892.01	$4,214.38	$10.03
Sub-total	**$209,784.02**	**$0.00**	**$104,892.01**	**$4,214.38**	**$10.03**
Non-power equipment					
Chisel, 16 ft	$9,323.74	$932.37	$5,128.06	$206.04	$0.49
Cultivator	6,249.24	624.69	3,436.97	138.09	0.33
Disk, 18 ft	16,316.55	1,631.65	8,974.10	360.56	0.86
Bed Shaper-3 Row	11,305.04	1,130.50	6,217.77	249.82	0.59
Rolling cultivartor, 6 row	5,738.73	574.36	3,156.54	126.82	0.30
Lilliston cultivator, 6 rw	5,625.00	562.50	3,093.75	124.30	0.30
Lister, 3 row-16'	3,307.60	330.99	1,819.30	73.10	0.17
Sprayer	4,085.44	408.80	2,247.12	90.29	0.21
Small tools	1,239.03		619.51	24.89	0.06
Sub-total	**$63,190.37**	**$6,195.86**	**$34,693.11**	**$1,393.91**	**$3.32**
Power equipment					
110 HP 2WD Tractor	$81,641.01	$8,216.55	$44,928.78	$1,805.16	$4.30
130 HP 2WD Tractor	105,871.08	10,587.11	58,229.09	2,339.54	5.57
Sub-total	**$187,512.09**	**$18,803.66**	**$103,157.88**	**$4,144.70**	**$9.87**
Vehicles					
Pickup	$19,159.66	$1,915.97	$10,537.82	$423.39	$1.01
Sub-total	**$19,159.66**	**$1,915.97**	**$10,537.82**	**$423.39**	**$1.01**
Total	**$1,774,047.75**	**$26,915.49**	**$1,514,731.63**	**$22,137.18**	**$52.71**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 420 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
110 HP 2WD Tractor	536.8	$2.43	$9.25	$1,304.42	$4,965.40	$2,602.00	$8,871.82	$21.12
130 HP 2WD Tractor	422.4	2.81	10.93	1,186.94	4,616.83	2,376.07	8,179.84	19.48
Chisel, 16 ft	160.0	2.00		320.00		552.09	872.09	2.08
Cultivator	56.0	1.07		59.92		131.46	191.38	0.46
Disk, 18 ft	224.0	2.20		492.80		1,376.29	1,869.09	4.45
Bed Shaper-3 Row	112.0	1.93		216.16		389.51	605.67	1.44
Rolling cultivartor, 6 rov	112.0	0.92		103.04		197.71	300.75	0.72
Lilliston cultivator, 6 rw	112.0	0.75		84.00		193.81	277.81	0.66
Lister, 3 row-16'	56.0	0.88		49.28		69.57	118.85	0.28
Sprayer	40.0	0.85		34.00		85.93	119.93	0.29
Pickup	8,800.0	0.10	0.15	880.00	1,320.00	1,422.98	3,622.98	8.63
Machine Shed/Shop				600.00		661.45	1,261.45	3.00
Irrigation system				3,600.00		6,899.95	10,499.95	25.00
			Total	**$8,930.57**	**$10,902.23**	**$16,958.81**	**$36,791.61**	**$87.60**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
110 HP 2WD Tractor	$81,641	$8,217	10000	700	536.8	1	19	0.0354	$2,602.00
130 HP 2WD Tractor	105,871	10,587	10000	700	422.4	1	24	0.0249	2,376.07
Chisel, 16 ft	9,324	932	2000	300	160.0	1	12	0.0658	552.09
Cultivator	6,249	625	2000	300	56.0	1	25	0.0234	131.46
Disk, 18 ft	16,317	1,632	2000	400	224.0	1	9	0.0937	1,376.29
Bed Shaper-3 Row	11,305	1,131	2000	300	112.0	1	18	0.0383	389.51
Rolling cultivartor, 6 ro	5,739	574	2000	300	112.0	1	18	0.0383	197.71
Lilliston cultivator, 6 rw	5,625	563	2000	300	112.0	1	18	0.0383	193.81
Lister, 3 row-16'	3,308	331	2000	300	56.0	1	25	0.0234	69.57
Sprayer	4,085	409	2000	300	40.0	1	25	0.0234	85.93
Pickup	19,160	1,916	100000	20000	8,800.0	1	10	0.0825	1,422.98
Machine Shed/Shop	65,902	0					40	0.0100	661.45
Irrigation system	209,784	0					20	0.0329	6,899.95
Return flow system	0	0					20	0.0329	0.00
								Total	**$16,958.81**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

			Acres: 400	
Equipment	**Total Use (hours)**	**Assigned Power Equipment**	**Hours used per acre** lettuce	**Times over land** lettuce
Chisel, 16 ft	160.00	130 HP 2WD Tractor	0.20	2
Cultivator	56.00	110 HP 2WD Tractor	0.14	1
Disk, 18 ft	224.00	130 HP 2WD Tractor	0.14	4
Bed Shaper-3 Row	112.00	110 HP 2WD Tractor	0.14	2
Rolling cultivartor, 6 row	112.00	110 HP 2WD Tractor	0.14	2
Lilliston cultivator, 6 rw	112.00	110 HP 2WD Tractor	0.14	2
Lister, 3 row-16'	56.00	110 HP 2WD Tractor	0.14	1
Sprayer	40.00	110 HP 2WD Tractor	0.10	1
Power equipment*				
110 HP 2WD Tractor	536.80		-	-
130 HP 2WD Tractor	422.40		-	-
Vehicles (use units in miles				
Pickup	8,800.0		20	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	320	
Total cropped acres	300	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 320 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 320 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	300	2,925.00
Sugar Beets	300	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	936,000	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	147,771	461.78
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	205.94
Farmstead, waste arces	0	0.00
Equipment		
Power implements	136,473	426.48
Non-power implements	153,540	479.81
Vehicles	68,975	215.55
Small tools	3,071	9.60
Total farm investment	**$1,511,731**	**$4,724.16**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	2,305	7.20
Farm family	770	2.41
Hired labor	4,441	13.88

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$98,553.00	$307.98
Fertilizer	29,220.00	91.31
Herbicides	12,975.00	40.55
Insect control	14,400.00	45.00
Seed	15,501.00	48.44
Disease control	5,400.00	16.88
Misc. crop expenses	0.00	0.00
On-farm irrigation pumping	47,259.04	147.68
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	31,350.19	97.97
Workmen's compensation	7,524.04	23.51
Social Security	2,398.29	7.49
Repairs	11,796.22	36.86
Fuel, grease & oil	9,880.04	30.88
Telephone	912.00	2.85
Electricity	1,220.00	3.81
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	5,767.78	18.02
Interest on operating capital	5,909.35	18.47
Subtotal - variable expenses	**$300,065.94**	**$937.71**
Fixed expenses		
Depreciation	$23,912.49	$74.73
Taxes	8,933.57	27.92
Insurance	3,439.56	10.75
Interest on debt	20,524.64	64.14
Subtotal - fixed expenses	**$56,810.26**	**$177.53**
Farm income analysis		
Crop sales	$406,260.00	$1,269.56
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$406,260.00**	**$1,269.56**
Total farm expenses	$356,876.19	$1,115.24
Net farm income	**$49,383.81**	**$154.32**
Return to family farm		
Return to equity	$30,727.46	$96.02
Return to management	4,938.38	15.43
Return to labor	34,590.80	108.10
Total return to farm family	**$70,256.63**	**$219.55**
Payment Capacity analysis		
Net returns	**-$20,872.82**	
per acre	**-$65.23**	(320 acres)
per acre-foot	**-$20.34**	(1026 AF)

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Sugar Beets	36.60 Ton	300	10,980		10,980	$37.00	$406,260.00
						Total	**$406,260.00**

Livestock revenue

	Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
				Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	0.50
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
Tractor, 140 hp	$79,000	1998	2004	$96,955	$9,695	10000	700	$3.90	$1.05
Tractor, 80 hp	32,200	1998	2004	39,518	3,952	10000	600	7.19	1.50

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Spike Harrow-20 ft	$800	1999	2004	$960	$96	2000	200	$0.90
Roller Harrow, 15'	12,550	1999	2004	15,060	1,506	2000	200	5.29
Disk, 15 ft	13,900	1999	2004	16,680	1,320	2000	200	1.52
Row Planter, 4 row	10,000	1995	2004	13,500	1,350	2000	200	10.50
Row cultivator, 4 row	4,000	1995	2004	5,400	540	2000	400	2.00
Crustbuster	1,950	1999	2004	2,340	234	2000	200	0.19
Beet lifter	60,000	1999	2004	72,000	7,200	2000	200	7.70
Beet Topper	23,000	1999	2004	27,600	2,760	2000	200	3.70

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
pickup	$22,000	1999	2004	$21,076	$1,916	100000	20000	$0.15	$0.10	20
Tandem Truck	50,000	1999	2004	47,899	23,950	50000	20000	0.30	0.20	3

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$24.00
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Sugar Beets	0	0	9	0	9	17	24	24	17	0	0	0
Operator labor distribution %												
Sugar Beets	2	2	2	10	15	15	15	10	15	10	2	2

All costs are indexed to year2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation Labor	Sugar Beets	300	9	acre	2700
				Total	**2,700.00**

Custom work

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Fertilizer application	Sugar Beets	300	3 acre	2000	$7.00	$7.29	$21.87	$6,561.00
Ground spray	Sugar Beets	300	6 acre	2000	8.00	8.34	50.04	15,012.00
Hand Thin	Sugar Beets	300	1 acre	2000	108.50	113.06	113.06	33,918.00
Hand weed	Sugar Beets	300	1 acre	2000	85.25	88.83	88.83	26,649.00
Air Spray	Sugar Beets	300	2 acre	2000	9.00	9.38	18.76	5,628.00
Fertilizer application	Sugar Beets	300	2 acre	2000	10.00	10.42	20.84	6,252.00
Weed control	Sugar Beets	300	1 acre	2000	14.50	15.11	15.11	4,533.00
							Total	**$98,553.00**

Fertilizer

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
11-52-0	Sugar Beets	300	300 lb	2000	$0.13	$0.17	$51.00	$15,300.00
Nitrogen	Sugar Beets	300	160 lb	2000	0.23	0.29	46.40	13,920.00
							Total	**$29,220.00**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Herbicide	Sugar Beets	300	1 acre	2000	$29.00	$29.00	$29.00	$8,700.00
Chemical Herbicide	Sugar Beets	300	1 acre	2000	14.25	14.25	14.25	4,275.00
							Total	**$12,975.00**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Pesticde	Sugar Beets	300	1 acre	2000	$48.00	$48.00	$48.00	$14,400.00
							Total	**$14,400.00**

Seed cost

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Beet seed pellets	Sugar Beets	300	1 acre	2000	$40.55	$51.67	$51.67	$15,501.00
							Total	**$15,501.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Fungicide	Sugar Beets	300	1 acre	2000	$18.00	$18.00	$18.00	$5,400.00
							Total	**$5,400.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

All costs are indexed to year2004

Crop expenses by crop

Sugar Beets

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Fertilizer application	custom work	300	3 acre	2000	$7.00	$7.29	$21.87	$6,561.00
Ground spray	custom work	300	6 acre	2000	8.00	8.34	50.04	15,012.00
Beet seed pellets	seed cost	300	1 acre	2000	40.55	51.67	51.67	15,501.00
Hand Thin	custom work	300	1 acre	2000	108.50	113.06	113.06	33,918.00
Hand weed	custom work	300	1 acre	2000	85.25	88.83	88.83	26,649.00
Air Spray	custom work	300	2 acre	2000	9.00	9.38	18.76	5,628.00
11-52-0	fertilizer	300	300 lb	2000	0.13	0.17	51.00	15,300.00
Nitrogen	fertilizer	300	160 lb	2000	0.23	0.29	46.40	13,920.00
Fertilizer application	custom work	300	2 acre	2000	10.00	10.42	20.84	6,252.00
Weed control	custom work	300	1 acre	2000	14.50	15.11	15.11	4,533.00
Pesticde	insect control	300	1 acre	2000	48.00	48.00	48.00	14,400.00
Herbicide	herbicide	300	1 acre	2000	29.00	29.00	29.00	8,700.00
Chemical Herbicide	herbicide	300	1 acre	2000	14.25	14.25	14.25	4,275.00
Fungicide	disease control	300	1 acre	2000	18.00	18.00	18.00	5,400.00
							Total	**$176,049.00**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	12		$192.00
Demand charge	$2.90 per HP	12	131.90723	$4,590.37

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	413599.44	$42,476.66
			Total	$47,259.04

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)
Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)
Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)
Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)
Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)
Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)
Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Sugar Beets	2.42	300	210	10	260	334068.8	34308.86
						Total	34308.86

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Sugar Beets	0.5	300	210	10	260	69022.48	7088.608
						Total	7088.608

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Sugar Beets	0.5	300	210	10	20	10508.19	1079.191
						Total	1079.191

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops
				Sugar Beets
Custom work	$98,553.00	$1,979.84	$671.29	$98,553.00
Fertilizer	29,220.00	587.00	199.03	29,220.00
Herbicide	12,975.00	260.66	88.38	12,975.00
Insect control	14,400.00	289.28	98.09	14,400.00
Seed cost	15,501.00	311.40	105.59	15,501.00
Disease control	5,400.00	108.48	36.78	5,400.00
Miscellaneous	0.00	0.00	0.00	0.00
Irrigation pumping	47,259.04	949.39	321.90	42,476.66
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	41,272.52	829.13	281.13	23,274.00
Fuel	9,880.04	198.48	67.30	9,880.04
Equipment repairs	8,496.22	170.68	57.87	8,496.22
Other repairs	3,300.00	66.29	22.48	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	5,767.78	115.87	39.29	
Total	**$294,156.59**	**$5,909.35**	**$2,003.65**	**$260,175.92**

Notes: Total hired labor expense includes 4,440.5 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($9,922.33) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($192.00) and demand charges ($4,590.37) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 320 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$936,000.00	$24,033.67	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	2.64
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	73,885.50	1,006.54	3.15
Non-power equipment	84,273.00	1,148.05	3.59
Power equipment	75,060.00	1,022.54	3.20
Vehicles	47,420.17	646.01	2.02
Livestock	0.00	0.00	0.00
Small tools	1,535.40	20.92	0.07
Total	**$1,251,124.88**	**$28,723.81**	**$89.76**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	702,400.00	1.00	$702,400.00	1.00000%	$7,024.00
Improvement taxes	65,901.64	0.50	32,950.82	1.00000%	329.51
Equipment taxes	290,012.72	0.50	145,006.36	1.00000%	1,450.06
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$8,933.57**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	0.00	233.22	0.00
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$3,439.56**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,305.26	96.3	96.3	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	96.3	96.3
Family	770.00	0.0	0.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	0.0	0.0
Hired	4,440.54	0.0	0.0	29.3	171.6	655.4	801.4	990.4	749.6	871.4	171.6	0.0	0.0
Total	7,515.80	96.3	96.3	339.3	481.6	965.4	1,181.4	1,370.4	1,129.6	1,181.4	481.6	96.3	96.3

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sugar Beets	7,515.80	96.3	96.3	339.3	481.6	965.4	1,181.4	1,370.4	1,129.6	1,181.4	481.6	96.3	96.3
Total	7,515.80	96.3	96.3	339.3	481.6	965.4	1,181.4	1,370.4	1,129.6	1,181.4	481.6	96.3	96.3

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sugar Beets	4,815.80	96.3	96.3	96.3	481.6	722.4	722.4	722.4	481.6	722.4	481.6	96.3	96.3
Total	4,815.80	96.3	96.3	96.3	481.6	722.4	722.4	722.4	481.6	722.4	481.6	96.3	96.3

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sugar Beets	2,700.00	0.0	0.0	243.0	0.0	243.0	459.0	648.0	648.0	459.0	0.0	0.0	0.0
Total	2,700.00	0.0	0.0	243.0	0.0	243.0	459.0	648.0	648.0	459.0	0.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
4,440.54	$7.06	$31,350.19

	Rate	
Social Security	0.0765	$2,398.29
Worker's Comp.	$ 24/$100	7,524.04
		$41,272.52

Return to Labor

	Hours	Wage	**Total**
Farm operator	2,305.26	$12.50	$28,815.80
Farm family	770.00	7.50	5,775.00
			$34,590.80

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 320 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Interest on debt Per acre
Real Estate Investment Costs					
Land	$936,000.00		$936,000.00	$8,874.95	$27.73
Improvement costs					
Machine Shed	$65,901.64	$0.00	$32,950.82	$312.43	$0.98
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$0.98**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$147,771.00	$0.00	$73,885.50	$2,968.59	$9.28
Sub-total	**$147,771.00**	**$0.00**	**$73,885.50**	**$2,968.59**	**$9.28**
Non-power equipment					
Spike Harrow-20 ft	$960.00	$96.00	$528.00	$21.21	$0.07
Roller Harrow, 15'	15,060.00	1,506.00	8,283.00	332.80	1.04
Disk, 15 ft	16,680.00	1,320.00	9,000.00	361.60	1.13
Row Planter, 4 row	13,500.00	1,350.00	7,425.00	298.32	0.93
Row cultivator, 4 row	5,400.00	540.00	2,970.00	119.33	0.37
Crustbuster	2,340.00	234.00	1,287.00	51.71	0.16
Beet lifter	72,000.00	7,200.00	39,600.00	1,591.06	4.97
Beet Topper	27,600.00	2,760.00	15,180.00	609.91	1.91
Small tools	3,070.80		1,535.40	61.69	0.19
Sub-total	**$156,610.80**	**$15,006.00**	**$85,808.40**	**$3,447.63**	**$10.77**
Power equipment					
Tractor, 140 hp	$96,954.55	$9,695.46	$53,325.00	$2,142.50	$6.70
Tractor, 80 hp	39,518.18	3,951.82	21,735.00	873.27	2.73
Sub-total	**$136,472.72**	**$13,647.28**	**$75,060.00**	**$3,015.78**	**$9.42**
Vehicles					
pickup	$21,075.63	$1,915.97	$11,495.80	$461.88	$1.44
Tandem Truck	47,899.16	23,949.58	35,924.37	1,443.38	4.51
Sub-total	**$68,974.79**	**$25,865.55**	**$47,420.17**	**$1,905.26**	**$5.95**
Total	**$1,511,731.00**	**$54,518.83**	**$1,251,124.88**	**$20,524.64**	**$64.14**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 320 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
Tractor, 140 hp	676.5	$1.05	$3.90	$710.32	$2,638.35	$4,293.45	$7,642.12	$23.88
Tractor, 80 hp	511.5	1.50	7.19	767.25	3,677.69	1,169.80	5,614.74	17.55
Spike Harrow-20 ft	45.0	0.90		40.50		20.19	60.69	0.19
Roller Harrow, 15'	135.0	5.29		714.15		666.90	1,381.05	4.32
Disk, 15 ft	180.0	1.52		273.60		1,127.17	1,400.77	4.38
Row Planter, 4 row	150.0	10.50		1,575.00		721.59	2,296.59	7.18
Row cultivator, 4 row	270.0	2.00		540.00		611.60	1,151.60	3.60
Crustbuster	60.0	0.19		11.40		49.22	60.62	0.19
Beet lifter	150.0	7.70		1,155.00		3,848.50	5,003.50	15.64
Beet Topper	90.0	3.70		333.00		708.64	1,041.64	3.26
pickup	6,600.0	0.10	0.15	660.00	990.00	1,581.08	3,231.08	10.10
Tandem Truck	8,580.0	0.20	0.30	1,716.00	2,574.00	3,592.58	7,882.58	24.63
Machine Shed				600.00		661.45	1,261.45	3.94
Irrigation system				2,700.00		4,860.30	7,560.30	23.63
			Total	**$11,796.22**	**$9,880.04**	**$23,912.49**	**$45,588.75**	**$142.46**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
Tractor, 140 hp	$96,955	$9,695	10000	700	676.5	1	15	0.0492	$4,293.45
Tractor, 80 hp	39,518	3,952	10000	600	511.5	1	20	0.0329	1,169.80
Spike Harrow-20 ft	960	96	2000	200	45.0	1	25	0.0234	20.19
Roller Harrow, 15'	15,060	1,506	2000	200	135.0	1	15	0.0492	666.90
Disk, 15 ft	16,680	1,320	2000	200	180.0	1	11	0.0734	1,127.17
Row Planter, 4 row	13,500	1,350	2000	200	150.0	1	13	0.0594	721.59
Row cultivator, 4 row	5,400	540	2000	400	270.0	1	7	0.1258	611.60
Crustbuster	2,340	234	2000	200	60.0	1	25	0.0234	49.22
Beet lifter	72,000	7,200	2000	200	150.0	1	13	0.0594	3,848.50
Beet Topper	27,600	2,760	2000	200	90.0	1	22	0.0285	708.64
pickup	21,076	1,916	100000	20000	6,600.0	1	10	0.0825	1,581.08
Tandem Truck	47,899	23,950	50000	20000	8,580.0	1	6	0.1500	3,592.58
Machine Shed	65,902	0					40	0.0100	661.45
Irrigation system	147,771	0					20	0.0329	4,860.30
Return flow system	0	0					20	0.0329	0.00
								Total	**$23,912.49**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 300

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre Sugar Beets	Times over land Sugar Beets
Spike Harrow-20 ft	45.00	Tractor, 80 hp	0.15	1
Roller Harrow, 15'	135.00	Tractor, 140 hp	0.15	3
Disk, 15 ft	180.00	Tractor, 140 hp	0.15	4
Row Planter, 4 row	150.00	Tractor, 140 hp	0.50	1
Row cultivator, 4 row	270.00	Tractor, 80 hp	0.30	3
Crustbuster	60.00	Tractor, 80 hp	0.20	1
Beet lifter	150.00	Tractor, 140 hp	0.50	1
Beet Topper	90.00	Tractor, 80 hp	0.30	1
Power equipment*				
Tractor, 140 hp	676.50		-	-
Tractor, 80 hp	511.50		-	-
Vehicles (use units in miles				
pickup	6,600.0		20	1
Tandem Truck	8,580.0		26	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	420	
Total cropped acres	400	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 420 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 420 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	400	2,925.00
Tomatoes	400	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	1,228,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	197,028	469.11
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	56,780	135.19
Farmstead, waste arces	0	0.00
Equipment		
Power implements	374,113	890.74
Non-power implements	163,804	390.01
Vehicles	19,160	45.62
Small tools	3,276	7.80
Total farm investment	**$2,042,660**	**$4,863.48**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	2,099	5.00
Farm family	700	1.67
Hired labor	3,863	9.20

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$178,346.67	$424.63
Fertilizer	44,536.36	106.04
Herbicides	0.00	0.00
Insect control	40,052.84	95.36
Seed	84,488.00	201.16
Disease control	0.00	0.00
Misc. crop expenses	2,220.00	5.29
On-farm irrigation pumping	14,579.68	34.71
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	29,085.53	69.25
Workmen's compensation	3,510.62	8.36
Social Security	2,225.04	5.30
Repairs	13,739.88	32.71
Fuel, grease & oil	22,788.39	54.26
Telephone	912.00	2.17
Electricity	1,220.00	2.90
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	8,754.10	20.84
Interest on operating capital	8,968.97	21.35
Subtotal - variable expenses	**$455,428.09**	**$1,084.35**
Fixed expenses		
Depreciation	$28,444.54	$67.73
Taxes	12,606.38	30.02
Insurance	2,178.72	5.19
Interest on debt	28,285.58	67.35
Subtotal - fixed expenses	**$71,515.22**	**$170.27**
Farm income analysis		
Crop sales	$816,000.00	$1,942.86
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$816,000.00**	**$1,942.86**
Total farm expenses	$526,943.31	$1,254.63
Net farm income	**$289,056.69**	**$688.23**
Return to family farm		
Return to equity	$40,864.03	$97.30
Return to management	28,905.67	68.82
Return to labor	32,882.58	78.29
Total return to farm family	**$102,652.27**	**$244.41**
Payment Capacity analysis		
Net returns	**$186,404.41**	
per acre	**$443.82**	(420 acres)
per acre-foot	**$133.15**	(1400 AF)

Crop revenues

Crop	Yield per acre units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Tomatoes	40.00 ton	400	16,000		16,000	$51.00	$816,000.00
						Total	**$816,000.00**

Livestock revenue

Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
			Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.600%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	1.00
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.75
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$800	Meter or other change	$47.31
Building insurance rate	$7	Demand charge per HP	$0.00
Machinery insurance rate	$0	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
110 HP 2WD Tractor	$60,000	2001	2004	$67,500	$7,931	10000	700	$9.25	$2.43
130 HP 2WD Tractor	76,200	2001	2004	85,725	10,220	10000	700	10.93	2.81
200HP Crawler	156,000	2000	2004	181,813	17,482	10000	700	16.82	4.01
Generator Lights	3,819	2000	2004	4,451	0	2000	500	0.00	0.00
60 HP 2WD Tractor	29,708	2000	2004	34,624	3,461	10000	700	4.41	1.34

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Bed Shaper-3 Row	$9,653	2000	2004	$11,250	$1,125	2000	300	$1.93
Cultivator-Sled	5,362	2000	2004	6,249	625	2000	300	1.07
Disk, Offset-18'	14,000	2000	2004	16,317	1,632	2000	400	2.20
Disk-Stubble-16	12,944	2000	2004	15,086	1,508	2000	300	2.04
Ditcher-V	7,800	2000	2004	9,091	909	2000	300	5.51
Incorporator-15 ft	22,000	2000	2004	25,640	2,564	2000	300	6.42
Lister, 3 row-16'	2,838	2000	2004	3,308	331	2000	300	0.88
Saddle Tank-300 G	2,145	2000	2004	2,500	251	2000	300	0.58
Scraper-Drag-10'	2,581	2000	2004	3,008	301	2000	300	0.38
Subsoiler, 16'	7,200	2000	2004	8,391	839	2000	300	1.62
Trailer Dollie	1,311	2000	2004	1,528	153	2000	400	0.10
Tri-plane-16'	20,109	2000	2004	23,436	2,343	2000	300	3.02
Vine Diverter	19,305	2000	2004	22,499	2,251	2000	300	2.23
Vine Trainer	4,800	2000	2004	5,594	559	2000	400	2.88
Planter w/Sled-3 row	8,500	2000	2004	9,906	991	2000	300	2.26

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$20,000	1998	2004	$19,160	$1,916	100000	20000	$0.15	$0.10	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/Shop	$50,000	1998	2004	$56,780	$0	30	$500.00

Labor input data for this farm budget

Labor input data

Hourly wages:			*Miscellaneous:*	
	Operator	$13.00	Percent added to machine labor	10.00%
	Family	$8.00	Percent added to machine usage	10.00%
	Hired	$8.00	Worker's compensation rate/$100	$12.07
Hired labor Social Security rate		$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Tomatoes	0	20	0	0	0	20	40	20	0	0	0	0
Operator labor distribution %												
Tomatoes	2	4.4	4.5	12.1	10.1	12.7	6.9	2	2	2	39.3	2

All costs are indexed to year 2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Thin	Tomatoes	400	5.3	acre	2120
Irrigation Labor	Tomatoes	400	2.98	Hours	1192
				Total	**3,312.00**

Custom work

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Hoe Weeds	Tomatoes	400	2	acre	2000	$15.00	$17.25	$34.50	$13,800.00
Air Application Dust	Tomatoes	400	35	Lb	2002	0.18	0.19	6.65	2,660.00
Air App Spray 10 Gal	Tomatoes	400	1.76	Acre	2002	5.25	5.42	9.54	3,815.68
Air App Spray 20 Gal	Tomatoes	400	0.25	Acre	2002	7.50	7.75	1.94	775.00
Harvest	Tomatoes	400	40	Ton	2002	9.50	9.82	392.80	157,120.00
Assessments	Tomatoes	400	1	Ton	2002	0.40	0.44	0.44	176.00
								Total	**$178,346.67**

Fertilizer

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
10-34-0	Tomatoes	400	180	lb	2002	$0.12	$0.16	$28.80	$11,520.00
UN-32	Tomatoes	400	153	lb-N	2002	0.26	0.34	52.02	20,808.00
Fert: 7-21-0	Tomatoes	400	5.37	Gal	2003	3.00	3.41	18.31	7,324.68
N-Cal AntiCrustant	Tomatoes	400	9.32	Gal	2002	1.00	1.31	12.21	4,883.68
								Total	**$44,536.36**

Herbicide

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Insect control

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Vapam	Tomatoes	400	3.3	Gal	2002	$4.50	$4.54	$14.98	$5,992.80
Treflan HP	Tomatoes	400	1.2	Pint	2002	3.48	3.51	4.21	1,684.80
Matrix DF	Tomatoes	400	1.34	Oz	2002	12.68	12.79	17.14	6,855.44
Dithane DF	Tomatoes	400	2	Lb	2002	3.49	3.52	7.04	2,816.00
Kocide101	Tomatoes	400	2	Lb	2002	2.55	2.57	5.14	2,056.00
Sulfur, Dust 98%	Tomatoes	400	35	Lb	2002	0.18	0.18	6.30	2,520.00
Avaunt	Tomatoes	400	2.35	Oz	2002	6.69	6.75	15.86	6,345.00
Bravo Weatherstik	Tomatoes	400	1.68	Pint	2002	7.43	7.49	12.58	5,033.28
Success	Tomatoes	400	1.5	Fl Oz	2002	6.60	6.66	9.99	3,996.00
NoMate TPW MEC	Tomatoes	400	0.42	Fl Oz	2002	16.25	16.39	6.88	2,753.52
								Total	**$40,052.84**

Seed cost

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Tomato Seed	Tomatoes	400	71.6	thou	2002	$2.65	$2.95	$211.22	$84,488.00
								Total	**$84,488.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Rent Fertilizer Spr	Tomatoes	400	1	acre	2002	$5.00	$5.55	$5.55	$2,220.00
								Total	**$2,220.00**

All costs are indexed to year2004

Crop expenses by crop

Tomatoes

Item	Category	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Tomato Seed	seed cost	400	71.6	thou	2002	$2.65	$2.95	$211.22	$84,488.00
Hoe Weeds	custom work	400	2	acre	2000	15.00	17.25	34.50	13,800.00
Rent Fertilizer Spr	misc cost	400	1	acre	2002	5.00	5.55	5.55	2,220.00
10-34-0	fertilizer	400	180	lb	2002	0.12	0.16	28.80	11,520.00
UN-32	fertilizer	400	153	lb-N	2002	0.26	0.34	52.02	20,808.00
Fert: 7-21-0	fertilizer	400	5.37	Gal	2003	3.00	3.41	18.31	7,324.68
N-Cal AntiCrustant	fertilizer	400	9.32	Gal	2002	1.00	1.31	12.21	4,883.68
Vapam	insect control	400	3.3	Gal	2002	4.50	4.54	14.98	5,992.80
Treflan HP	insect control	400	1.2	Pint	2002	3.48	3.51	4.21	1,684.80
Matrix DF	insect control	400	1.34	Oz	2002	12.68	12.79	17.14	6,855.44
Dithane DF	insect control	400	2	Lb	2002	3.49	3.52	7.04	2,816.00
Kocide101	insect control	400	2	Lb	2002	2.55	2.57	5.14	2,056.00
Sulfur, Dust 98%	insect control	400	35	Lb	2002	0.18	0.18	6.30	2,520.00
Avaunt	insect control	400	2.35	Oz	2002	6.69	6.75	15.86	6,345.00
Bravo Weatherstik	insect control	400	1.68	Pint	2002	7.43	7.49	12.58	5,033.28
Success	insect control	400	1.5	Fl Oz	2002	6.60	6.66	9.99	3,996.00
NoMate TPW MEC	insect control	400	0.42	Fl Oz	2002	16.25	16.39	6.88	2,753.52
Air Application Dust	custom work	400	35	Lb	2002	0.18	0.19	6.65	2,660.00
Air App Spray 10 Gal	custom work	400	1.76	Acre	2002	5.25	5.42	9.54	3,815.68
Air App Spray 20 Gal	custom work	400	0.25	Acre	2002	7.50	7.75	1.94	775.00
Harvest	custom work	400	40	Ton	2002	9.50	9.82	392.80	157,120.00
Assessments	custom work	400	1	Ton	2002	0.40	0.44	0.44	176.00
								Total	**$349,643.87**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$47.31	12		$567.72
Demand charge	$0.00 per HP	12	76.1474	$0.00

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.75000	136435.8	$14,011.96
			Total	$14,579.68

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted ra $2.75000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Tomatoes	2.5	400	120	10	10	53800.63	5525.325
						Total	5525.325

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Tomatoes	0.35	400	120	10	260	64420.98	6616.035
						Total	6616.035

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Tomatoes	0.65	400	120	10	20	18214.2	1870.598
						Total	1870.598

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops
				Tomatoes
Custom work	$178,346.67	$3,582.83	$1,214.81	$178,346.67
Fertilizer	44,536.36	894.70	303.36	44,536.36
Herbicide	0.00	0.00	0.00	0.00
Insect control	40,052.84	804.63	272.82	40,052.84
Seed cost	84,488.00	1,697.29	575.49	84,488.00
Disease control	0.00	0.00	0.00	0.00
Miscellaneous	2,220.00	44.60	15.12	2,220.00
Irrigation pumping	14,579.68	292.89	99.31	14,011.96
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	34,821.20	699.53	237.18	28,423.44
Fuel	22,788.39	457.80	155.22	22,788.39
Equipment repairs	9,639.88	193.66	65.66	9,639.88
Other repairs	4,100.00	82.37	27.93	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	8,754.10	175.86	59.63	
Total	**$446,459.13**	**$8,968.97**	**$3,041.06**	**$424,507.53**

Notes: Total hired labor expense includes 3,862.6 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($5,735.67) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($567.72) and demand charges ($.00) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 420 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$1,228,500.00	$31,544.19	$75.11
Land development	0.00	0.00	0.00
Improvements	28,389.83	728.97	1.74
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	98,514.00	1,342.06	3.20
Non-power equipment	90,092.17	1,227.33	2.92
Power equipment	206,603.39	2,814.56	6.70
Vehicles	10,537.82	143.56	0.34
Livestock	0.00	0.00	0.00
Small tools	1,638.04	22.32	0.05
Total	**$1,664,275.25**	**$37,822.97**	**$90.05**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	921,900.00	1.00	$921,900.00	1.00000%	$9,219.00
Improvement taxes	56,779.66	1.00	56,779.66	1.00000%	567.80
Equipment taxes	537,916.75	0.50	268,958.38	1.00000%	2,689.58
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$12,606.38**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$56.78	$378.72
Machinery insurance	0.00	395.21	0.00
Liability insurance			1,000.00
Vehicle insurance			800.00
		Total insurance	**$2,178.72**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,098.66	67.0	240.0	150.7	240.0	240.0	240.0	240.0	240.0	67.0	67.0	240.0	67.0
Family	700.00	0.0	70.0	0.0	70.0	70.0	140.0	140.0	140.0	0.0	0.0	70.0	0.0
Hired	3,862.62	0.0	499.8	0.0	95.3	28.3	707.8	1,175.9	349.4	0.0	0.0	1,006.3	0.0
Total	6,661.28	67.0	809.8	150.7	405.3	338.3	1,087.8	1,555.9	729.4	67.0	67.0	1,316.3	67.0

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Tomatoes	6,661.28	67.0	809.8	150.7	405.3	338.3	1,087.8	1,555.9	729.4	67.0	67.0	1,316.3	67.0
Total	6,661.28	67.0	809.8	150.7	405.3	338.3	1,087.8	1,555.9	729.4	67.0	67.0	1,316.3	67.0

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Tomatoes	3,349.28	67.0	147.4	150.7	405.3	338.3	425.4	231.1	67.0	67.0	67.0	1,316.3	67.0
Total	3,349.28	67.0	147.4	150.7	405.3	338.3	425.4	231.1	67.0	67.0	67.0	1,316.3	67.0

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Tomatoes	3,312.00	0.0	662.4	0.0	0.0	0.0	662.4	1,324.8	662.4	0.0	0.0	0.0	0.0
Total	3,312.00	0.0	662.4	0.0	0.0	0.0	662.4	1,324.8	662.4	0.0	0.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
3,862.62	$7.53	$29,085.53

	Rate	
Social Security	0.0765	$2,225.04
Worker's Comp.	$ 12.07/$100	3,510.62
		$34,821.20

Return to Labor

	Hours	Wage	**Total**
Farm operator	2,098.66	$13.00	$27,282.58
Farm family	700.00	8.00	5,600.00
			$32,882.58

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 420 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Per acre
Real Estate Investment Costs					
Land	$1,228,500.00		$1,228,500.00	$11,648.37	$27.73
Improvement costs					
Machine Shed/Shop	$56,779.66	$0.00	$28,389.83	$269.19	$0.64
Sub-total	**$56,779.66**	**$0.00**	**$28,389.83**	**$269.19**	**$0.64**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$197,028.00	$0.00	$98,514.00	$3,958.12	$9.42
Sub-total	**$197,028.00**	**$0.00**	**$98,514.00**	**$3,958.12**	**$9.42**
Non-power equipment					
Bed Shaper-3 Row	$11,250.26	$1,125.38	$6,187.82	$248.62	$0.59
Cultivator-Sled	6,249.24	624.69	3,436.97	138.09	0.33
Disk, Offset-18'	16,316.55	1,631.65	8,974.10	360.56	0.86
Disk-Stubble-16	15,085.81	1,508.12	8,296.96	333.36	0.79
Ditcher-V	9,090.65	909.06	4,999.85	200.89	0.48
Incorporator-15 ft	25,640.29	2,564.03	14,102.16	566.60	1.35
Lister, 3 row-16'	3,307.60	330.99	1,819.30	73.10	0.17
Saddle Tank-300 G	2,499.93	250.58	1,375.26	55.26	0.13
Scraper-Drag-10'	3,008.07	300.69	1,654.38	66.47	0.16
Subsoiler, 16'	8,391.37	839.14	4,615.25	185.43	0.44
Trailer Dollie	1,527.93	152.68	840.31	33.76	0.08
Tri-plane-16'	23,436.39	2,342.59	12,889.49	517.88	1.23
Vine Diverter	22,499.35	2,250.52	12,374.93	497.20	1.18
Vine Trainer	5,594.24	559.42	3,076.83	123.62	0.29
Planter w/Sled-3 row	9,906.47	990.65	5,448.56	218.91	0.52
Small tools	3,276.08		1,638.04	65.81	0.16
Sub-total	**$167,080.22**	**$16,380.19**	**$91,730.21**	**$3,685.56**	**$8.78**
Power equipment					
110 HP 2WD Tractor	$67,500.00	$7,931.25	$37,715.63	$1,515.35	$3.61
130 HP 2WD Tractor	85,725.00	10,219.50	47,972.25	1,927.44	4.59
200HP Crawler	181,812.95	17,482.01	99,647.48	4,003.66	9.53
Generator Lights	4,450.92	0.00	2,225.46	89.42	0.21
60 HP 2WD Tractor	34,623.71	3,461.44	19,042.58	765.10	1.82
Sub-total	**$374,112.56**	**$39,094.20**	**$206,603.39**	**$8,300.96**	**$19.76**
Vehicles					
Pickup	$19,159.66	$1,915.97	$10,537.82	$423.39	$1.01
Sub-total	**$19,159.66**	**$1,915.97**	**$10,537.82**	**$423.39**	**$1.01**
Total	**$2,042,660.13**	**$57,390.36**	**$1,664,275.25**	**$28,285.58**	**$67.35**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 420 acres		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
110 HP 2WD Tractor	541.2	$2.43	$9.25	$1,315.12	$5,006.10	$2,197.70	$8,518.92	$20.28
130 HP 2WD Tractor	246.4	2.81	10.93	692.38	2,693.15	1,671.31	5,056.84	12.04
200HP Crawler	624.8	4.01	16.82	2,505.45	10,509.14	7,174.95	20,189.53	48.07
Generator Lights	418.0	0.00	0.00	0.00	0.00	811.97	811.97	1.93
60 HP 2WD Tractor	664.4	1.34	4.41	890.30	2,930.00	1,488.16	5,308.46	12.64
Bed Shaper-3 Row	100.0	1.93		193.00		319.38	512.38	1.22
Cultivator-Sled	160.0	1.07		171.20		361.63	532.83	1.27
Disk, Offset-18'	360.0	2.20		792.00		2,180.77	2,972.77	7.08
Disk-Stubble-16	96.0	2.04		195.84		397.47	593.31	1.41
Ditcher-V	8.0	5.51		44.08		181.10	225.18	0.54
Incorporator-15 ft	56.0	6.42		359.52		510.79	870.31	2.07
Lister, 3 row-16'	56.0	0.88		49.28		65.89	115.17	0.27
Saddle Tank-300 G	112.0	0.58		64.96		82.99	147.95	0.35
Scraper-Drag-10'	64.0	0.38		24.32		59.93	84.25	0.20
Subsoiler, 16'	80.0	1.62		129.60		167.17	296.77	0.71
Trailer Dollie	380.0	0.10		38.00		250.88	288.88	0.69
Tri-plane-16'	112.0	3.02		338.24		778.23	1,116.47	2.66
Vine Diverter	84.0	2.23		187.32		479.44	666.76	1.59
Vine Trainer	84.0	2.88		241.92		119.21	361.13	0.86
Planter w/Sled-3 row	136.0	2.26		307.36		425.78	733.14	1.75
Pickup	11,000.0	0.10	0.15	1,100.00	1,650.00	1,589.78	4,339.78	10.33
Machine Shed/Shop				500.00		915.05	1,415.05	3.37
Irrigation system				3,600.00		6,215.00	9,815.00	23.37
			Total	**$13,739.88**	**$22,788.39**	**$28,444.54**	**$64,972.81**	**$154.70**

Depreciation Table

				Use units (hours, miles if vehicle, years if building)					
Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
110 HP 2WD Tractor	$67,500	$7,931	10000	700	541.2	1	18	0.0369	$2,197.70
130 HP 2WD Tractor	85,725	10,220	10000	700	246.4	1	25	0.0221	1,671.31
200HP Crawler	181,813	17,482	10000	700	624.8	1	16	0.0437	7,174.95
Generator Lights	4,451	0	2000	500	418.0	1	5	0.1824	811.97
60 HP 2WD Tractor	34,624	3,461	10000	700	664.4	1	15	0.0478	1,488.16
Bed Shaper-3 Row	11,250	1,125	2000	300	100.0	1	20	0.0315	319.38
Cultivator-Sled	6,249	625	2000	300	160.0	1	12	0.0643	361.63
Disk, Offset-18'	16,317	1,632	2000	400	360.0	1	6	0.1485	2,180.77
Disk-Stubble-16	15,086	1,508	2000	300	96.0	1	21	0.0293	397.47
Ditcher-V	9,091	909	2000	300	8.0	1	25	0.0221	181.10
Incorporator-15 ft	25,640	2,564	2000	300	56.0	1	25	0.0221	510.79
Lister, 3 row-16'	3,308	331	2000	300	56.0	1	25	0.0221	65.89
Saddle Tank-300 G	2,500	251	2000	300	112.0	1	18	0.0369	82.99
Scraper-Drag-10'	3,008	301	2000	300	64.0	1	25	0.0221	59.93
Subsoiler, 16'	8,391	839	2000	300	80.0	1	25	0.0221	167.17
Trailer Dollie	1,528	153	2000	400	380.0	1	5	0.1824	250.88
Tri-plane-16'	23,436	2,343	2000	300	112.0	1	18	0.0369	778.23
Vine Diverter	22,499	2,251	2000	300	84.0	1	24	0.0237	479.44
Vine Trainer	5,594	559	2000	400	84.0	1	24	0.0237	119.21
Planter w/Sled-3 row	9,906	991	2000	300	136.0	1	15	0.0478	425.78
Pickup	19,160	1,916	100000	20000	11,000.0	1	9	0.0922	1,589.78
Machine Shed/Shop	56,780	0					30	0.0161	915.05
Irrigation system	197,028	0					20	0.0315	6,215.00
Return flow system	0	0					20	0.0315	0.00
								Total	**$28,444.54**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 400

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre Tomatoes	Times over land Tomatoes
Bed Shaper-3 Row	100.00	110 HP 2WD Tractor	0.25	1
Cultivator-Sled	160.00	110 HP 2WD Tractor	0.20	2
Disk, Offset-18'	360.00	200HP Crawler	0.90	1
Disk-Stubble-16	96.00	200HP Crawler	0.12	2
Ditcher-V	8.00	130 HP 2WD Tractor	0.02	1
Incorporator-15 ft	56.00	60 HP 2WD Tractor	0.14	1
Lister, 3 row-16'	56.00	110 HP 2WD Tractor	0.14	1
Saddle Tank-300 G	112.00	110 HP 2WD Tractor	0.14	2
Scraper-Drag-10'	64.00	110 HP 2WD Tractor	0.16	1
Subsoiler, 16'	80.00	130 HP 2WD Tractor	0.20	1
Trailer Dollie	380.00	60 HP 2WD Tractor	0.95	1
Tri-plane-16'	112.00	200HP Crawler	0.28	1
Vine Diverter	84.00	60 HP 2WD Tractor	0.21	1
Vine Trainer	84.00	60 HP 2WD Tractor	0.21	1
Planter w/Sled-3 row	136.00	130 HP 2WD Tractor	0.34	1
Power equipment*				
110 HP 2WD Tractor	541.20		-	-
130 HP 2WD Tractor	246.40		-	-
200HP Crawler	624.80		-	-
Generator Lights	418.00		0.95	1
60 HP 2WD Tractor	664.40		-	-
Vehicles (use units in miles)				
Pickup	11,000.0		25	1

* Includes additional 10%.

Farm Summary

	Acres	Avg. market value ($/acre)
Total farm size	420	
Total cropped acres	400	2,925.00
Farmstead, roads, waste	20	2,925.00

Note: all 'per acre' totals based upon 420 acres (cropped and waste acres), except the Payment Capacity 'per acre' result, which is based upon 420 acres (irrigated and waste acres). which is based upon 0 acres (irrigated and waste acres).

Irrigated land	400	2,925.00
Wheat	400	2,925.00
Non-irrigated land	0	0.00

Summary of Farm Investment

Item	Total	Per acre
Land	1,228,500	2,925.00
Land development	0	0.00
Improvements		
Irrigation system	197,028	469.11
Livestock	0	0.00
Permanent plantings	0	0.00
Buildings and fences	65,902	156.91
Farmstead, waste arces	0	0.00
Equipment		
Power implements	156,232	371.98
Non-power implements	124,364	296.11
Vehicles	19,160	45.62
Small tools	2,487	5.92
Total farm investment	**$1,793,674**	**$4,270.65**

Summary of Farm Work

Work by (in hours):	Total	Per acre
Farm operator	1,518	3.61
Farm family	280	0.67
Hired labor	1,561	3.72

Financial Summary

Variable expenses	Total	Per acre
Crop expenses		
Custom work	$37,382.84	$89.01
Fertilizer	19,360.00	46.10
Herbicides	1,768.00	4.21
Insect control	0.00	0.00
Seed	8,840.00	21.05
Disease control	0.00	0.00
Misc. crop expenses	800.00	1.90
On-farm irrigation pumping	4,348.67	10.35
Livestock expenses		
Livestock purchases	0.00	0.00
Purchased feed	0.00	0.00
Livestock marketing	0.00	0.00
Misc. livestock expenses	0.00	0.00
General expenses		
Hired labor	11,020.60	26.24
Workmen's compensation	2,644.94	6.30
Social Security	843.08	2.01
Repairs	12,291.48	29.27
Fuel, grease & oil	8,175.64	19.47
Telephone	912.00	2.17
Electricity	1,220.00	2.90
Other farm expenses	0.00	0.00
Miscellaneous (2% of variable)	2,192.15	5.22
Interest on operating capital	2,245.95	5.35
Subtotal - variable expense	**$114,045.35**	**$271.54**
Fixed expenses		
Depreciation	$24,746.76	$58.92
Taxes	11,081.49	26.38
Insurance	5,130.28	12.21
Interest on debt	22,618.57	53.85
Subtotal - fixed expenses	**$63,577.10**	**$151.37**
Farm income analysis		
Crop sales	$172,392.00	$410.46
Livestock sales	0.00	0.00
Other income	0.00	0.00
Gross income	**$172,392.00**	**$410.46**
Total farm expenses	$177,622.45	$422.91
Net farm income	**-$5,230.45**	**-$12.45**
Return to family farm		
Return to equity	$36,765.46	$87.54
Return to management	-523.05	-1.25
Return to labor	21,069.60	50.17
Total return to farm family	**$57,312.02**	**$136.46**

Payment Capacity analysis		
Net returns	**-$62,542.47**	
per acre	**-$148.91**	(420 acres)
per acre-foot	**-$122.15**	(512 AF)

Crop revenues

Crop	Yield per acre	units	Acres	Total produced	Total fed to livestock	Total sold	Price	Revenue
Wheat	103.00	bu	400	41,200		41,200	$3.74	$154,088.00
Wheat Direct payme	88.00	bu	400	35,200		35,200	0.52	18,304.00
							Total	**$172,392.00**

Livestock revenue

	Number	Selling price per CWT	Selling weight	Number sold	Revenue from livestock
				Total revenue	**$0.00**

Financial & Miscellaneous input data for this farm budget

Financial input data

Return on Equity	3.00%	*Interest rates:*					Adjustment
Return on Management	10.00%	Real estate	6.580%	*Tax rates:*			
Return on Management	6.00%	Non-real estate	7.360%		Land	1.000%	1.00
(Benefits analysis)		Depreciation	4.200%		Equipment	1.000%	0.50
Return to farm family	$0				Improvements	1.000%	0.50
(Land class analysis)		Months of interest bearing	6				
		on operating capital		*Debt levels:*	Land	14.41%	
Waste acre tax value	$2,195	per acre			Equipment	54.59%	

Miscellaneous farm input data

Misc. expenses per farm	$0	Base rate per kWH	$0.10
Misc. expenses per acre	$0	Adjusted rate per kWH	$2.90
Misc. income per farm	$0	Homestead & waste acres	20
Total vehicle taxes	$130	Homestead & waste acre mkt value	$2,925
Total vehicle insurance	$2,000	Meter or other change	$16.00
Building insurance rate	$7	Demand charge per HP	$2.90
Machinery insurance rate	$7	Electricity expenses	$1,220
Liability insurance	$1,000	Phone expenses	912

Equipment input data for this farm budget

Power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Fuel cost per hour	Repair cost per hour
90 HP 2WD Tractor	$40,880	2002	2004	$44,747	$5,752	12000	800	$6.90	$1.79
130 HP 2WD Tractor	90,840	1998	2004	111,485	11,149	10000	900	5.38	4.04

Non-power implement input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life hours	Max use/yr	Repair cost per hour
Chisel, Heavy 11'	$5,727	1998	2004	$7,029	$703	2000	400	$1.13
Disc, Border	1,398	1998	2004	1,716	172	2000	300	0.22
Disc, Finish, 18'	26,459	1998	2004	32,472	3,247	2000	300	4.12
Disc, Stubble, 14'	36,036	1998	2004	44,226	4,423	2000	300	5.61
Ditcher-V	4,070	1998	2004	4,995	500	2000	300	1.08
Grain Drill, 20'	22,733	1998	2004	27,900	2,790	2000	300	5.97
Rear Blade, 8'	2,504	1998	2004	3,073	307	2000	300	0.36
Saddle Tank, 300 Gal	2,407	1998	2004	2,954	295	2000	300	0.64

Vehicle input data

Name	Base price	Base year	Budget price	Indexed price	Salvage value	Life miles	Max use/yr	Fuel cost per mile	Repair cost per mile	Miles to hour conversion
Pickup	$20,000	1998	2004	$19,160	$1,916	100000	20000	$0.15	$0.10	20

Building and fence input data

Name	Base price	Base year	Budget year	Indexed price	Salvage value	Life years	Repair cost per year
Machine Shed/shop	$60,000	2002	2004	$65,902	$0	40	$600.00

Labor input data for this farm budget

Labor input data

Hourly wages:		*Miscellaneous:*	
Operator	$12.50	Percent added to machine labor	10.00%
Family	$7.50	Percent added to machine usage	10.00%
Hired	$7.50	Worker's compensation rate/$100	$24.00
Hired labor Social Security rate	$7.65		

Monthly labor data

Hour limits	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operator	240	240	240	240	240	240	240	240	240	240	240	240
Family	70	70	70	70	70	140	140	140	70	70	70	70
Manual labor distribution %												
Wheat	0	0	50	25	25	0	0	0	0	0	0	0
Operator labor distribution %												
Wheat	10	10	10	20	15	0	0	0	0	0	25	10

All costs are indexed to year 2004

Crop expenses by type of expense

Manual Labor

Item	Crop	Acres	Units per acre	Units	Total cost
Irrigation Labor	Wheat	400	3.75	Hour	1500
				Total	**1,500.00**

Custom work

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Air Application	Wheat	400	1	Acre	1998	$7.50	$8.09	$8.09	$3,236.00
Harvest	Wheat	400	2.73	Ton	1998	29.00	31.27	85.37	34,146.84
								Total	**$37,382.84**

Fertilizer

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Un-32	Wheat	400	140	Lb-N	2003	$0.26	$0.30	$42.00	$16,800.00
46-0-0	Wheat	400	40	Lb-N	1998	0.13	0.16	6.40	2,560.00
								Total	**$19,360.00**

Herbicide

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
MCPA	Wheat	400	2	Pint	1998	$2.25	$2.21	$4.42	$1,768.00
								Total	**$1,768.00**

Insect control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Seed cost

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Wheat Seed	Wheat	400	130	Lb	1998	$0.13	$0.17	$22.10	$8,840.00
								Total	**$8,840.00**

Disease control

Item	Crop	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
							Total	**$0.00**

Miscellaneous expenses

Item	Crop	Acres	Units per acre		Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Assessment	Wheat	400	50	Cwt	1998	$0.03	$0.04	$2.00	$800.00
								Total	**$800.00**

All costs are indexed to year 2004

Crop expenses by crop

Wheat

Item	Category	Acres	Units per acre	Base year index	Non-indexed cost per unit	Cost per unit	Cost per acre	Total cost
Un-32	fertilizer	400	140 Lb-N	2003	$0.26	$0.30	$42.00	$16,800.00
46-0-0	fertilizer	400	40 Lb-N	1998	0.13	0.16	6.40	2,560.00
Wheat Seed	seed cost	400	130 Lb	1998	0.13	0.17	22.10	8,840.00
MCPA	herbicide	400	2 Pint	1998	2.25	2.21	4.42	1,768.00
Air Application	custom work	400	1 Acre	1998	7.50	8.09	8.09	3,236.00
Harvest	custom work	400	2.73 Ton	1998	29.00	31.27	85.37	34,146.84
Assessment	misc cost	400	50 Cwt	1998	0.03	0.04	2.00	800.00
							Total	**$68,150.84**

On-farm irrigation pumping expenses

	Monthly charge	Months	Total HP	Charge
Meter charge	$16.00	12		$192.00
Demand charge	$2.90 per HP	12	32.77985	$1,140.74

	Energy rates per kWh			
	Base	Adj.	Total kWh	
Energy charge	$0.10270	$2.90000	29366.369	$3,015.93
			Total	$4,348.67

Energy charge algorithm

Step 1: Determine the required GPM
= (Acres irrigated * Amount pumped (AFl) * gal/AF) / (Days of pumping)/(Hours of use)/(min/hr)
(Hours of use assumed to be 18)

Step 2: Determine the required head
= (Pumping pressure * (ft/PSI)) + (Pumping lift)

Step 3: Determine pump size, required HP
= (Required GPM * Required Head)/(HP conversion * Pump efficiency)
(Pump efficiency assumed to be 0.70)

Step 4: Determine kWh to pump 1 AF
= (kWh conversion * Required head)/ (Pumping efficiency * Total efficiency)
(Total efficiency assumed to be 0.90)

Step 5: Determine irrigation season pumping capacity
= (Days of pumping * Required GPM * Hours of use * min/hr)/(gal/AF)

Step 6: Determine total required kWh
= (Season pumping capacity) * (kWh to pump 1 AF)

Step 7: Determine pumping expense
= Total required kWh * (base rate per kWh)

Conversions
1 AF = 325,900 gallons
1 PSI = 2.31 ft.
HP conversion = 3960
kWh conversion = 1.024

Energy rate per kWh:
Base rate: $0.10270
Adjusted rat $2.90000 (currently not used)

Surface water requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Wheat	1	400	60	10	10	21520.25	2210.13
						Total	2210.13

Groundwater requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Wheat	0	400	60	10	260	0	0
						Total	0

Return flow requirements

Crop	Amount pumped	Acres irrigated	Days of pumping	Pumping PSI	Pumping lift (ft)	Required kWh	Pumping cost
Wheat	0.28	400	60	10	20	7846.116	805.7961
						Total	805.7961

Computation of Interest and Return to Equity on Operating Capital

Equipment interest rate:	7.36%
Return to equity:	3.00%
Equipment debt:	54.59%

Category	Total Operating	Interest	Return to equity	Crops
				Wheat
Custom work	$37,382.84	$750.99	$254.63	$37,382.84
Fertilizer	19,360.00	388.93	131.87	19,360.00
Herbicide	1,768.00	35.52	12.04	1,768.00
Insect control	0.00	0.00	0.00	0.00
Seed cost	8,840.00	177.59	60.21	8,840.00
Disease control	0.00	0.00	0.00	0.00
Miscellaneous	800.00	16.07	5.45	800.00
Irrigation pumping	4,348.67	87.36	29.62	3,015.93
Livestock purchases	0.00	0.00	0.00	
Purchased feed	0.00	0.00	0.00	
Livestock marketing	0.00	0.00	0.00	
Hired labor	14,508.62	291.47	98.83	14,970.00
Fuel	8,175.64	164.24	55.69	8,175.64
Equipment repairs	8,091.48	162.55	55.12	8,091.48
Other repairs	4,200.00	84.37	28.61	
Telephone	912.00	18.32	6.21	
Electricity	1,220.00	24.51	8.31	
Other farm expenses	0.00	0.00	0.00	
Misc. (2% add-on)	2,192.15	44.04	14.93	
Total	**$111,799.40**	**$2,245.95**	**$761.52**	**$102,403.89**

Notes: Total hired labor expense includes 1,561.0 hours due to insufficient 'on-farm' resources that are not assigned to specific crops.
Total hired labor expense includes workers comp and Social Security expenses ($3,488.02) not assigned to specific crops.
Irrigation pumping expense includes meter charges ($192.00) and demand charges ($1,140.74) not assigned to specific crops.

Return to Equity on Investment

	Land	Equipment	Return to Equity
Equity/Asset ratio	85.59%	45.41%	3.00%

All 'per acre' totals based upon 420 acres.

	Computation value	Return to Equity Per farm	Per acre
Real Estate Investment			
Land	$1,228,500.00	$31,544.19	$75.11
Land development	0.00	0.00	0.00
Improvements	32,950.82	846.08	2.01
Permanent plantings	0.00	0.00	0.00
Non-real estate investment			
Irrigation and return flow system	98,514.00	1,342.06	3.20
Non-power equipment	68,400.21	931.82	2.22
Power equipment	86,566.56	1,179.30	2.81
Vehicles	10,537.82	143.56	0.34
Livestock	0.00	0.00	0.00
Small tools	1,243.64	16.94	0.04
Total	**$1,526,713.00**	**$36,003.94**	**$85.72**

Farm taxes

	Taxable value	Adjustment factor	Adjusted taxable value	Tax rate	Tax
Land taxes	921,900.00	1.00	$921,900.00	1.00000%	$9,219.00
Improvement taxes	65,901.64	0.50	32,950.82	1.00000%	329.51
Equipment taxes	280,596.97	0.50	140,298.48	1.00000%	1,402.98
Vehicle taxes					130.00
Livestock taxes					0.00
				Total taxes	**$11,081.49**

Farm insurance expenses

	Rate	Investment value* (1000's)	Total
Building insurance	6.67	$65.90	$439.56
Machinery insurance	6.67	253.48	1,690.72
Liability insurance			1,000.00
Vehicle insurance			2,000.00
		Total insurance	**$5,130.28**

* The fire and wind insurance rate for buildings and machinery is per $1000 of investments (including all power and non-power equipment, buildings, and irrigation system). Irrigation and return flow systems are included in the machinery insurance calculation.
* Investment values for insurance purposes are based upon the average of purchase price and salvage value.

Labor limits by month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	2,880.00	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0	240.0
Family	1,050.00	70.0	70.0	70.0	70.0	70.0	140.0	140.0	140.0	70.0	70.0	70.0	70.0

Labor used each month (for entire operation)

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Farm operator	1,517.57	185.9	185.9	240.0	240.0	240.0	0.0	0.0	0.0	0.0	0.0	240.0	185.9
Family	280.00	0.0	0.0	70.0	70.0	70.0	0.0	0.0	0.0	0.0	0.0	70.0	0.0
Hired	1,560.99	0.0	0.0	625.9	436.7	343.8	0.0	0.0	0.0	0.0	0.0	154.6	0.0
Total	3,358.56	185.9	185.9	935.9	746.7	653.8	0.0	0.0	0.0	0.0	0.0	464.6	185.9

Total labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Wheat	3,358.56	185.9	185.9	935.9	746.7	653.8	0.0	0.0	0.0	0.0	0.0	464.6	185.9
Total	3,358.56	185.9	185.9	935.9	746.7	653.8	0.0	0.0	0.0	0.0	0.0	464.6	185.9

Equipment operator labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Wheat	1,858.56	185.9	185.9	185.9	371.7	278.8	0.0	0.0	0.0	0.0	0.0	464.6	185.9
Total	1,858.56	185.9	185.9	185.9	371.7	278.8	0.0	0.0	0.0	0.0	0.0	464.6	185.9

Manual labor

	Total	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Wheat	1,500.00	0.0	0.0	750.0	375.0	375.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,500.00	0.0	0.0	750.0	375.0	375.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Hired labor expenses

Hired labor hours	Hourly wage	**Total**
1,560.99	$7.06	$11,020.60
	Rate	
Social Security	0.0765	$843.08
Worker's Comp.	$ 24/$100	2,644.94
		$14,508.62

Return to Labor

	Hours	Wage	**Total**
Farm operator	1,517.57	$12.50	$18,969.60
Farm family	280.00	7.50	2,100.00
			$21,069.60

Farm investment expenses

	Land	Equipment	
Interest rate	6.58%	7.36%	
Debt/Asset ratio	14.41%	54.59%	All 'per acre' totals based upon 420 acres.

Item	Investment Value	Salvage Value	Computation Value	Interest on debt Per farm	Interest on debt Per acre
Real Estate Investment Costs					
Land	$1,228,500.00		$1,228,500.00	$11,648.37	$27.73
Improvement costs					
Machine Shed/shop	$65,901.64	$0.00	$32,950.82	$312.43	$0.74
Sub-total	**$65,901.64**	**$0.00**	**$32,950.82**	**$312.43**	**$0.74**
Non-real Estate Investment Costs					
Irrigation system costs					
Irrigation system	$197,028.00	$0.00	$98,514.00	$3,958.12	$9.42
Sub-total	**$197,028.00**	**$0.00**	**$98,514.00**	**$3,958.12**	**$9.42**
Non-power equipment					
Chisel, Heavy 11'	$7,028.59	$703.23	$3,865.91	$155.33	$0.37
Disc, Border	1,715.73	171.82	943.78	37.92	0.09
Disc, Finish, 18'	32,472.41	3,247.36	17,859.88	717.58	1.71
Disc, Stubble, 14'	44,226.00	4,423.09	24,324.54	977.32	2.33
Ditcher-V	4,995.00	499.50	2,747.25	110.38	0.26
Grain Drill, 20'	27,899.59	2,789.59	15,344.59	616.52	1.47
Rear Blade, 8'	3,073.09	306.82	1,689.96	67.90	0.16
Saddle Tank, 300 Gal	2,954.05	294.55	1,624.30	65.26	0.16
Small tools	2,487.29		1,243.64	49.97	0.12
Sub-total	**$126,851.76**	**$12,435.96**	**$69,643.86**	**$2,798.17**	**$6.66**
Power equipment					
90 HP 2WD Tractor	$44,747.03	$5,752.09	$25,249.56	$1,014.48	$2.42
130 HP 2WD Tractor	111,485.45	11,148.55	61,317.00	2,463.61	5.87
Sub-total	**$156,232.48**	**$16,900.64**	**$86,566.56**	**$3,478.09**	**$8.28**
Vehicles					
Pickup	$19,159.66	$1,915.97	$10,537.82	$423.39	$1.01
Sub-total	**$19,159.66**	**$1,915.97**	**$10,537.82**	**$423.39**	**$1.01**
Total	**$1,793,673.50**	**$31,252.57**	**$1,526,713.00**	**$22,618.57**	**$53.85**

Note: Investment value is based upon the number required, not unit value. See Depreciation table for details.

Equipment Expense Table

Equipment	Actual annual use (hours, miles if vehicle)	Cost per unit of use		Annual costs		All 'per acre' totals based upon 420 acres.		
		Repairs	Fuel	Repairs	Fuel	Depreciation	Total	Per acre
90 HP 2WD Tractor	259.6	$1.79	$6.90	$464.68	$1,791.24	$911.40	$3,167.32	$7.54
130 HP 2WD Tractor	880.0	4.04	5.38	3,555.20	4,734.40	7,363.09	15,652.69	37.27
Chisel, Heavy 11'	400.0	1.13		452.00		1,163.17	1,615.17	3.85
Disc, Border	16.0	0.22		3.52		36.08	39.60	0.09
Disc, Finish, 18'	200.0	4.12		824.00		2,411.70	3,235.70	7.70
Disc, Stubble, 14'	200.0	5.61		1,122.00		3,284.60	4,406.60	10.49
Ditcher-V	32.0	1.08		34.56		105.07	139.63	0.33
Grain Drill, 20'	80.0	5.97		477.60		586.88	1,064.48	2.53
Rear Blade, 8'	40.0	0.36		14.40		64.65	79.05	0.19
Saddle Tank, 300 Gal	68.0	0.64		43.52		62.16	105.68	0.25
Pickup	11,000.0	0.10	0.15	1,100.00	1,650.00	1,616.10	4,366.10	10.40
Machine Shed/shop				600.00		661.45	1,261.45	3.00
Irrigation system				3,600.00		6,480.40	10,080.40	24.00
			Total	**$12,291.48**	**$8,175.64**	**$24,746.76**	**$45,213.88**	**$107.65**

Depreciation Table

Use units (hours, miles if vehicle, years if building)

Item	Investment value	Salvage value	Expected life	Annual maximum	Actual Annual	# Required	Years of life	Sinking fund factor	Annual depreciation cost
90 HP 2WD Tractor	$44,747	$5,752	12000	800	259.6	1	25	0.0234	$911.40
130 HP 2WD Tractor	111,485	11,149	10000	900	880.0	1	11	0.0734	7,363.09
Chisel, Heavy 11'	7,029	703	2000	400	400.0	1	5	0.1839	1,163.17
Disc, Border	1,716	172	2000	300	16.0	1	25	0.0234	36.08
Disc, Finish, 18'	32,472	3,247	2000	300	200.0	1	10	0.0825	2,411.70
Disc, Stubble, 14'	44,226	4,423	2000	300	200.0	1	10	0.0825	3,284.60
Ditcher-V	4,995	500	2000	300	32.0	1	25	0.0234	105.07
Grain Drill, 20'	27,900	2,790	2000	300	80.0	1	25	0.0234	586.88
Rear Blade, 8'	3,073	307	2000	300	40.0	1	25	0.0234	64.65
Saddle Tank, 300 Gal	2,954	295	2000	300	68.0	1	25	0.0234	62.16
Pickup	19,160	1,916	100000	20000	11,000.0	1	9	0.0937	1,616.10
Machine Shed/shop	65,902	0					40	0.0100	661.45
Irrigation system	197,028	0					20	0.0329	6,480.40
Return flow system	0	0					20	0.0329	0.00
								Total	**$24,746.76**

Note: sinking factor = i/((1+i)^n - 1) where i = interest rate, n = years of life
Value to be depreciated = (investment value - salvage value)
Depreciation cost = (investment value - salvage value) * (sinking factor)

Crop Machinery Use

Acres: 400

Equipment	Total Use (hours)	Assigned Power Equipment	Hours used per acre	Times over land
			Wheat	Wheat
Chisel, Heavy 11'	400.00	130 HP 2WD Tractor	0.50	2
Disc, Border	16.00	90 HP 2WD Tractor	0.04	1
Disc, Finish, 18'	200.00	130 HP 2WD Tractor	0.25	2
Disc, Stubble, 14'	200.00	130 HP 2WD Tractor	0.25	2
Ditcher-V	32.00	90 HP 2WD Tractor	0.08	1
Grain Drill, 20'	80.00	90 HP 2WD Tractor	0.20	1
Rear Blade, 8'	40.00	90 HP 2WD Tractor	0.10	1
Saddle Tank, 300 Gal	68.00	90 HP 2WD Tractor	0.17	1
Power equipment*				
90 HP 2WD Tractor	259.60		-	-
130 HP 2WD Tractor	880.00		-	-
Vehicles (use units in miles)				
Pickup	11,000.0		25	1

* Includes additional 10%.

Cropping Patterns – San Luis Unit

SAN LUIS UNIT CROPPING PATTERN (Adjusted for land retirement alternatives indicated) AND WEIGHTED PAYMENT CAPACITY

	PAYMENT CAPACITY	PAYMENT CAPACITY ADJUSTED	FDR	BROADVIEW 96-98		PACHECO 03		PANOCHE 03-05		SAN LUIS 02-04		WESTLANDS 03-05		TOTAL	
Crops Represented	$/Acre		AF/Acre	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Alfalfa Hay	0.01	0.01	6.50	102	1.13%	222	4.38%	1,647	4.45%	1,693	4.46%	12,313	2.43%	15,977	2.68%
Alfalfa Seed	94.62	94.62	2.00	851	9.45%	0	0.00%	480	1.30%	0	0.00%	3,952	0.78%	5,284	0.89%
Almonds	335.61	335.61	4.30	0	0.00%	0	0.00%	901	2.43%	14,811	39.05%	62,872	12.42%	78,584	13.20%
Cantaloupe	317.74	317.74	1.33	910	10.10%	1,429	28.18%	4,177	11.27%	4,426	11.67%	71,098	14.04%	82,040	13.78%
Cotton	115.04	115.04	3.50	5,631	62.50%	2,233	44.03%	20,539	55.44%	8,965	23.64%	158,773	31.36%	196,141	32.94%
Wine Grapes	93.25	93.25	3.00	0	0.00%	0	0.00%	703	1.90%	381	1.01%	10,361	2.05%	11,445	1.92%
Sugar Beets	(65.23)	0.00	3.42	0	0.00%	0	0.00%	21	0.06%	0	0.00%	4,823	0.95%	4,844	0.81%
Tomatoes, Proc	443.82	443.82	3.50	1,142	12.67%	1,087	21.44%	7,251	19.57%	4,001	10.55%	119,677	23.63%	133,158	22.36%
Wheat	(148.91)	0.00	1.28	374	4.15%	100	1.97%	1,330	3.59%	3,650	9.62%	62,498	12.34%	67,952	11.41%
TOTAL				9,010	100%	5,071	100%	37,050	100%	37,927	100%	506,367	100%	595,424	100.00%
% of San Luis Unit (Acres)				1.51%		0.85%		6.22%		6.37%		85.04%		100.00%	
Wtd Farm Delivery Requirement (AF/A)					3.08		2.98		3.30		3.47		3.07		3.11
Weighted Payment Capacity															
$/Acre (negative value = 0)					169.18		235.33		197.61		243.09		229.90		227.86
$/Acre-Foot					54.93		78.97		59.88		70.05		74.89		73.27
$/Acre (Wt includes negative pmt cap)					163.00		232.40		192.23		228.76		210.90		210.33
$/Acre-Foot					52.92		77.99		58.25		65.93		68.70		67.63

*Payment capacity for lettuce budget was negative. However, for this analysis, lettuce payment capacity has been set to zero.

Acres in Alternative	406,742	
Drainage Impaired	WESTLANDS - Adjusted 03-05	
	Acres	%
Alfalfa Hay	12,313	2.43%
Alfalfa Seed	3,952	0.78%
Almonds	62,872	12.42%
Cantaloupe	81,348	16.07%
Cotton	162,697	32.13%
Wine Grapes	10,361	2.05%
Lettuce	0	0.00%
Rice	0	0.00%
Sugar Beets	0	0.00%
Tomatoes, Proc	162,697	32.13%
Wheat	10,127	2.00%
	506,367	100.00%
Wtd Pmt Capacity ($/acre)		**$274.93**

Acres in Alternative	396,614	
Water Needs	WESTLANDS 03-05	
	Acres	%
Alfalfa Hay	12,313	2.43%
Alfalfa Seed	3,952	0.78%
Almonds	62,872	12.42%
Cantaloupe	79,323	15.67%
Cotton	158,646	31.33%
Wine Grapes	10,361	2.05%
Lettuce	0	0.00%
Rice	0	0.00%
Sugar Beets	0	0.00%
Tomatoes, Proc	158,646	31.33%
Wheat	20,255	4.00%
	506,367	100.00%
Wtd Pmt Capacity ($/acre)		**$269.18**

SUMMARY - SAN LUIS UNIT CROPPING PATTERN (Average - based on years indicated)

Budget	Crops Represented	SAN LUIS UNIT BROADVIEW 96-98 Acres	PACHECO 03 Acres	PANOCHE 03-05 Acres	SAN LUIS 02-04 Acres	WESTLANDS 03-05 Acres	TOTAL Acres	%
Alfalfa Hay	Alfalfa Hay	0	222	898	1,683	10,732	13,535	2.30%
Irrig. Pasture	Irrig Pasture	0	0	0	0	1,532	1,532	0.26%
(included w/	Silage	0	0	180	0	0	180	0.03%
Alfalfa Hay)	Other Forage	0	0	0	0	48	48	0.01%
	Other Hay	102	0	569	10	0	681	0.12%
		102	222	1,647	1,693	12,313	15,977	2.71%
Alfalfa Seed	Grass (All Kinds)	0	0	0	0	0	0	0.00%
	Clover Seed (All Kinds)	0	0	0	0	0	0	0.00%
	Corn	0	0	0	0	0	0	0.00%
	Alfalfa Seed	851	0	149	0	1,315	2,315	0.39%
Vine Seed --	Lettuce	0	0	0	0	0	0	0.00%
(included w/	Potato (All Kinds)	0	0	0	0	0	0	0.00%
Alfalfa Seed)	Onion	0	0	0	0	0	0	0.00%
	Sugar Beet	0	0	0	0	0	0	0.00%
	Other Seed	0	0	0	0	2,637	2,637	0.45%
	Pea	0	0	0	0	0	0	0.00%
	Garlic Seed			332			332	0.06%
		851	0	480	0	3,952	5,284	0.90%
Almonds	Almonds	0	0	869	12,920	41,994	55,783	9.48%
	Pecans	0	0	0	0	0	0	0.00%
	Walnuts	0	0	7	5	408	419	0.07%
	Other Nuts	0	0	0	237	10,969	11,205	1.90%
Oranges	Oranges & Tangerines	0	0	0	211	546	757	0.13%
(included w/	Lemons & Limes	0	0	0	0	0	0	0.00%
Almonds)	Grapefruit	0	0	0	0	38	38	0.01%
Olives	Olives	0	0	25	0	0	25	0.00%
Peaches	Cherries	0	0	0	133	292	425	0.07%
(included w/	Apricot	0	0	0	928	511	1,439	0.24%
Almonds)	Other Fruit	0	0	0	0	0	0	0.00%
	Peaches	0	0	0	24	1,272	1,295	0.22%
	Berries (All Kinds)	0	0	0	0	0	0	0.00%
Pears	Pears	0	0	0	0	0	0	0.00%
(included w/	Apples	0	0	0	155	288	443	0.08%
Almonds)	Prunes & Plums	0	0	0	198	448	647	0.11%
	Nectarines					224	224	0.04%
		0	0	901	14,811	56,989	72,701	12.35%
Cantaloupe	Cantaloupe	910	1,429	1,566	4,108	17,969	25,982	4.41%
	Watermelon	0	0	280	0	1,900	2,180	0.37%
	Honey Ball, Honeydew, ect	0	0	1,711	0	3,026	4,737	0.80%
	Cucumbers	0	0	0	0	0	0	0.00%
	Mixed Melons					728	728	0.12%
		910	1,429	3,556	4,108	23,623	33,627	5.71%
Cotton	Cotton, Lint (Upland)	5,631	2,233	13,913	8,965	99,604	130,346	22.15%
	Cotton, Seed (Upland)	0	0	5,455	0	0	5,455	0.93%
	Cotton Lint (Am. Pima)			1,068		59,168	60,236	10.23%
	Cotton Seed (Am. Pima)			104			104	0.02%
		5,631	2,233	20,539	8,965	158,773	196,141	33.32%
Grapes, Wine	Grapes, Other	0	0	703	381	859	1,943	0.33%
	Grapes, Table	0	0	0	0	826	826	0.14%
	Grapes, Wine					7,646	7,646	1.30%
	Grapes, Juice					60	60	0.01%
		0	0	703	381	9,391	10,476	1.78%
Lettuce	Carrots	0	0	0	0	481	481	0.08%
	Cauliflower	0	0	97	0	26	123	0.02%
	Greens (Kale, ect)	0	0	0	0	0	0	0.00%
	Celery	0	0	0	0	0	0	0.00%
	Cabbage	0	0	0	0	0	0	0.00%
	Broccili	0	0	0	0	6,505	6,505	1.11%
	Lettuce	0	0	0	27	25,101	25,128	4.26%
	Garlic			524	291	14,698	15,513	2.50%
	Cucumbers					431	431	0.07%
	Spinach					206	206	0.03%
	Squash					27	27	0.00%
		0	0	621	317	47,475	48,413	8.23%
Rice	Rice	0	0	0	0	0	0	0.00%
Sugar Beets	Other Misc Field Crops	0	0	0	0	0	0	0.00%
	Sugar Beets	0	0	21	0	4,823	4,844	0.82%
		0	0	21	0	4,823	4,844	0.82%
Tomatoes, Proc	Peas, Green (Fresh Mkt)	0	0	0	0	0	0	0.00%
	Peppers (All Kinds)	0	0	0	0	1,955	1,955	0.33%
	Potatoes, Early	0	0	0	0	0	0	0.00%
	Asparagus	0	344	869	139	556	1,908	0.32%
	Nursery	0	0	0	0	0	0	0.00%
	Squash	0	0	0	0	0	0	0.00%
	Potatoes, Late	0	0	0	0	0	0	0.00%
	Beans (Proc)	0	0	0	0	0	0	0.00%
	Beans, Dry	0	0	262	262	779	1,303	0.22%
	Soybeans	0	0	0	0	0	0	0.00%
	Tomatoes (Fresh Mkt)	0	0	1,644	3,268	4,159	9,071	1.54%
	Corn, Sweet (Proc)	0	0	0	0	5,751	5,751	0.98%
	Corn	0	0	0	0	0	0	0.00%
	Onions, Dry	0	0	343	227	4,072	4,642	0.79%
	Tomatoes (Canning)	1,142	743	3,977	0	87,095	92,957	15.79%
	Other Vegetables	0	0	0	106	0	106	0.02%
	Beans (Fresk Mkt)	0	0	0	0	0	0	0.00%
	Onions, Green	0	0	0	0	0	0	0.00%
	Corn, Sweet Fresh Mkt)	0	0	0	0	2	2	0.00%
	Peas, Green (Proc)	0	0	150	0	0	150	0.03%
	Vegetables - Transplant			6			6	0.00%
	Beans, Garbanzo					2,366	2,366	0.40%
	Beans, Green					805	805	0.14%
	Mustard					196	196	0.03%
	Onions, Dehy					9,876	9,876	1.68%
	Parsley					441	441	0.07%
	Pomegranates					1,624	1,624	0.28%
		1,142	1,087	7,251	4,001	119,677	133,158	22.62%
Wheat	Barley	20	0	391	84	8,273	8,767	1.49%
	Other Cereals	0	0	0	0	0	0	0.00%
	Wheat	354	100	821	1,291	49,940	52,506	8.92%
	Sorghum	0	0	0	0	1,957	1,957	0.33%
	Oats	0	0	71	1,645	1,699	3,415	0.58%
	Wheat Straw			47			47	0.01%
	Corn				630	630	1,260	0.21%
		374	100	1,330	3,650	62,498	67,952	11.55%
	TOTAL	9,010	5,071	37,050	37,927	499,514	588,572	100.00%

Source: Data from USBR Crop Reports.

579,032

San Luis Cropping Pattern is off by 108 acres b/c I didn't know what to do with "Flowers"

WESTLANDS		
CROPS NOT ADDED IN ABOVE		
Eucalyptus	57	
Jojoba	11	
Radichio	21	Added into Lettuce acres above
Safflower	1,252	Added into Other Seed acres above
Vetch	48	Added into Other Forage acres above
NB Trees & Vines	6,852	Added into Almonds and Grapes based on % of bearing crops.
Fallow	71,275	
Non-Harvested	1,513	
	81,030	

PACHECO CROP DISTRIBUTION

			2002	2003	2004	**2002-04**	% of Total
CATEGORY	**CROP**	**UNIT**	**ACRES**	**ACRES**	**ACRES**	**AVG**	
	Cotton			2,233		2,233	44.0%
	Melons			1,429		1,429	28.2%
	Tomatoes			743		743	14.7%
	Asparagus			344		344	6.8%
	Hay			222		222	4.4%
	Wheat			100		100	2.0%
GRAND TOTALS				5,071		5,071	

PANOCHE CROP DISTRIBUTION

CATEGORY	CROP	UNIT	2003 ACRES	2004 ACRES	2005 ACRES	2003-05 AVERAGE	%
VEGETABLES	ASPARAGUS	CWT	1,158	874	574	869	2.3%
	BEANS (PROCESSING)	TON					
	BEANS (FRESH MARKET)	CWT					
	BROCCOLI	CWT					
	GARLIC	CWT	1,042	390	141	524	1.4%
	LETTUCE	CWT					
	MELONS - CANTALOUPES	CWT	1,630	1,780	1,287	1,566	4.2%
	-HONEYDEW	CWT	1,514	1,399	2,220	1,711	4.6%
	-WATERMELONS	CWT	-	301	538	280	0.8%
	ONIONS (DRY)	CWT	156	633	241	343	0.9%
	PEAS, GREEN (PROCESSING)	TON			150	150	0.4%
	TOMATOES (CANNING)	TON	4,494	2,784	4,652	3,977	10.7%
	TOMATOES (FRESH MARKET)	CWT	2,117	2,052	763	1,644	4.4%
SEEDS	ALFALFA	CWT	-	446	-	149	
	GARLIC	CWT	-	608	387	332	0.9%
	ONIONS						
	SUGAR BEET	CWT					
FRUITS	GRAPES (TABLE)	TON					
	GRAPES (OTHER)	TON	653	728	728	703	1.9%
	PRUNES AND PLUMS	TON					
NUTS	ALMONDS	TON	812	918	878	869	2.3%
	WALNUTS	TON	-	20	-	7	0.0%
CEREALS	BARLEY	BU	240	784	148	391	1.1%
	CORN	BU					
	OATS	BU	150	-	64	71	0.2%
	SAFFLOWER	BU					
	SORGHUM	BU					
	SUDAN						
	WHEAT	BU	1,869	595	-	821	2.2%
FORAGE	ALFALFA HAY	TON	1,272	452	971	898	2.4%
	OTHER HAY (Grass)	TON	1,182	344	180	569	1.5%
	IRRIGATED PASTURE	AUM					
	CORN FODDER	TON					
	SILAGE OR ENSILAGE	TON	-	122	419	180	0.5%
MISCELLANEOUS	BEANS (DRY & EDIBLE)	CWT	435	-	350	262	0.7%
	COTTON, LINT (UPLAND)	BALE	14,914	15,774	11,050	13,913	37.6%
FIELD CROPS	COTTON, SEED (UPLAND)	TON	5,223	4,467	6,676	5,455	14.7%
	COTTON, LINT (AM-PIMA)	BALE	-	1,134	2,070	1,068	2.9%
	COTTON, SEED (AM-PIMA)	TON	-	90	221	104	0.3%
	SUGAR BEETS	TON	-	-	63	21	
	SOYBEANS	BU					
	VEG - TRANSPLANTS	TON	-	19	-	6	0.0%
	WHEAT STRAW	BALE	-	140	-	47	0.1%
	CAULIFLOWER	CWT	-	290	-	97	0.3%
	OLIVES		25			25	0.1%
GRAND TOTALS			38,886	37,143	34,770	**37,050**	

Panoche Cropping Pattern
Updated San Luis ATP 2007-11-16.xls

San Luis District Cropping Pattern

CROP	2002	2003	2004	AVG 02-04	% of Total
Alfalfa	1,540	2,045	1,463	**1,683**	4.4%
Almonds	11,112	12,812	14,837	**12,920**	34.0%
Apples	283	158	25	**155**	0.4%
Apricots	911	896	978	**928**	2.4%
Asparagus	136	140	140	**139**	0.4%
Barley	-	251	-	**84**	0.2%
Beans	173	534	80	**262**	0.7%
Cherries	100	209	89	**133**	0.3%
Clover	-	-	-	**-**	0.0%
Corn	778	884	228	**630**	1.7%
Cotton	6,675	10,162	10,058	**8,965**	23.6%
Evergreen	-	-	-	**-**	0.0%
Flowers	80	78	166	**108**	0.3%
Garlic	413	304	155	**291**	0.8%
Grapes	431	318	395	**381**	1.0%
Lettuce	40	40	-	**27**	0.1%
Melons	4,430	4,700	3,195	**4,108**	10.8%
Milo	-	-	-	**-**	0.0%
Misc. Field Crops	-	-	-	**-**	0.0%
Misc. Fruits	-	-	-	**-**	0.0%
Misc. Vegetables	51	-	266	**106**	0.3%
Oats	2,404	1,603	928	**1,645**	4.3%
Onions	194	279	207	**227**	0.6%
Oranges	182	185	266	**211**	0.6%
Pasture (Perm)	-	-	-	**-**	0.0%
Peaches	29	21	21	**24**	0.1%
Pistachios	160	239	311	**237**	0.6%
Pomegranites	-	-	-	**-**	0.0%
Prunes	311	146	138	**198**	0.5%
Rive	-	-	-	**-**	0.0%
Safflower	-	-	-	**-**	0.0%
Sudan Hay	30	-	-	**10**	0.0%
Sugar Beets	-	-	-	**-**	0.0%
Tomatoes	3,304	2,869	3,631	**3,268**	8.6%
Walnuts	13	2	-	**5**	0.0%
Wheat	996	2,168	710	**1,291**	3.4%
TOTAL	34,776	41,043	38,287	**38,035**	

	WESTLANDS IRRIGATION DISTRICT CROPPING PATTERNS, by Year									
Crop Name	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**Average 1993-2004**	Average 2002-2004	Percent of Total
Alfalfa-Hay	10,550	15,250	13,304	9,701	13,150	12,307	10,684	8,804	**12,047**	**2.1%**
Alfalfa-Seed	12,393	14,111	8,915	2,214	1,460	336	1,116	5,727	**971**	0.2%
Almonds	21,868	28,103	29,178	31,683	34,794	37,554	40,102	24,636	**37,483**	**6.4%**
Apples	1,568	1,102	1,127	707	467	387	291	984	**382**	0.1%
Apricots	638	644	604	598	525	535	473	510	**511**	0.1%
Artichokes	15	15	32	26	27			12	**27**	0.0%
Asparagus	1,246	822	866	655	671	620	462	758	**584**	0.1%
Barley	7,076	5,609	6,851	15,110	7,634	7,199	5,587	6,914	**6,807**	1.2%
Beans-Dry	4,585	4,590	1,106	589	1,093	949	822	2,451	**955**	0.2%
Beans-Garbanzo	3,524	7,277	8,082	8,320	4,065	1,140	1,843	6,792	**2,349**	0.4%
Beans-Green	2,019	2,924	1,247	629	386	250	1,447	1,252	**694**	0.1%
Broccoli	4,618	7,405	2,412	3,394	4,849	5,048	7,258	4,216	**5,718**	1.0%
Cabbage	138	428	27	165	39			121	**39**	0.0%
Cantaloupes	18,405	17,944	18,193	14,025	14,260	16,713	17,712	17,867	**16,228**	**2.8%**
Carrots-Bulk	371	1,168	328	283	40	300	367	487	**236**	0.0%
Carrots-Fresh	0	0	0	0	0			0	**0**	0.0%
Casabas	0	0	0	0	4			4	**4**	0.0%
Cauliflower	101	30	28	43	15		79	42	**47**	0.0%
Cherries	60	62	123	143	212	252	237	109	**234**	0.0%
Corn-Field	1,509	584	694	395	1,066	442	431	689	**646**	0.1%
Corn-Sweet	4,595	5,289	4,240	3,621	5,254	5,931	5,897	3,813	**5,694**	1.0%
Corn-Nuts	0	21	179	145	160			51	**160**	0.0%
Cotton-Lint-Acala	138,118	127,340	180,141	98,354	101,306	121,853	102,242	161,773	**108,467**	**18.7%**
Cotton-Lint-Pima	74,729	75,980	28,024	90,215	60,727	37,621	68,875	54,089	**55,741**	**9.6%**
Crenshaws	0	0	0	0	6			6	**6**	0.0%
Cucumbers	40	78	214	204	472	473	431	199	**459**	0.1%
Eggplant	0	0	0	0	1			1	**1**	0.0%
Eucalyptus	76	42	59	53	51	51	24	46	**42**	0.0%
Garlic	23,497	22,820	14,064	15,146	17,036	18,465	16,166	18,893	**17,222**	**3.0%**
Grains-Sorghum	282	279	1,259	2,680	960	99	1499	627	**853**	0.1%
Grapes-Juice	0	0	0	0	55			55	**55**	0.0%
Grapefruit	103	38	38	38	38	38 185	38	37	**38**	0.0%
Grapes-Raisin	155	0	0	0	145		801	137	**473**	0.1%
Grapes-Table	535	730	1,014	1,005	899	1,235	732	758	**955**	0.2%
Grapes-Wine	7,054	8,559	8,776	9,111	8,281	6,789	6,725	6,907	**7,265**	1.2%
Grapes-Juice						180		180	**180**	0.0%
Honeydews	2,025	2,284	1,732	2,513	3,002	2,949	2,268	2,411	**2,740**	0.5%
Jojoba	11	11	11	11	11	11	11	11	**11**	0.0%
Lettuce-Fall	11,040	12,091	10,400	9,225	10,473	10,367	9,513	9,325	**10,118**	1.7%
Lettuce-Spring	12,469	14,323	13,691	13,911	14,929	13,482	14,563	12,159	**14,325**	**2.5%**
Melons-Mixed	806	746	642	658	599	573	1,072	724	**748**	0.1%
Milo	152	0	0	0	49			49	**49**	0.0%
Mustard						179	307	221	**243**	0.0%
Nectarines	30	30	32	30	190	90	224	124	**168**	0.0%
Oats	1,313	493	284	371	3,400	1,665		812	**2,533**	0.4%
Olives	312	312	312	312	312			360	**312**	0.1%
Onions-Dehy.	12,052	11,790	10,471	8,647	10,301	9,148	9,405	9,816	**9,618**	1.7%
Onions-Fresh	2,285	1,916	2,410	3,232	2,869	3,824	3,753	2,565	**3,482**	0.6%
Oranges	216	325	216	216	1,039	216	216	278	**490**	0.1%
Parsley	0	421	421	412	317	710	456	236	**494**	0.1%
Pasture	2,425	1,396	1,554	1,739	1,560	1,681	559	1,292	**1,267**	0.2%
Peaches	263	223	226	223	971	1,133	1,574	525	**1,226**	0.2%
Peas-Green	0	0	0	0	151			151	**151**	0.0%
Pecans	72	0	0	0	10			10	**10**	0.0%
Peppers-Misc.	1,310	1,970	1,747	1,790	1,214	1,578	2,297	1,625	**1,696**	0.3%
Pistachios	6,784	5,040	5,131	9,333	11,393	11,158	9,868	6,994	**10,806**	1.9%
Plums	0	0	0	0	292	144	264	78	**233**	0.0%
Pomegreanates	1,025	841	1,178	1,234	1,372	1,481	1,653	1,087	**1,502**	0.3%
Potatoes-Sweet	0	0	29	0	43			43	**43**	0.0%
Prunes	149	149	149	229	147	149	223	157	**173**	0.0%
Pumpkins	0	0	62	0	7			9	**7**	0.0%
Radicchio	54	0	4	22	77	63		76	**70**	0.0%
Rice	0	0	0	0	0			0	**0**	0.0%
Safflower	3,698	2,567	2,209	4,409	3,956	2,236	200	4,931	**2,131**	0.4%
Seed-Crop-Misc.	1,409	1,970	1,630	2,048	1,680	1,172	2,066	1,271	**1,639**	0.3%
Seed-Crop-Vegetable	0	0	0	0	0			0	**0**	0.0%
Spinach	51	53	0	75	75	305	252	70	**211**	0.0%
Sudan Grass	0	0	0	0	0			0	**0**	0.0%
Squash	81	0	0	0	13		26	14	**20**	0.0%
Sugar Beets	9,427	7,432	8,543	5,007	5,083	4,984	4,719	6,500	**4,929**	0.8%
Tangerines	50	50	50	50	50	50	183	54	**94**	0.0%
Tomatoes-Fresh	3,766	3,660	3,235	3,209	2,815	4,528	3,255	3,783	**3,533**	0.6%
Tomatoes-Proc.	85,881	95,578	94,982	81,913	90,360	88,048	92,395	86,862	**90,268**	**15.5%**
Vegetable-misc.	0	0	0	0	0			0	**0**	0.0%
Vetch						145		145	**145**	0.0%
Walnuts	427	435	459	356	357	411	407	384	**392**	0.1%
Watermelons	1,279	1,528	1,399	1,454	1,316	1,710	2,205	1,144	**1,744**	0.3%
Wheat	39,536	23,884	28,436	35,150	34,174	57,844	43,384	28,958	**45,134**	**7.8%**
Wildlife Area	255	0	0	0	57			57	**57**	0.0%
NB Trees & Vines	4,041	4,440	7,077	4,359	115	2,018	7,233	3,698	**3,122**	0.5%
Fallow	33,481	37,206	46,748	73,802	94,557	76,654	70,367	58,733	**80,526**	**13.9%**
Non-Harvested	747	645	850	1,818	438	1,722	1,461	1,094	**1,207**	0.2%
Total in Production	578,790	583,053	577,445	577,010	579,922	579,157	578,720	578,779	581,238	

California Cooperative Extension Enterprise Budgets

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2003

SAMPLE COSTS TO ESTABLISH AND PRODUCE

ALFALFA

SAN JOAQUIN VALLEY
300 Acre Planting

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

SAMPLE COSTS TO ESTABLISH AND PRODUCE ALFALFA
300 acres
San Joaquin Valley 2003

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INTRODUCTION

Sample costs to establish an alfalfa stand and produce alfalfa in the San Joaquin Valley are shown 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. Practices described are based on the production practices considered typical for this crop and region, but will not apply to every farm situation. Sample costs for labor, materials, equipment and custom services are based on current figures. “Your Costs” columns in Tables 1, 2, 4 and 5 are provided for entering your farm costs.

The hypothetical farm operations, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of the calculations used in the study call the Department of Agricultural and Resource Economics, University of California, Davis, California, (530) 752-3589 or the local UC Cooperative Extension office.

Sample Cost of Production Studies for many commodities are available and can be requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-3589. Current studies can be downloaded from the department website http://coststudies.ucdavis.edu or obtained from the local county UC Cooperative Extension offices. Some archived studies are also available on the website.

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ASSUMPTIONS

The assumptions refer to Tables 1 through 11 and pertain to sample costs to establish an alfalfa stand, and produce alfalfa hay and haylage in the San Joaquin Valley. Practices described represent production practices and materials considered typical of a well-managed alfalfa stand in the San Joaquin Valley. Costs, materials, and practices in this study will not be applicable to all situations. Establishment and cultural practices vary among growers within the region. **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. The hypothetical farm consists of 1,200 non-contiguous acres of field and row crops of which 300 acres are alfalfa and the remaining 900 acres are planted to other crops such as cotton, corn, grains, processing tomatoes, and dry beans. It is assumed that a portion of the alfalfa is planted in a quarter section (160 acres). The farm is owned and operated by the grower.

Stand Establishment Operating Costs

Tables 1 to 3 show the costs associated with ground preparation, planting and establishing an alfalfa stand. Land preparation and planting are done in the fall. The establishment year ends after the herbicide application in December.

Land Preparation. Stand establishment begins by discing down the residue from the previous crop. The ground is chiseled to a depth of 18 to 24 inches to fracture the soil, which improves root penetration and water infiltration. The fields are laser leveled by a custom operator. Borders (levees) for irrigation checks are made at periodic intervals (60 feet in this study) through the field. The fields are then disced and harrowed to prepare the seedbed.

Planting. Alfalfa seed is planted with a Brillion seeder 1/4 inch to 1/2 inch deep at 25 to 30 pounds of seed per acre. The seed is planted in September and the stand life is expected to be three years.

Fertilization. Nitrogen (N) and phosphorus (P) as 11-52-0 at 300 pounds per acre of material are applied by a custom operator in September prior to the final discing. The fertilizer application in this study is assumed to be sufficient for 2 years; therefore one-half of the cost is allocated to the establishment year and one-half to the first production year. Depending upon preplant soil analysis results, potassium (K) may also be required.

Irrigation. Water for seed germination is applied immediately after planting (8 acre-inches). If winter rains do not occur, a second irrigation in October or early November may be necessary. Water is supplied by an irrigation district, although some growers may use or supplement with well water. Water prices vary among irrigation districts. The authors agreed that $30 per acre-foot is a fair value for this study, based upon information from their respective counties.

Pest Management. For pest identification, monitoring, management and pesticide information, visit the UC IPM website at www.ipm.ucdavis.edu. Written recommendations are required for many pesticides, and are available from licensed pest control advisers. For information on pesticide use permits, contact the local county Agricultural Commissioner's office.

Weeds. Post-emergent herbicides (Raptor) and 2,4-DB herbicide (Butyrac) are applied in December for broadleaf weed and grass control. A custom applicator applies the herbicides.

Overhead Costs. One-half of the cash and non-cash overhead costs for the 300 acres are allocated to the previous crop.

Production Operating Costs

Irrigation. Irrigation includes the water cost and labor expense. From April to October, ten irrigations totaling 4.5 acre-feet of water are applied by flooding the checks. The actual water requirement will vary each year based on soil, climatic, and plant physiological factors. Water is pumped through alfalfa valves at the head of the field and flows down the alfalfa check between the borders. A semi-permanent drain ditch is made at the end of the field. All field operations turn inside the field and do not cross the drain.

Fertilization. Once the stand is established, plant tissue tests should be taken to determine nutrient requirements. In this study, phosphorous as 11-52-0, at 150 pounds per acre, is applied in November of the second year and is assumed to be sufficient for the remaining stand life. Therefore, the cost is allocated over two years.

Pest Management. The pesticides, rates, and application practices mentioned in this cost study are listed in the *UC IPM Pest Management Guidelines – Alfalfa.* **Pesticides mentioned in this study are not recommendations, but those commonly used in the region.** For information and pesticide use permits, contact the local county Agricultural Commissioner's office. For information on other pesticides available, pest identification, monitoring, and management, visit the UC IPM website at www.ipm.ucdavis.edu. **Pest control costs can vary considerably each year depending upon local conditions and pest populations in any given year.** Adjuvants are recommended for many pesticides for effective control and are an added cost. The adjuvants in this study are not included as a cost in all applications.

Pest Control Adviser (PCA). Written recommendations are required for many pesticides and are available from licensed pest control advisers. In addition the PCA or an independent consultant will monitor the field for agronomic problems including irrigation and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company.

Weeds. During the first two years, a preemergence herbicide (Treflan TR-10) is applied in February for grass control or in February and April if dodder is expected. Residual herbicides (Velpar and Karmex) for control of winter weeds are applied in December of the first year and a contact herbicide (Gramoxone) in the second year. In April of the third year, a post emergence herbicide (Prism) is applied to control summer grasses. The stand is removed at the end of the third production year, hence no winter herbicide application. The herbicide costs will vary slightly during the production years due to the difference each year in weed control.

Insects. Several insect species attack alfalfa, but alfalfa weevil, aphids, alfalfa caterpillar, and armyworms are the major economic pests in this study. Weevils and aphids are assumed to reach population levels requiring a single treatment for control for which an insecticide (Lorsban) is applied by air in March. Worms (alfalfa caterpillar and armyworms) are controlled in July with an aerial insecticide (Lannate) application.

Harvest. In this study, the alfalfa is custom harvested for hay seven times; April, May, June, July, August, September, and October, and for haylage two times, March and November. (See Table 10 for hay harvested by the grower). Alfalfa for hay is cut with a self-propelled swather and left to dry for several days before it is turned and windrowed using a rake. Once the hay has dried to the correct moisture content, it is baled into 1,500-pound bales (47" W x 35" H x 98" L). The bales are picked up with a balewagon that moves them from the field and roadsides them in a stack. A conversion kit is attached to the standard balewagon to handle 1,500 bales. For haylage, the alfalfa is cut and wilted in the field, then chopped into a truck or trailer and taken to the dairy where it is placed in a bag, pile, or bunker for ensiling. Normally, these cuttings are for a dairy enterprise and are harvested by the buyer.

Custom Harvest. In this study, the custom harvester charges $25 per ton to swath, rake, and bale and $2.50 per 1,500 pound bale ($3.33 per ton) to roadside. Many harvesting companies swath, rake, bale, and roadside (pickup bales and stack) the harvested alfalfa for a single fee. Fees to swath, rake, bale, and roadside, range from $25 to $32 per hay ton and are usually based on a minimum of one-ton of hay per acre. Some companies will hire out for the individual operations and charge accordingly, but these fees when added together may be higher than the fee quoted for all operations. Individually, swathing ranges around $10 to $12 per acre, raking $4 to $5 per acre, baling $12 to $14 per ton, and roadsiding $4 to $6 per ton.

Yields. The crop is assumed to yield 8.00 tons of hay per acre at 90% dry matter (DM). In this study 7 tons is harvested as hay (90% DM) and 3.03 green tons (30% DM) or 1-ton hay equivalent, is harvested as haylage. Annual yields range from 5 to 11 tons of hay per acre in this region.

Returns. A price of $125 per ton for premium hay is based on USDA California 2002 averages for the San Joaquin Valley market districts. Hay prices and hay quality will vary during the season and by district. USDA alfalfa hay standards are Supreme, Premium, Good, Fair, and Utility, with Supreme garnering the highest price. The hay price in this study is based on 90% dry matter and the haylage on 30% dry matter. The buyer pays a price per green ton relative to the current hay market price less harvesting costs. In this study, the haylage return equals market price less harvest cost (buyer harvests haylage) times % haylage dry matter divided by % hay dry matter. ($125-$28) X (30%DM/90%DM) = $32.30. (The common "rule of thumb" is to subtract the harvest costs from the hay market price and divide by 3). Table 9 shows grower returns based on hay yields ranging from 8 to 11 tons per acre with 87.5% of the hay yield harvested as hay and 12.5% harvested as haylage.

Pickup/ATV. The pickup and the all terrain vehicle (ATV) each travel 7.12 miles per acre for alfalfa production use or a total of 2,137 miles per vehicle per year. Costs are estimated and not based on any specific data.

Labor. Labor rates of $13.14 per hour for machine operators and $9.86 for general labor includes payroll overhead of 46%. The basic hourly wages are $9.00 for machine operators and $6.75 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for field crops (code 0171), and a percentage for other possible benefits. Workers' compensation costs will vary among growers, but for this study the cost is based upon the average industry final rate as of January 1, 2003 (California Department of Insurance). Labor for operations involving machinery are 20% higher than the operation time given in Table 1 and 4 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

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 Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower and fuel type. Prices for on-farm delivery of diesel and gasoline are $1.11 and $1.58 per gallon, respectively. The fuel prices are a January 2003 average based on four California delivery locations. The cost includes a 2.25% sales tax (effective September 2001) on diesel fuel and 7.25% sales tax on gasoline. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in the "Cost Per Acre to Produce" table is determined by multiplying the total hourly operating cost in the "Hourly Equipment Costs" table for each piece of equipment used from the Operation Time (Hrs/A) column by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.14% 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.

Risk. Production risks should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect the profitability and economic viability of alfalfa production.

Cash Overhead

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm, not to a particular operation. These costs include property taxes, interest, office expense, liability and property insurance, and investment repairs (buildings and irrigation equipment). Employee benefits, payroll taxes and workers' compensation insurance are included in labor costs and not under cash overhead. A portion of the overhead costs in the establishment year is allocated to the previous crop.

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 property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% 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 0.676% of the average value

of the assets over their useful life. Liability insurance covers accidents on the farm and costs $1,246 for the entire farm or $1.04 per acre.

Office. Costs are estimated at $25 per acre for the ranch and are not based on any specific information, except that there is a cost involved for bookkeeping, payroll, tax preparation, and telephone.

Investment Repairs. Annual repairs on investments or capital recovery items that require maintenance are calculated as 2% of the purchase price. Repairs are not calculated for land and establishment costs.

Non-Cash Overhead

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments. A portion of the overhead costs in the establishment year are allocated to the previous crop

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

Salvage Value. Salvage value is the estimated value of an investment at the end of its useful life. For farm machinery the value is a percentage of the new cost of the investment (Boehlje and Eidman). The value is calculated from equations developed by ASAE based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE, by the annual hours of use in the operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate.

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 equipment life.

Interest Rate. The interest rate of 6.25% used to calculate capital recovery cost is the USDA-ERS's ten year average of California's agricultural sector long-run rate of return to production assets from current income.

Tools. Includes shop equipment/tools and other tools used on the farm and does not recognize any specific inventory.

Irrigation System. The system consists of underground lines with alfalfa valves. The cost for the 300 acres is based on a quarter section (160 acres) with one-quarter mile runs. There are two 18-inch mainlines each approximately 2,625 feet with 10 or 12-inch alfalfa valves every 60 feet and a quarter mile intertie line (connects two mainlines) with 12-inch PVC. The permanent irrigation system consists of wells, pumps and motors, and buried mainline included in the land purchase price.

Land. Cropland with district water suitable for alfalfa production typically ranges in value among counties from $2,000 to $5,500 per acre, except for Stanislaus County, which ranges from $3,000 to $8,500. The land in this study is owned by the grower and cost $3,500 per acre.

Hay Barn. The open barn with metal roof covers 5,000 square feet and is 20 feet high. The building's ten support poles are on concrete piers with a natural floor (ground). Construction costs included in the price are based on prevailing wage.

Establishment Costs. Costs to establish the alfalfa stand are used to determine capital recovery expenses, depreciation, and interest on investment, during the production years. The establishment cost is the sum of cash costs for land preparation, planting, and cash overhead for establishing the alfalfa. The Total Cash Cost shown in Table 1 represents the establishment cost per acre. For this study, the cost is $346 per acre or $103,800 for the 300 acres. The alfalfa stand establishment cost is amortized over the 3-year stand life.

Equipment. Although, farm equipment is purchased new or used, the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. 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

Table 1. COSTS PER ACRE to ESTABLISH ALFALFA

SAN JOAQUIN VALLEY 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre: Labor Cost	Fuel,Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Stubble Disc 2X	0.27	4	6	0	0	10	
Chisel Field	0.19	3	3	0	0	6	
Laser Level Field	0.00	0	0	0	75	75	
Make Borders	0.09	1	1	0	0	2	
Fertilize-1X/2Yrs (11-52-0)	0.00	0	0	24	3	26	
Finish Disc and Harrow	0.15	2	3	0	0	5	
Plant	0.26	4	3	81	0	88	
Irrigate 1X	0.18	2	0	20	0	22	
Weed-Winter (Raptor, 2,4-DB)	0.00	0	0	34	9	42	
Pickup Truck Use	0.12	2	1	0	0	3	
ATV Use	0.12	2	0	0	0	2	
TOTAL CULTURAL COSTS	1.37	21	17	158	86	283	
Interest on operating capital @ 7.14%						6	
TOTAL OPERATING COSTS/ACRE		21	17	158	86	289	
CASH OVERHEAD:*							
Liability Insurance						1	
Office Expense						20	
Property Taxes						30	
Property Insurance						1	
Investment Repairs						5	
TOTAL CASH OVERHEAD COSTS						57	
TOTAL CASH COSTS/ACRE						346	
NON-CASH OVERHEAD:*		Per producing acre		-- Annual Cost -- Capital Recovery			
Land		2,800		175		175	
Irrigation System		226		20		20	
Building		40		4		4	
Shop Tools		9		1		1	
Fuel Tanks		2		0		0	
Equipment		77		10		10	
TOTAL NON-CASH OVERHEAD COSTS		3,153		210		210	
TOTAL COSTS/ACRE						556	

*1/2 of alfalfa acres Overhead is allocated to previous crop

UC COOPERATIVE EXTENSION

Table 2. MATERIAL and INPUT COSTS to ESTABLISH ALFALFA

SAN JOAQUIN VALLEY 2003

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
OPERATING COSTS					
Custom:					
Laser Level	1.00	acre	75.00	75	
Broadcast Fertilizer	0.50	acre	5.50	3	
Ground Application	1.00	acre	8.50	9	
Fertilizer:					
11-52-0	150.00	lb	0.16	24	
Seed:					
Alfalfa Seed (raw)	30.00	lb	2.60	78	
Inoculum ($/seed lb)	30.00	sdlb	0.09	3	
Irrigation:					
Water	8.00	acin	2.50	20	
Herbicide:					
Raptor	4.00	floz	4.77	19	
Butyrac (2,4-DB)	2.00	pint	4.75	10	
Adjuvant:					
No Foam A	2.00	pint	2.70	5	
Labor (machine)	1.43	hrs	13.14	19	
Labor (non-machine)	0.18	hrs	9.86	2	
Fuel - Gas	0.47	gal	1.58	1	
Fuel - Diesel	8.39	gal	1.11	9	
Lube				2	
Machinery repair				6	
Interest on operating capital @ 7.14%				6	
TOTAL OPERATING COSTS/ACRE				289	

UC COOPERATIVE EXTENSION

Table 3. WHOLE FARM ANNUAL EQUIPMENT COSTS - ESTABLISHMENT YEAR

SAN JOAQUIN VALLEY 2003

ANNUAL EQUIPMENT COSTS

					Cash Overhead		
Yr Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
03 115HP 7420 MFWD Tractor	75,874	10	22,412	8,751	332	491	9,574
03 150HP 78104 WD Tractor	102,012	10	30,133	11,765	447	661	12,873
03 ATV	7,800	5	3,496	1,247	38	56	1,342
03 Brillion Seeder 18'	1,800	7	459	271	8	11	290
03 Chisel - Heavy 15'	8,000	12	1,108	903	31	46	979
03 Disc - Finish 18'	17,100	12	2,368	1,929	66	97	2,092
03 Disc - Stubble 18'	45,045	5	14,673	8,176	202	299	8,677
03 Disc - Border	2,100	12	291	237	8	12	257
03 Harrow - Spike 18'	772	12	107	87	3	4	94
03 Pickup 3/4 Ton	28,000	5	12,549	4,477	137	203	4,817
TOTAL	288,503		87,596	37,844	1,271	1,880	40,996
60% of New Cost *	173,102		52,558	22,706	763	1,128	24,597

*Used to reflect a mix of new and used equipment

UC COOPERATIVE EXTENSION

Table 4. COSTS PER ACRE to PRODUCE ALFALFA

SAN JOAQUIN VALLEY 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Weed-Grasses (TR-10)	0.00	0	0	21	9	30	
Make Semi-permanent Drain	0.01	0	0	0	0	1	
Insect-Aphid/Weevil (Lorsban)	0.00	0	0	12	9	21	
Weed-Spring (Prism)	0.00	0	0	20	9	28	
Irrigate - 10X	1.80	18	0	135	0	153	
Insect-Worm (Lannate)	0.00	0	0	10	9	19	
Fertilize 1X/2Yr	0.00	0	0	12	3	15	
Weed-Winter (Velpar/Karmex)	0.00	0	0	27	9	36	
Pickup Truck Use	0.24	4	2	0	0	6	
ATV Use	0.24	4	1	0	0	4	
TOTAL CULTURAL COSTS	2.28	25	2	237	46	311	
Harvest:							
Harvest - Haylage 2X*	0.00	0	0	0	0	0	
Harvest - Hay 7X	0.00	0	0	0	198	198	
TOTAL HARVEST COSTS	0.00	0	0	0	198	198	
Interest on operating capital @ 7.14%						9	
TOTAL OPERATING COSTS/ACRE		26	2	237	245	519	
CASH OVERHEAD:							
Liability Insurance						1	
Office Expense						25	
Property Taxes						38	
Property Insurance						2	
Investment Repairs						11	
TOTAL CASH OVERHEAD COSTS						77	
TOTAL CASH COSTS/ACRE						596	
NON-CASH OVERHEAD:		Per producing acre		-- Annual Cost -- Capital Recovery			
Land		3,500		219		219	
Building		50		4		4	
Hay Barn		41		4		4	
Fuel Tanks		3		0		0	
Shop Tools		11		1		1	
Irrigation System		451		40		40	
Alfalfa Establishment		346		130		130	
Equipment		14		2		2	
TOTAL NON-CASH OVERHEAD COSTS		4,416		400		400	
TOTAL COSTS/ACRE						996	

*Harvested by buyer

UC COOPERATIVE EXTENSION

Table 5. COSTS AND RETURNS PER ACRE to PRODUCE ALFALFA

SAN JOAQUIN VALLEY 2003

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Hay	7.00	ton	125.00	875	
Haylage	3.00	ton	32.30	97	
TOTAL GROSS RETURNS				972	
OPERATING COSTS					
Insecticide:					
Lorsban 4 E	2.00	pint	6.19	12	
Lannate 90 SP	0.50	lb	20.00	10	
Custom:					
Air Application	2.00	acre	9.00	18	
Buyer Harvests	3.00	ton	0.00	0	
Ground Application	3.00	acre	8.50	25	
Swath, Rake, Bale	7.00	ton	25.00	175	
Roadside Hay 1500 lb bale	7.00	ton	3.33	23	
Broadcast Fertilizer 1X/2Yr	0.50	acre	5.50	3	
Herbicide:					
Treflan TR-10	20.00	lb	1.05	21	
Prism	1.00	pint	19.62	20	
Velpar L	2.00	pint	9.50	19	
Karmex DF	1.50	lb	5.59	8	
Irrigation:					
Water	54.00	acin	2.50	135	
Fertilizer:					
11-52-0	75.00	lb	0.16	12	
Labor (machine)	0.58	hrs	13.14	8	
Labor (non-machine)	1.82	hrs	9.86	18	
Fuel - Gas	0.95	gal	1.58	2	
Fuel - Diesel	0.08	gal	1.11	0	
Lube				0	
Machinery repair				1	
Interest on operating capital @ 7.14%				9	
TOTAL OPERATING COSTS/ACRE				519	
NET RETURNS ABOVE OPERATING COSTS				453	
CASH OVERHEAD COSTS:					
Liability Insurance				1	
Office Expense				25	
Property Taxes				38	
Property Insurance				2	
Investment Repairs				11	
TOTAL CASH OVERHEAD COSTS/ACRE				77	
TOTAL CASH COSTS/ACRE				596	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Land				219	
Building				4	
Hay Barn				4	
Fuel Tanks				0	
Shop Tools				1	
Irrigation System				40	
Alfalfa Establishment				130	
Equipment				2	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				400	
TOTAL COSTS/ACRE				996	
NET RETURNS ABOVE TOTAL COSTS				-24	

UC COOPERATIVE EXTENSION

Table 6. MONTHLY CASH COSTS PER ACRE to PRODUCE ALFALFA

SAN JOAQUIN VALLEY 2003

Beginning JAN 03 Ending DEC 03	JAN 03	FEB 03	MAR 03	APR 03	MAY 03	JUN 03	JUL 03	AUG 03	SEP 03	OCT 03	NOV 03	DEC 03	TOTAL
Weed-Grasses (TR-10)		30											30
Make Semi-permanent Drain			1										1
Insect-Aphid/Weevil (Lorsban)			21										21
Weed-Spring (Prism)				28									28
Irrigate - 10X				15	15	31	31	31	15	15			153
Insect-Worm (Lannate)							19						19
Fertilize 1X/2Yr											15		15
Weed-Winter (Velpar/Karmex)												36	36
Pickup Truck Use	0	0	0	0	0	0	0	0	0	0	0	0	6
ATV Use	0	0	0	0	0	0	0	0	0	0	0	0	4
TOTAL CULTURAL COSTS	1	30	22	44	16	31	50	31	16	16	15	37	311
Harvest:													
Harvest - Haylage*			0								0		0
Harvest - Hay				28	28	28	28	28	28	28			198
TOTAL HARVEST COSTS			0	28	28	28	28	28	28	28	0		198
Interest on operating capital	0	0	0	1	1	1	2	2	2	-1	0	0	9
TOTAL OPERATING COSTS/ACRE	1	30	23	73	45	61	80	61	46	44	15	36	519
TOTAL OPERATING COSTS/ton**	0	4	3	9	6	8	10	8	6	6	2	5	65
OVERHEAD:													
Liability Insurance		1											1
Office Expense	2	2	2	2	2	2	2	2	2	2	2	2	25
Property Taxes	19						19						38
Property Insurance	1						1						1
Investment Repairs	1	1	1	1	1	1	1	1	1	1	1	1	11
TOTAL CASH OVERHEAD COSTS	23	4	3	3	3	3	23	3	3	3	3	3	77
TOTAL CASH COSTS/ACRE	24	5	26	76	48	64	103	64	50	47	18	39	596
TOTAL CASH COSTS/ton**	3	1	3	10	6	8	13	8	6	6	2	5	75

*Harvested by buyer **Based on 8 hay tons

UC COOPERATIVE EXTENSION
Table 7. RANGING ANALYSIS
SAN JOAQUIN VALLEY 2003

COSTS PER ACRE TO PRODUCE ALFALFA AT VARYING YIELDS

bold in tables = data in study	YIELD (ton/acre)						
Total Yield as Hay:	5.00	6.00	7.00	**8.00**	9.00	10.00	11.00
OPERATING COSTS:							
Cultural Cost	311	311	311	311	311	311	311
Harvest Cost - Hay	124	149	174	198	223	248	273
Interest on operating capital	8	9	9	9	10	10	11
TOTAL OPERATING COSTS/acre	443	469	494	518	544	569	595
Operating Cost/ton	89	78	71	65	60	57	54
CASH OVERHEAD COSTS	77	77	77	77	77	77	77
TOTAL CASH COSTS/acre	520	546	571	595	621	646	672
Cash Costs/ton	104	91	82	74	69	65	61
NON-CASH OVERHEAD COSTS	400	400	400	400	400	400	400
TOTAL COSTS/acre	920	946	971	995	1,021	1,046	1,072
Total Costs/ton	184	158	139	124	113	105	97

NET RETURNS PER ACRE **ABOVE OPERATING COSTS**

$/ton		YIELD (ton/acre)						
Hay		4.38	5.25	6.13	**7.00**	7.88	8.75	9.63
	Haylage	1.88	2.25	2.63	**3.00**	3.38	3.75	4.13
110.00	27.31	90	170	252	334	415	496	577
120.00	30.64	140	230	323	414	505	596	687
125.00	**32.30**	165	260	358	454	550	646	742
130.00	33.97	190	290	393	494	595	696	797
140.00	37.30	240	350	463	574	685	796	907
150.00	40.63	290	410	533	654	775	896	1,017
160.00	43.96	340	470	603	734	865	996	1,128
170.00	47.29	390	530	673	814	955	1,096	1,238

NET RETURN PER ACRE **ABOVE CASH COST**

$/ton		YIELD (ton/acre)						
Hay		4.38	5.25	6.13	**7.00**	7.88	8.75	9.63
	Haylage	1.88	2.25	2.63	**3.00**	3.38	3.75	4.13
110.00	27.31	13	93	175	257	338	419	500
120.00	30.64	63	153	246	337	428	519	610
125.00	**32.30**	88	183	281	377	473	569	665
130.00	33.97	113	213	316	417	518	619	720
140.00	37.30	163	273	386	497	608	719	830
150.00	40.63	213	333	456	577	698	819	940
160.00	43.96	263	393	526	657	788	919	1,051
170.00	47.29	313	453	596	737	878	1,019	1,161

NET RETURNS PER ACRE **ABOVE TOTAL COST**

$/ton		YIELD (ton/acre)						
Hay		4.38	5.25	6.13	**7.00**	7.88	8.75	9.63
	Haylage	1.88	2.25	2.63	**3.00**	3.38	3.75	4.13
110.00	27.31	-387	-307	-225	-143	-62	19	100
120.00	30.64	-337	-247	-154	-63	28	119	210
125.00	**32.30**	-312	-217	-119	-23	73	169	265
130.00	33.97	-287	-187	-84	17	118	219	320
140.00	37.30	-237	-127	-14	97	208	319	430
150.00	40.63	-187	-67	56	177	298	419	540
160.00	43.96	-137	-7	126	257	388	519	651
170.00	47.29	-87	53	196	337	478	619	761

UC COOPERATIVE EXTENSION

Table 8. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, and BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY 2003

ANNUAL EQUIPMENT COSTS

					Cash Overhead		
Yr Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
03 150HP 7810 4WDTractor	102,012	10	30,133	11,765	447	661	12,873
03 ATV	7,800	5	3,496	1,247	38	56	1,342
03 Ditcher - V	7,800	12	1,080	880	30	44	954
03 Pickup 3/4 Ton	28,000	5	12,549	4,477	137	203	4,817
TOTAL	145,612		47,258	18,370	652	964	19,986
60% of New Cost*	87,367		28,355	11,022	391	579	11,992

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

					Cash Overhead			
Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Repairs	Total
Building 2,400 sqft	60,000	20		5,338	203	300	1,200	7,041
Alfalfa Establishment	103,800	3		39,012	0	0	0	39,012
Fuel Tanks	3,500	20		311	12	18	70	411
Hay Barn	49,000	20		4,359	166	245	980	5,750
Irrigation System	135,300	20		12,036	457	676	2,706	15,876
Land	4,200,000	20	4,200,000	262,500	0	42,000	0	304,500
Shop Tools	13,072	20	1,307	1,128	49	72	131	1,380
TOTAL INVESTMENT	4,564,672		4,201,307	324,685	886	43,311	5,087	373,969

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	1,200.00	acre	1.04	1,248
Office Expense	1,200.00	acre	25.00	30,000

UC COOPERATIVE EXTENSION

Table 9. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY 2003

		COSTS PER HOUR						
			Cash Overhead			Operating		
Yr Description	Actual Hours Used	Capital Recovery	Insur-ance	Taxes	Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
03 150HP 7810 4WDTractor	1,599.70	4.41	0.17	0.25	2.65	11.11	13.76	18.58
03 ATV	284.20	3.41	0.10	0.15	0.57	1.82	2.39	6.06
03 Ditcher - V	165.50	3.19	0.11	0.16	2.11	0	2.11	5.57
03 Pickup 3/4 Ton	400.30	6.71	0.21	0.30	2.08	5.45	7.53	14.75

UC COOPERATIVE EXTENSION

Table 10. GROWER COSTS PER ACRE to HARVEST ALFALFA HAY

SAN JOAQUIN VALLEY 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost
Swathing	1.03	16	7	0	0	23
Raking	0.60	9	4	0	0	13
Baling	0.72	11	19	4	0	35
Roadsiding	0.20	3	9	0	0	12
TOTAL HARVEST COSTS	2.55	40	38	4	0	83
Interest on operating capital @ 7.14%						1
TOTAL OPERATING COSTS/ACRE		40	38	4	0	84
CASH OVERHEAD:						
Property Taxes						5
Property Insurance						4
TOTAL CASH OVERHEAD COSTS						9
TOTAL CASH COSTS/ACRE						93
NON-CASH OVERHEAD:						
Equipment						106
TOTAL NON-CASH OVERHEAD COSTS						106
TOTAL COSTS/ACRE						199

SUMMARY OF COSTS PER ACRE TO HARVEST ALFALFA

Operation	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre
Bale Twine (5 twine/bale)	1,043	ft	0.004	4
Labor (machine)	3.07	hrs	13.140	40
Fuel - Diesel	9.96	gal	1.110	11
Lube				2
Machinery repair				26
Interest on operating capital				1
TOTAL OPERATING COST/ACRE				84

ANNUAL HARVEST EQUIPMENT COSTS

Yr Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead: Insur- ance	Taxes	Total
03 150HP 7810 4WD Tractor	102,012	10	30,113	11,765	447	661	12,873
03 37HP 4WD Tractor	22,000	10	6,498	2,537	96	142	2,776
03 Baler 3/4 Ton bale	86,000	10	14,194	10,759	339	501	11,599
03 Bale Wagon NH1095	112,600	10	18,585	14,087	443	656	15,186
03 Bale Wagon 1500 lb Bale Attachment	21,450	10	3,540	2,684	84	125	2,893
03 Hay Rake 20'	19,305	10	3,414	2,398	77	114	2,588
03 Swather 14' Header	69,700	10	12,326	8,658	277	410	9,346
	433,067		88,690	52,889	1,764	2,609	57,261
60% of New Cost*	259,840		53,214	31,733	1,058	1,565	34,357

* Used to reflect a mix of new and used equipment

UC COOPERATIVE EXTENSION

Table 11. OPERATIONS WITH EQUIPMENT

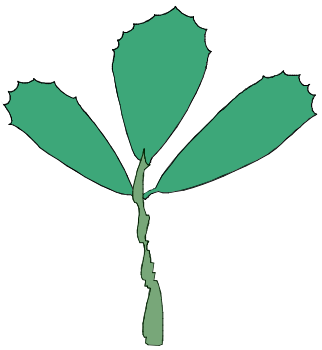
SAN JOAQUIN VALLEY 2003

Operation	Operation Month	Equipment Tractor	Equipment Implement	Material	Rate/acre	Unit
Cultural:						
Weed-Grasses (TR-10)	February	Ground-Custom		Treflan TR-10	20.00	lb
Make Semi-permanent Drain	March	150 HP 4WD	Ditcher-V			
Insect-Aphid/Weevil-Lorsban	March	Air-Custom		Lorsban 4	2.00	pt
Weed-Prism	April	Ground-Custom		Prism	1.00	pt
Irrigate - 10X	April			Water	5.40	acin
	May			Water	5.40	acin
	June			Water	10.80	acin
	July			Water	10.80	acin
	August			Water	10.80	acin
	September			Water	5.40	acin
	October			Water	5.40	acin
Insect-Worm Lannate	July	Air-Custom		Lannate SP	0.50	lb
Fertilize 1/2 cost	November	Ground-Custom		11-52-0	75.00	lb
Weed-Winter Velpar/Karmex	December	Ground-Custom		Velpar L	2.00	pt
				Karmex DF	1.50	lb
Pickup Truck Use	Annual	Pickup 3/4 Ton				
ATV Use	Annual	ATV				
Harvest - Haylage 2X	March	Buyer				
	November	Buyer				
Harvest - Hay 7X	April	Custom				
	May	Custom				
	June	Custom				
	July	Custom				
	August	Custom				
	September	Custom				
	October	Custom				

U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

ALFALFA



SEED PRODUCTION

IMPERIAL COUNTY – 2004

Prepared by:
Herman S Meister Farm Advisor, U.C. Cooperative Extension, Imperial County

For an explanation of calculations used for the study refer to the attached General Assumptions or call the author, Herman Meister, at the Imperial County Cooperative Extension office, (760)352-9474 or e-mail at hmeister@ucdavis.edu.

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University of California and the United States Department of Agriculture cooperating.

FOREWORD

We wish to thank growers, pest control advisors, chemical applicators and chemical dealers, custom farm operators, fertilizer dealers, seed companies, contract harvesters, equipment companies, and the Imperial County Agricultural Commissioner's office for providing us with the data necessary to compile this circular. Without their cooperation we could not have achieved the accuracy needed for evaluating the cost of production for the field crop industry in Imperial County.

The information presented herein allows one to get a "ballpark" idea of field crop production costs and practices in the Imperial County. Most of the information was collected through verbal communications via office visits and personal phone calls. The information does not reflect the exact values or practices of any one grower, but are rather an average of countywide prevailing costs and practices. Exact costs incurred by individual growers depend upon many variables such as weather, land rent, seed, choice of agrichemicals, location, time of planting, etc. No exact comparison with individual grower practice is possible or intended. The budgets do reflect, however, the prevailing industry trends within the region.

Overhead usually includes secretarial and office expenses, general farm supplies, communications, utilities, farm shop, transportation, moving farm equipment, accountants, insurance, safety training, permits, etc. Eleven to 13% of the total of land preparation, growing costs and land rent was used to estimate overhead. Hourly rates vary with each crop depending on the workman's compensation percentages.

Since all of the inputs used to figure production costs are impossible to document in a single page, we have included extra expense in man-hours or overhead to account for such items as pipe setting, motor grader, water truck, shovel work, bird and rodent control, etc. Whenever possible we have given the costs of these operations per hour listed on the cultural operations page. Some custom operators have indicated that they are instituting a "fuel surcharge" to reflect "spikes" in fuel cost.

Not included in these production costs are expenses resulting from management fees, loans, providing supervision, or return on investments. The crop budgets also do not contain expenses encumbered for road and ditch maintenance, and perimeter weed control. If all the above items were taken into account, the budget may need to be increased by 7-15%.

Where applicable we have used terminology that is commonly used in the agricultural industry. These terms are compiled in a glossary at the end of the circular. We feel that an understanding of these terms will be useful to entry-level growers, bankers, students and visitors.

Herman S Meister, Agronomy Advisor & Senior Editor

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2004-2005 Tillage & Harvest Rates
IMPERIAL COUNTY

HEAVY TRACTOR WORK & LAND PREPARATION

OPERATION	$/ACRE
Plow	32.00
Subsoil 2nd gear	45.00
Subsoil 3rd gear	38.00
Landplane	14.00
Triplane	12.00
Chisel 15”	26.00
Wil-Rich chisel	17.00
Big Ox	25.00
Slip plow	43.00
Mark/disc borders	10.50
Make cross checks (taps)	6.75
Break border	6.50
Stubble disc/with cultipack	22.50/24.50
Regular disc/with cultipack	13.00/15.00
List 30”-12 row/40” 8 row	16.50
Float	11.50
Dump (scraper) borders	18.25
Corrugate	14.00

LIGHT TRACTOR WORK

Power mulch dry	27.50
Power mulch with herbicide	31.00
Shape 30” 6-row / 40” 4-row	12.75/12.75
Plant sugar beets & cotton 30”/40”	17.00/15.00
Plant vegetables	20.00
Mulch plant wheat	20.25
Plant alfalfa (corrugated)	18.50
Plant alfalfa (beds)	19.00
Plant bermudagrass	13.75
Plant with drill (sudangrass, wheat)	14.75
Plant corn slope	17.00
Cultivate 30”/40” beds 4-row	16.00/14.00
Spike 30”/40” beds 4-row	13.00/11.00
Spike and furrow out 30”/40” 4-row	14.00/12.00
Furrow out 30”/40” beds 4-row	13.00/11.00
Lilliston 30” 6-row / 40” 4-row	14.00/14.00
Lilliston 30” 6 row/ 40” 4-row/ herb	15.50/15.50
Inj fert & fur out 30”/ 40” beds 4-row	16.50/14.50
Fertilize dry & fur out 30”/ 40” 4-row	17.00/15.00
Inject fertilizer flat	15.00
Broadcast dry fertilizer	8.00
Ground spray 30”/40” 8-row	12.00
Chop cotton stalks 30”/40”beds	16.00/14.00
List 80” melon beds	20.00
Plant 80” melon slope beds	22.00
Back fill furrow (melons)	9.5
Cultivate 80” melon slope beds	18.00
Center 80” melon beds	17.00
Re-run 80” melon beds	11.00
Inject fertilizer & furrow out 80” melon beds	18.00
Bust out 80” melon beds	12.00

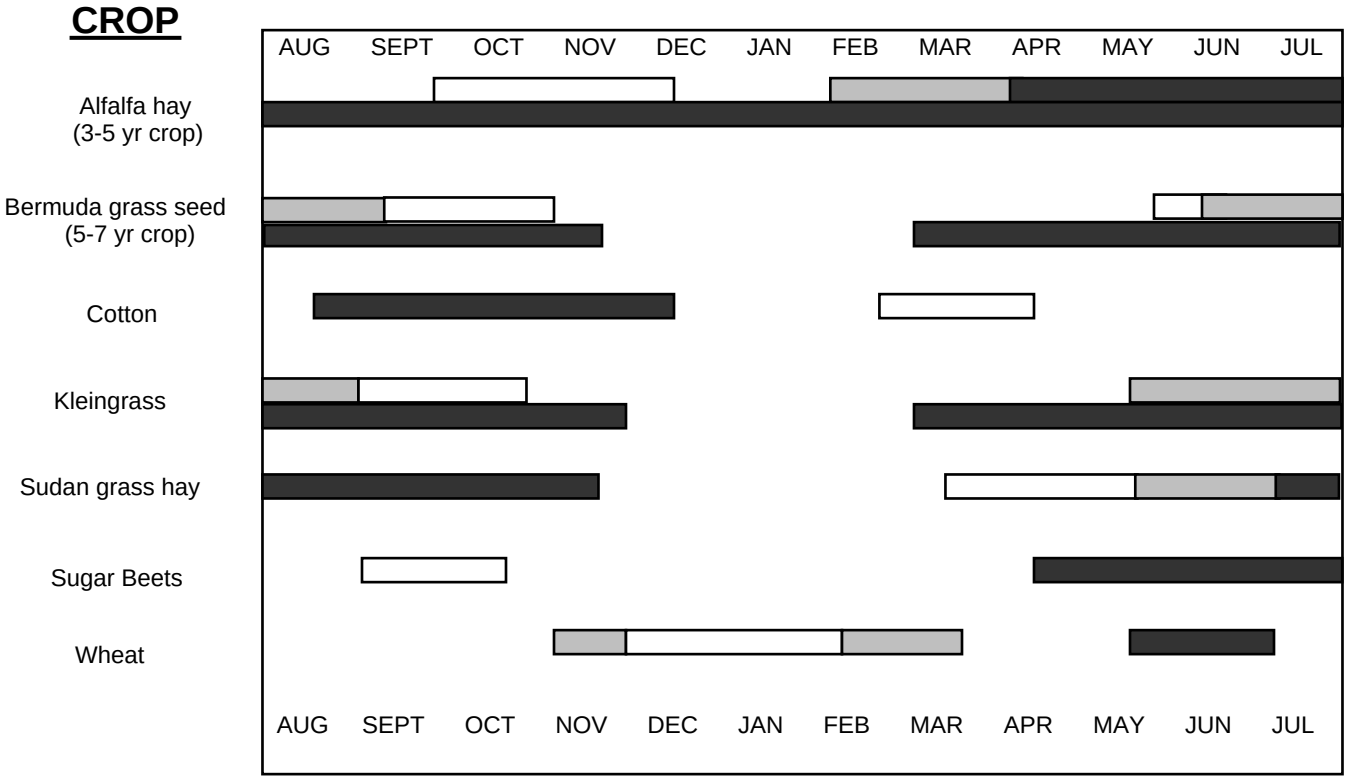
HARVEST COSTS-FIELD CROPS

	BY UNIT
Windrow alfalfa seed	17.50/acre
Combine alfalfa seed	41.00/acre
Swath bermudagrass	13.75/acre
Rake bermudagrass	5.50/acre
Swath sudangrass	11.25/acre
Rake sudangrass	6.00/acre
Swath alfalfa	8.75/acre
Rake alfalfa	5.00/acre
Bale (all types of hay- small bale)	0.70/bale
Haul & stack hay – small bale	0.27/bale
Bale (large bale 4X4)	7.50/bale
Haul & stack big bale	3.50/bale
Load with hay squeeze	62.50 / load
Dig sugar beets	2.65/clean ton
Haul sugar beets	2.50/clean ton
Combine wheat	16.00 per acre + 0.60 /cwt. over 1 ton
Haul wheat	5.00/ton
Combine bermudagrass seed 1st time	42.50/acre
Combine bermudagrass seed 2nd time	26.50/acre
Haul bermudagrass seed (local)	175/load
Pick Cotton 1st/2nd	03cts/lb/35.00/acre

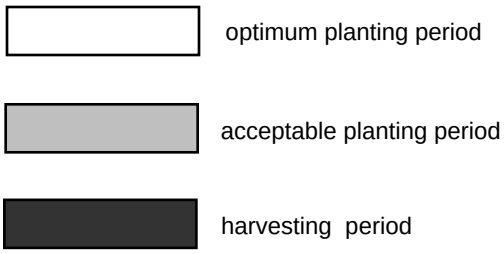
MISCELLANEOUS RATES BY THE HOUR

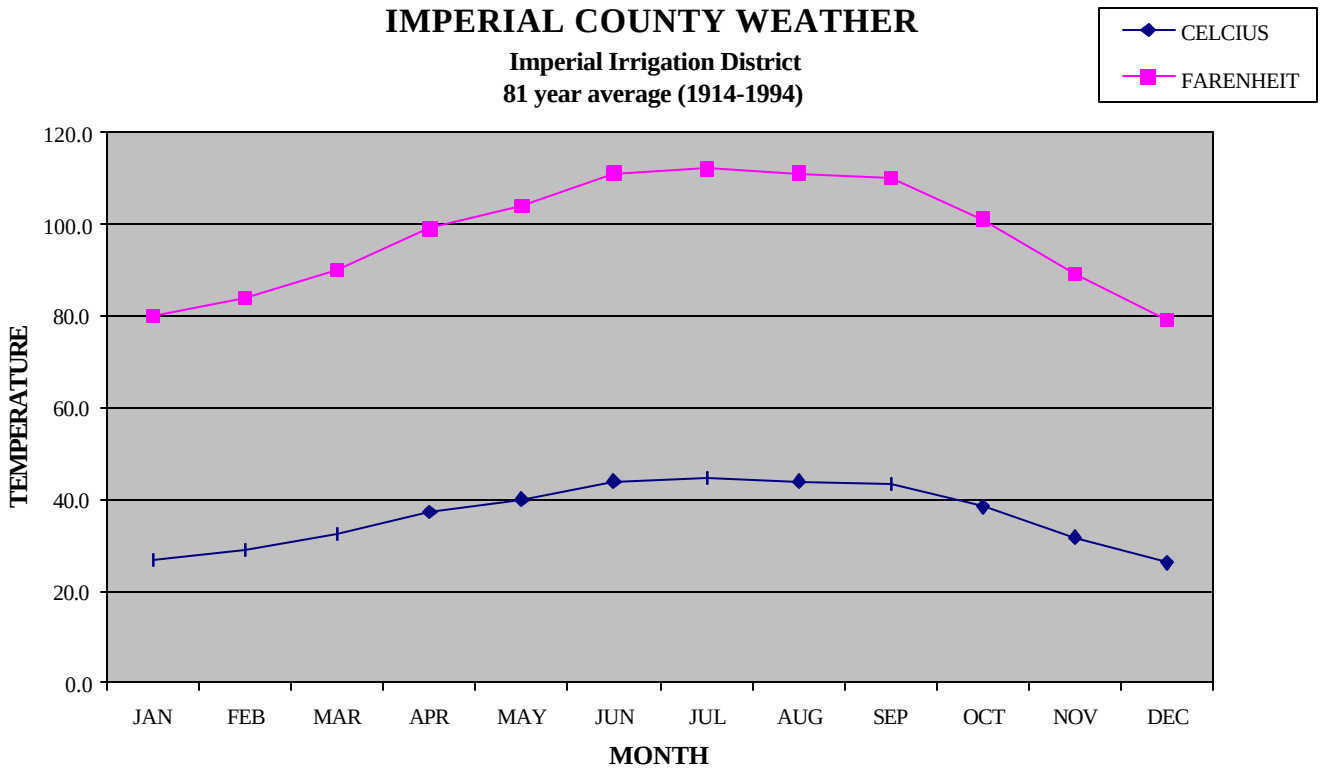
	$/HR
Motor grader	55.00
Backhoe	50.00
Water truck	40.00
Wheel tractor	35.00
Scraper	36.00
Versatile	60.00
D-6	56.00
D-8	73.00
Buck ends of field	35.00
Pipe setting (2 men)	38.00
Laser level	90.00
Work ends (disc out rotobucks)	40.00

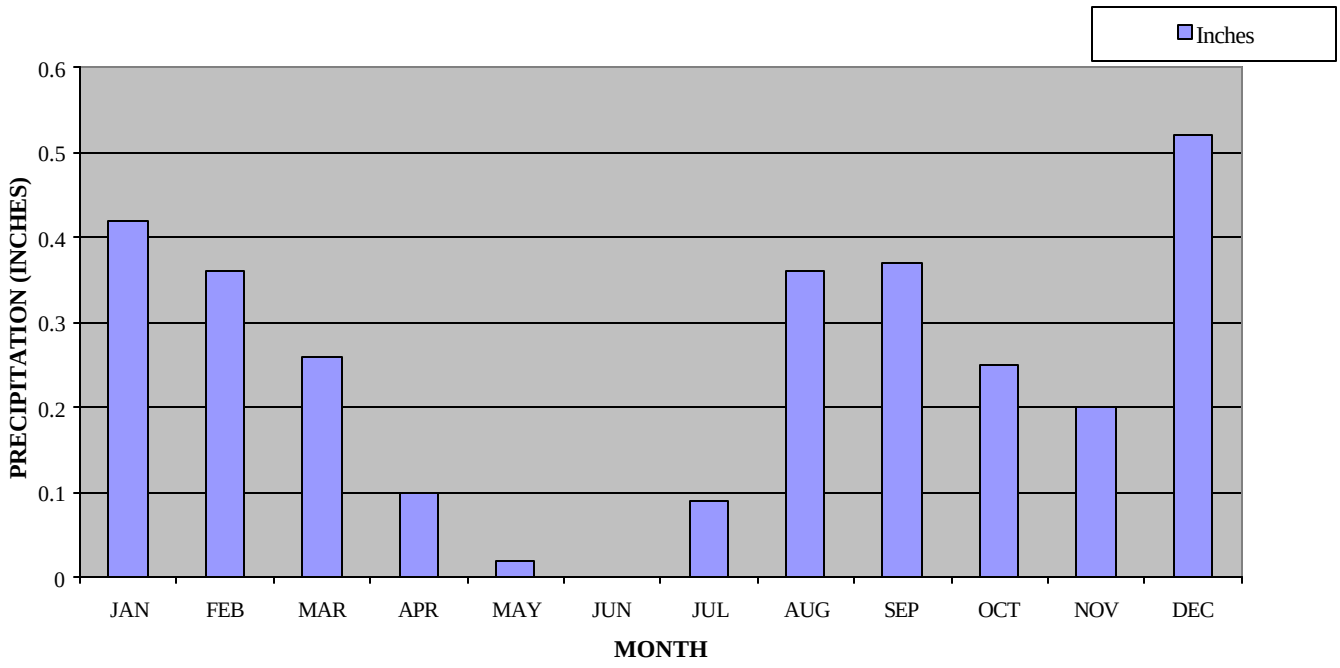
FIELD CROPS
PLANTING & HARVESTING CALENDAR
IMPERIAL VALLEY, CALIFORNIA



MONTH




IMPERIAL COUNTY WEATHER
Imperial Irrigation District
81 year average (1914-1994)
CELCIUS
FARENHEIT
TEMPERATURE
120.0
100.0
80.0
60.0
40.0
20.0
0.0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH


Inches
PRECIPITATION (INCHES)
0.6
0.5
0.4
0.3
0.2
0.1
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

IMPERIAL COUNTY PROJECTED ALFALFA SEED PRODUCTION COSTS 2004-2005

Flat Planted Culture - 80 acre field

Mechanical operations at prevailing rates. Hand labor at $9.45/hr ($6.75 plus SS, workman's compensation, unemployment and fringe benefits)

Typical yield of 450 pounds of clean seed (~600 pounds noncleaned) in 90 days on an established alfalfa hay stand.

OPERATION	Prevailing Rate	MATERIALS Type/Amount	MATERIALS Cost	HAND LABOR Hours	HAND LABOR Dollars	COST Per Acre
SEED PRODUCTION COSTS						
Irrigate 4x		Water 1.5 ac-ft	24.00	1.25	11.81	35.81
Insect control 3x	9.00	Insecticides	50.00			77.00
Bees		3 colonies @ 28.00	84.00			84.00
TOTAL GROWING PERIOD COSTS						**196.81**
Land rent (net acres)						115.00
Cash overhead--	11 % of growing period costs and land rent					34.30
TOTAL PREHARVEST COSTS						**346.11**
HARVEST COSTS @ 600 pounds / acre						
Windrow 1x	17.50 /acre					17.50
Combine	41.00 /acre					41.00
Hauling	175.00 truck load				~estimate	2.50
Cleaning seed	7.00 /cwt.	600 lbs non-clean seed				42.00
Bags	1.00 /cwt.	450 lbs clean seed				4.50
Seed Research Fee	0.15 /cwt.					0.68
TOTAL HARVEST COSTS						**108.18**
TOTAL ALL COSTS						**454.29**

PROJECTED NET GAIN (PER ACRE)

Yield	Price/pound ($)					Breakeven
Pounds clean seed/ac	**0.80**	**1.00**	**1.20**	**1.40**	**1.60**	**$ per pound**
200	-270	-230	-190	-150	-110	2.15
300	-202	-142	-82	-22	38	1.47
400	-134	-54	26	106	186	1.13
500	-65	35	135	235	335	0.93
600	3	123	243	363	483	0.80

IMPERIAL COUNTY ALFALFA SEED CULTURE 2004-2005

Annual acreage, yield, and value of alfalfa seed in Imperial County for five consecutive years

Year	Acres	lbs/Acre	Value/Acre
2003	15,882	360	$331
2002	12,559	392	$368
2001	15,328	371	$374
2000	26,462	426	$396
1999	24,362	411	$517

(Source: I.C. Agricultural Commissioner's Reports)

STARTING DATES: Starting times can vary for alfalfa seed production, but generally fall between May 1st and June 1st depending on the hay market to some degree. Most alfalfa seed is produced from hay fields that will be rotated to another crop in the fall. In recent years, more alfalfa has been planted on beds and this method is contributing to the overall production. Starting seed crops later (maturing for harvest in late August and into September) are exposed to high insect populations and weather related harvest problems. Seed crops started in April do not bloom properly and set seed poorly.

YIELD: Seed yields depend upon weather conditions during seed set as well as the severity of insect infestation levels and the need for pesticide applications. Heavy rain can ruin a seed crop in minutes. Seed yield per acre varies from a few hundred pounds to as much as 1,000 pounds.

Often seed is made from fields producing alfalfa hay as the main crop. Normally there is a lower rent charged against the seed crop on a hay field than one leased to grow seed alone. If a field were selected for seed only or leased for seed, the rent might be $140 per acre or more.

VARIETIES: A number of non-dormant varieties, both public and proprietary, are grown in Imperial County. Any alfalfa variety may be grown for seed; however, the grower should follow seed market trends before making a decision to grow a seed crop. Some growers produce seed for their own use. Occasionally, a small acreage of dormant varieties will be grown by special arrangement if seed demand indicates good potential returns.

IRRIGATION: Early in the cycle, allow the plants to become water stressed to initiate bloom and prevent rank vegetative growth. After bloom begins, the plants should be irrigated no more

frequently than necessary to prevent wilting and to help produce well-filled seedpods. The flowers of a slightly stressed plant and are more attractive to bees.

POLLINATION: Honey bees are the preferred pollinators for alfalfa seed production. In Imperial County, it is necessary to rely on commercial honeybees or commercial solitary bees due to the lack of availability of sufficient numbers of wild bees. At least three colonies of bees per acre are needed to produce high seed yields. Five or more colonies may produce higher seed yields on fields with high seed potential. Since the price of bees is high ($28/colony), some growers prefer to use fewer bees.

PEST CONTROL: Lygus control is necessary throughout the season to protect buds and young developing seeds. Stinkbugs can cause damage to maturing seed and should be controlled. Seed chalcid is best managed by proper cultural practices, as insecticides have not been cost effective. Consult your pest control advisor for information on currently registered insecticides.

As with hay production, Root rot (*Phytophthora* spp.) stem canker (*Rhizoctonia solani*) and anthracnose (*Colletotrichum trifolii*) can be severe problems.

HARVESTING: The seed crop may be desiccated with foliar applied desiccants or windrowed to facilitate combining. Flowering to a mature seedpod usually takes approximately 21 days.

GLOSSARY

10% Bloom stage of growth in alfalfa when 10% of the stems are flowering.

Bale or Baling Compacting dried alfalfa or grass into a compact package usually weighing 100-120 lbs.

Bed Mounded soil that is shaped and used for planting; beds are separated by furrows.

Berry see *kernel*

Big Ox® A chisel with 7 shanks used to rip soil 18-24 inches deep.

Blacken the beds To thoroughly wet/darken a bed with irrigation water applied in furrows.

Black point Darkened, sometimes shriveled embryo end of wheat seed; caused by several fungi including *Alternaria*, *Fusarium*, and *Helminthosporium*; also called kernel smudge.

Bleach Loss of green color in hay due to sun exposure.

Boot stage Stage of wheat development when the sheath surrounding the inflorescence expands.

Break borders To tear down flat flood borders or flat crop borders.

Broadcast To spread seed on the soil surface.

Buck ends of field The remaking of beds at the end of a field in order to channel when beds at the end of a field are destroyed due to insufficient turn around space for farm equipment.

Chisel A tractor-mounted, knifelike implement used to rip soil 15-20 inches deep.

Corrugation Ridges made in soil to control the flow of water down a field (mini-beds). Name stems from the resemblance to corrugated sheet metal.

Crimping Mechanical operation used to crush stems of hay for better curing.

Cross checks Small dikes at perpendicular angles to borders used for water diversion into a field; also called taps.

Cultipacker A farm implement used to break up clods of soil; consists of groups of knobbed metal rings stacked together; also called a ringroller.

Cultivate To work beds after planting in order to control weeds, loosen soil, and allow for application of fertilizer

Custom rate The value assigned to a cultural operation by farmers or contractors for cost accounting; normally includes the cost of the operator.

Cwt of CWT One hundred pounds

Damping-off A fungal disease of seedlings

Dough stage Stage of wheat kernel development, when kernels are mature, but not hardened.

Dormant varieties Alfalfa varieties which do not produce much growth in cold weather.

Drill Type of planter used for cereals.

Dump borders See *scraper borders*

Eagle beak Type of planter shoe shaped like an eagle's beak used in mulch planting crops such as wheat.

Float A large, wooden frame pulled with a tractor for rough leveling of the soil surface.

Flood irrigation A method of irrigation where water is applied a field by gravity; the water is channeled by earth borders that are usually 70-200 feet apart.

Full bloom Alfalfa blooming at maximum potential.

Furrow irrigation A method of irrigation where water is applied to fields by gravity flow, down furrows; the water enters the bed by capillary action.

Furrow out The movement of soil from furrows to beds by tractor-mounted shovels; removes impediments to irrigation water.

Grated pipe Large diameter pipes used to deliver low pressure water to each furrow; used to keep head end of field dry for cultivation or harvesting.

Green chop Alfalfa that is cut green and dehydrated for making alfalfa pellets.

Ground spray The application of an agrichemical by a tractor-mounted sprayer.

Inject fertilizer The application of liquid of liquid fertilizer in the top or sides of a bed.

Irrigate up To irrigate a crop to emergence.

Kernel smudge See *black point*.

Landplane A large, tractor-pulled land leveling machine.

Laser level A land surface leveler that uses a laser guiding device to maintain an accurate grade.

Layby To apply an herbicide or other agrichemical at the last opportunity to enter a field with a tractor prior to harvest.

Lilliston A rolling cultivator with curved tines which uses ground speed to assist in working up the soil surface in order to destroy weeds.

Listing Throwing soil into a mound to make beds.

Lodge Cereals falling over due to the weight of the seed and lack of stem strength.

Motor grader A large grader normally used to cut tail ditches for draining off excess surface water.

Mulch plant Planting seed into moist soil; no additional irrigation needed to germinate crop.

Noncruciferous Any crop other than members of the cabbage family (e.g., broccoli, brussell sprouts, cauliflower, etc.)

Nondeterminant Describes a plant's growth habit; plant size is not determined and may increase (within limits) as long as proper growth conditions exist.

Off types Plant types whose characteristics differ from those of the true variety.

Pipe setting Installing 2-inch plastic tubes through a soil berm with a hydraulic ram; the pipes are used to control the flow of irrigation water.

Pinch wheel Type of sugar beet harvester which grasps the beet leaves by pinching.

Planting to stand Planting the same number of seeds as the desired number of plants in a field.

Plow To mix soil by inversion.

Power mulch A tractor-mounted, power rototiller.

Pull borders To make flood berms used to channel the flow of surface applied water.

Punching pipe see *pipe setting*.

Raking Rolling hay to a windrow in order to dry, or combining windrows.

Random flow planter A non-precision planter; seed drop is regulated by agitating the seed in a hopper over a hole; planting rate depends upon hole size and tractor speed.

Rank growth Excessive growth.

Roll beds To roll a large, metal roller over the tops of beds in order to firm them prior to thinning.

Rototill To mechanically mix soil.

Row A line of plants or a bed with a single line of plants.

Scald Death of plants due to excessive soil moisture during period of high temperature causing lack of oxygen to the plant roots; e.g., alfalfa, bermuda grass, and sudan grass.

Scraper borders Method of making borders without leaving low spots in soil within the area to be planted; helps to prevent water puddling thus preventing scald and root diseases.

Seed line A line down a bed in which seeds are planted.

Semolina flour Flour made from Durum wheat and used to make pasta.

Shatter Loss of grain from the seed heads prior to harvest, often caused by wind or moisture.

Sidedress To place pesticides or fertilizers in a band next to a row of plants.

Slip plow An implement pulled by a caterpillar and used to make deep cuts into the soil whereby soil from below is carried upward into the cut; used to improve drainage.

Solitary bees Type of bee used for pollination which lives alone, not in colonies.

Spike The running of tractor-mounted shanks into the soil or beds to improve aeration and drainage.

Spike wheel Type of sugar beet harvester using long metal spikes to penetrate the beets and hold them while lifting them out of the ground.

Stand The density of plants in a field after emergence.

Stubble disc An implement used to chop crop residue and incorporate it into the soil; the blades are scalloped unlike a standard disc..

Subbing Irrigation method where water is applied to a field in furrows and allowed to travel across beds by capillary action.

Subsoil The pulling of large, hard-faced shanks through the soil up to 42 inches deep; used to shatter soil layers and improve drainage, and leach salts.

Top crop Cotton bolls set at the top of the plant; the late crop.

Triplane A smaller, three-wheeled version of a *landplane*.

Versatile A large 4-wheel drive tractor used to pull discs and other implements.

Water back Irrigate again, often after sprinkling.

Water fun An application of an agrichemical in irrigation water (i.e., furrow irrigation).

Wil-rich chisel plow An implement used to work wet or moist soils prior to making beds.

Windrow Forage cut from the plants and raked into a single line for curing and baling.

Work ends Miscellaneous field operations including use of a motor grader to cut a tail ditch for irrigation drain water; or bucking ends and pipe punching.

Yellowberry wheat kernels that are yellow rather than the normal opaque; usually the result of insufficient, nitrogen fertilization.

AM-VS-03-2

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2003

SAMPLE COSTS TO ESTABLISH AN ALMOND ORCHARD AND PRODUCE

ALMONDS

SAN JOAQUIN VALLEY SOUTH
MICRO-SPRINKLER IRRIGATION

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH an ALMOND ORCHARD and PRODUCE ALMONDS

San Joaquin Valley South - 2003

Micro-Sprinkler Irrigation

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University of California and the United States Department of Agriculture, Risk Management Agency , Cooperating

INTRODUCTION

Sample costs to establish an almond orchard and produce almonds under micro-sprinkler irrigation in the Southern San Joaquin Valley are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production practices considered typical for the 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, "Your Costs", in Tables 2 and 3 is provided to enter your costs.

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 call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-3589 or your local UC Cooperative Extension office.

Sample Cost of Production Studies for many commodities are available and can be requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-4424. Current studies can be downloaded from the department website http://coststudies.ucdavis.edu or obtained from the local county UC Cooperative Extension offices. Some archived studies are also available on the website.

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ASSUMPTIONS

The assumptions refer to Tables 1 to 8 and pertain to sample costs to establish an orchard (Table 1) and produce almonds (Tables 2-8) in the Southern San Joaquin Valley under micro-sprinkler irrigation. Practices described represent production practices and materials considered typical of a well-managed orchard in the region. The costs, materials, and practices shown in this study will not apply to all situations. Establishment and production cultural practices vary by grower and the differences can be significant. **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.**

Land. The hypothetical farm consists of 105 contiguous acres farmed by the owner. Almond establishment and production are on 100 acres. Road, irrigation systems and farmstead occupy five acres.

Establishment Operating Costs

Site Preparation. The new orchard is planted (established) on land previously planted to an orchard. The land is assumed to be well drained and either a class I or II soil with a Storie index above 70%.

Orchard Removal. In October the trees are pushed over and then chipped. This is followed by orchard cleanup – stump removal and root removal. Orchard removal fees vary considerably. The lowest fees appear to be those in conjunction with cogeneration plants, where the plant keeps and grinds the wood.

Land Preparation. The tree row is slip plowed one time to break up layered or compacted soil. The row middles are ripped one time to a five-foot depth. The land is disked four times in different directions, berms made, and the tree rows fumigated. Custom operators do all operations, including fumigation, to prepare the orchard for planting in the year prior to planting, but costs are shown in the first year.

Planting. In February, contract labor companies who specialize in orchard planting do the planting operation. They dig (auger) the planting holes, plant, prune, spray trees with bactericide, and place a tree guard around the trunk. The tree guards protect against above ground rodents, herbicide sprays, and sunburn. In the second year, one tree per acre is replanted.

Trees. The Nonpareil almond variety and two other suitable pollinators are planted at 110 trees per acre on a 22 X 18-foot spacing. Almond orchards will include at least two or more varieties in which pollen shedding and bloom periods overlap to insure good pollination. Planting densities may range from 75 to 180 trees per acre. In the high-density or closer plantings (greater than 130 trees per acre), more intensive management is needed to prevent excessive insect and disease problems. The life of the orchard at the time of planting is estimated to be 22 to 25 years.

Fertilization. Leaf samples are taken in June/July for nutrient analysis and the fertilizers applied according to analysis recommendations. Fertilizer rates in this study are typical nutrient requirements, but do not take into account soil and water nitrogen. In the first year, equally split applications of nitrogen (N) as ammonium nitrate are made one-half in the spring (March) and one-half in the summer (July). The fertilizer is hand applied near the base of the trees (approximately 18-inches from the trunk). Beginning in the second year, equal applications of N are applied in the spring (March) and summer (July) through the irrigation system. One or two zinc chelate applications are made from May through September. In this study, zinc chelate is applied in May and September during the first and second year. The May sprays are combined with the mite sprays in the first and second years. Beginning in the fifth year, boron (Solubor) is sprayed on the trees in October. Annual rates of actual N used in this study are shown in Table A.

Table A. Applied Actual Nitrogen

Year:	1	2	3	4	5	6+
	lbs/acre					
N:	20	40	100	140	200	240

Training/Pruning. Suckering is done by grower labor twice (April and May) in the first year and once (May) in the second year. Training which includes pruning begins in December of the first year or January of the second year. In this study, pruning begins in the second year. A labor contractor does the pruning and tying each year. A custom or contract operator pushes the prunings out of the orchard, stacks and burns them. Pruning is heavier in the fourth year than in the past, because of the lower limbs that were left during the three previous seasons, resulting in higher pushing and burning costs.

Winter Sanitation. Winter (December) sanitation begins in the third year. In this study a minimal cost for hand poling is allocated in the third year and beginning in the fourth year, the costs include a custom operator who shakes the mummy nuts from the trees, and blows and rakes them into the row middles where the grower shreds them.

Pollination. A commercial beekeeper sets out 1/2 hive per acre in the third year, 2 hives per acre in the fourth year, 3 hives per acre from the fifth year and thereafter. The hives are placed in the orchard in early February, prior to bloom.

Irrigation. Water is pumped from a reservoir, through an infiltration system into the micro-sprinkler system. In this study water costs $10.50 per acre-inch. No assumption is made about effective rainfall. The drip irrigation line is laid out in December at which time 2 acre-inches of water is applied to the berms. Bubblers are used at each tree for irrigation through the first year. The micro sprinklers are installed in the second year and moved to the center of the trees. The amount of water applied each year is shown in Table B.

Table B. Applied Water

Year	AcIn/Yr
1	5
2	16
3	26
4	47
5+	52

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials available are listed in *UC Integrated Pest Management Guidelines, Almonds* available online at www.imp.ucdavis.edu . Pesticides mentioned in the study are commonly used, but are not recommendations.

Weeds. During February of the first year, after planting, the six-foot berm strip is sprayed with Treflan and incorporated with light discing. The row middles are disked four times – April, May, August October/November. In the second year, the row middles are disked five times – January, April, May, August, October/November. Beginning in the first year and in subsequent years a spot spray using Roundup is applied to the tree row in the spring (March) and summer (July). A dormant strip spray with Surflan and Goal is

applied beginning in the winter of the first year (December) or second year (January in this study). In February of the third year after the first discing, the row middles are floated and rolled to prepare the orchard floor for harvest. The resident vegetation is allowed to grow and is mowed four times – April, May June and July. Beginning in the fourth year, the row middles are mowed six times – March for frost control; April, two times; one time each in June, July, and August. Beginning in the third year, Roundup is applied to the entire orchard floor in August prior to harvest.

Insects. In May of the first year, peach twig borer is controlled with Diazinon. Beginning in the second year, a dormant spray in January or early February with Supreme Oil and Asana controls peach twig borer (PTB), San Jose scale (SJS), and brown almond and European red mites. In May of the first, second and third years, mites are controlled with an Agrimek and Supreme Oil application. Beginning in late June/July of the third year, ant bait (Clinch or Distance) is broadcast on the field for ant control. Navel orange worms (NOW) and mites are treated in June (hull split spray) with Imidan and Omite. The sprays in the first and second years are applied with a handgun that is attached to the sprayer. It is assumed that one person drives the tractor that pulls the sprayer and one person sprays the trees with the handgun, both labor costs are included in the application costs. Label rates may be reduced during the first three years, because of the small tree size.

Diseases. Beginning in the fourth year, brown rot is treated at full bloom with Rovral. Shot hole, botrytis (green fruit rot) and scab are treated two to three weeks later – mid-March - with Ziram and Vangard. Alternaria and rust may be a problem in some areas, but not every year and is not included as a cost in the study.

Vertebrates. Gophers in this study are managed in the first three years with poison bait applied in the spring and fall using a hand bait applicator. Beginning in the fourth year, gophers are controlled in the spring with gopher bait and ground squirrels in the late spring with an anti-coagulant squirrel bait. Squirrels may also be controlled with a late winter fumigation when soil moisture is adequate.

Harvest. Mechanical harvesting and pickup by a custom operator begins in the third year. The nuts are removed from the trees by shaking, moved to the centers by sweeping and hand raking, picked up and transported to a hulling and shelling facility.

Yields and Returns. Almonds begin bearing an economic crop in the third year after planting. Typical annual yields for almonds are measured in meat (kernel) pounds per acre and are shown in Table C.

Table C. Annual Yields

Year	Kernel Pounds
3	600
4	1,200
5	2,400
6	2,600
7+	2,800

Production Operating Costs

Winter Sanitation. Winter (January) sanitation destroys over-wintering sites for navel orange worm. A custom operator shakes the mummy nuts from the trees, and blows/rakes them into the row middles where the grower shreds them. Some hand poling is included in the cost, but often is needed in low rainfall years and costs can range from $80 to $400 per acre, depeinding on the number of mummy nuts. Some growers may pole the nuts at harvest after shaking to include the nuts in the yield and reduce poling costs for removing mummy nuts.

Pruning. Hand pruning is done by contract labor in December, but can be done anytime after harvest through the dormant period. The prunings are stacked in the row middles and a custom operator pushes them out of the orchard into a stack where they are burned. The practice of burning will change over the next few years due to new air pollution laws.

Irrigation. Water is pumped from a reservoir, through an infiltration system into the micro-sprinkler system. In this study water costs $10.50 per acre-inch ($126 per acre-foot) and includes the pumping cost from the reservoir. The irrigation costs includes the water and irrigation labor. A total of fifty-two acre-inches of water is applied to the orchard. Water costs in the San Joaquin Valley vary by water district and costs the grower from $30 to $200 per acre-foot. No assumption is made about effective rainfall, evaporation, and runoff.

Frost Protection. The resident vegetation is mowed in March. Also, when temperatures drop below freezing during or after bloom, water will be applied to the field during these periods.

Pollination. Three hives (6-7 frames/hive) per acre are contracted for pollination and set in the orchard by the beekeeper prior to bloom.

Fertilization. Nitrogen (N) as UN-32 at 240 pounds per acre is applied in equal amounts in March and July through the micro-sprinklers. Fertilizer labor charges are included with the irrigation costs. The irrigator connects the fertilizer tank to the irrigation system. Boron (Solubor) is foliar applied in October. Fertilizer rates in this study are typical nutrient requirements, but do not take into account soil and water nitrogen. Leaf samples are taken in June/July for nutrient analysis and the fertilizers applied according to analysis recommendations. Leaf samples in this study are calculated at one per 20 acres and analyzed for N, P, K, B, Na, and Zn. The cost includes the labor to collect and prepare the samples and lab fees.

Fall Defoliation. Zinc sulfate is applied in mid-November, mainly to defoliate the tree. This also allows for early pruning and provides secondary control for rust and some diseases.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Almonds*. For more information on other pesticides available, pest identification, monitoring, and management visit the above UC IPM website at www.ipm.ucdavis.edu. Cultural practices are discussed in the publications *Integrated Pest Management for Almonds* and the *Almond Production Manual*. For information and pesticide use permits, contact the local county agricultural commissioner's office. Many pesticides require or suggest the use of various adjuvants, but these costs are not included in the study.

Pest Control Adviser (PCA). Written recommendations are required for many pesticides and are made by licensed pest control advisors. In addition the PCA will monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study, the grower hires a PCA for pest and nutrition advice and a PCA or irrigation specialist for irrigation advice.

Weeds. A dormant strip spray using pre/post-emergent herbicides (Surflan, Goal) to control weeds in the tree rows is applied in January. In March and July, a post emergent spot spray (Roundup) is applied on the

berms. Resident species are grown as a ground cover in the middles and are mowed six times (March through August). A preharvest spray (Roundup) is used to prepare the orchard floor for harvest.

Insects. A dormant spray of Asana and Supreme Oil in January or early February before bud swell controls peach twig borer, San Jose scale, bacterial blast and brown almond and European red mites. Ant bait (Clinch or Distance) is broadcast on the orchard floor in June for ant control. When baits have failed, a aLorsban application may be necessary two weeks prior to shaking. At the beginning of hull split in June, Imidan and Omite are applied to control navel orangeworm (NOW) and various mites, respectively. NOW can also be managed by early harvest and winter sanitation.

Disease. Rovral and 1% Supreme Oil are applied in February at bloom to control brown rot blossom blight. A second spray using Ziram and Vangard to control, shot hole, greenfruit or jacket rot, and scab is applied in mid-March at petal fall.

Vertebrate Pest. Poison bait is applied in the spring by a mechanical applicator for gopher control. Ground squirrels are controlled by the use of anti-coagulant baits with above ground bait stations in the spring. Late winter fumigation is also done when soil moisture is adequate.

Harvest. In this study, a custom operator mechanically harvests the almond crop. The operator shakes the nuts from the trees, sweep the nuts into a windrow, picks up the nuts and hauls them to the huller/sheller. The custom operator also furnishes hand labor to rake the nuts missed by the sweeper into the windrow. Harvest begins in August for the early maturing varieties and continues into October for late maturing varieties.

Yields and Returns. Typical annual yields for almonds are measured in meat (kernel) pounds per acre and are shown in Table C. An estimated price of a $1.10 per pound based on 2002 average prices reported in the local Agricultural Commissioners Crop Reports is used in this study to determine potential profits/losses. Returns will vary depending on the market.

Assessment. The Almond Board of California (ABC) assesses all almonds commercially grown in the state to pay for almond promotions and research. The mandatory assessment is paid by processors and is not reflected in grower costs.

Pickup/ATV. The study assumes business use mileage of 4,500 miles per year for the pickup. The ATV is used for spot spraying, baiting ants and gophers and is included in those costs. Additional ATV use for monitoring the orchard and checking the irrigation system is shown under ATV and assumes the ATV travels 3,000 miles per year or 30 miles per acre.

Labor. Labor rates of $13.70 per hour for machine operators and $9.25 for general labor includes payroll overhead of 37%. The basic hourly wages are $10.00 for machine operators and $6.75 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for orchard/nut crops (code 0045), and a percentage for other possible benefits. Workers' compensation costs will vary among growers, but for this study the cost is based upon the average industry final rate as of January 1, 2003 (California Department of Insurance). Labor for operations involving machinery are

20% higher than the operation time given in Table 2 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

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 Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower and fuel type. Prices for on-farm delivery of diesel and gasoline are $1.11 and $1.58 per gallon, respectively. The fuel prices are a January 2003 average based on four California delivery locations. The cost includes a 2.25% sales tax (effective September 2001) on diesel fuel and 7.25% sales tax on gasoline. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in the "Cost Per Acre to Produce" table is determined by multiplying the total hourly operating cost in the "Hourly Equipment Costs" table for each piece of equipment used from the Operation Time (Hrs/A) column by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.14% 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.

Risk. Production risks should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect the profitability and economic viability of almond production.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

Property Taxes. Counties charge a base property tax rate of 1% 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% 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 0.676% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $645 for the entire farm.

Office Expense. Office and business expenses are estimated at $50 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop and office utilities, and miscellaneous administrative charges.

Sanitation Services. Sanitation services provide single portable toilets and washbasins for the orchard and cost the farm $112 per month. The monthly service charge is an average of four to six California sanitation companies and locations. The cost includes delivery and 2 months of weekly service.

Safety Training/Equipment. An estimated cost to cover safety training workshops, record keeping and related materials for employees. Also, includes safety equipment such as respirators for spraying, coveralls, eyewash stations and related materials.

Management/Supervisor Salaries. The grower farms the orchard; therefore no salaries are included for management. Returns above costs are considered a return to management.

Investment Repairs. Annual maintenance is calculated as two percent of the purchase price.

Non-Cash Overhead Costs

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase 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 formula for the calculation of the annual capital recovery costs is ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for equipment and investments are shown in the tables.

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. The interest rate of 6.25% used to calculate capital recovery cost is the USDA-ERS's ten-year average of California's agricultural sector long-run rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can only be used effectively in the agricultural sector.

Establishment Cost. Costs to establish the orchard are used to determine capital recovery expenses, depreciation, and interest on investment for the production years. Establishment cost is the sum of the costs for land preparation, planting, trees, cash overhead and production expenses for growing the trees through the first year that almonds are harvested minus any returns from production. The Total Accumulated Net Cash Cost on Table 1, in the third year represents the establishment cost. For this study the cost is $3,853 per acre or $385,300 for the 100-acre orchard. The establishment cost is spread over the remaining 22 years of the 25 years the orchard is in production.

Irrigation System. Micro-sprinkler lines are laid out prior to planting. The labor cost for laying out the line and changing from bubblers to micro-sprinkler is included in the irrigation system cost. A 25 horsepower pump, reservoir and filtration/injector station is already installed from the previous orchard and is not accounted for in this study. The water flows into the reservoir from the district and is pumped from the reservoir into the system.

Land. Land values for open or cropland range from $2,400 to $3,500 per acre. Land in this study is valued at $3,000 per acre or $3,150 per producing acre. Land with producing almond orchards ranges from $4,000 to $8,000 per acre.

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

Tools. This includes shop tools, hand tools, and miscellaneous field tools such as pruning tools.

Fuel Tanks. Two 500-gallon fuel tanks using gravity feed are on metal stands. The tanks are setup in a cement containment pad that meets federal, state, and county regulations.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in the Whole Farm Annual Equipment, Investment, and Business Overhead Costs table. 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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For information concerning the above mentioned University of California publications contact UC DANR Communications Services (1-800-994-8849) or your local county Cooperative Extension office.

UC COOPERATIVE EXTENSION

Table 1. SAMPLE COSTS TO ESTABLISH AN ALMOND ORCHARD

SAN JOAQUIN VALLEY - SOUTH 2003

	Cost Per Acre				
Year:	1st	2nd	3rd	4th	5th
Meat Pounds Per Acre:			600	1,200	2,400
Planting Costs:					
Orchard Removal	125				
Orchard Removal Field Cleanup	140				
Land Preparation - Slip Plow Tree Row	240				
Land Preparation - Subsoil Row Middles	150				
Land Preparation - Disc 4X	52				
Land Preparation - Fumigate Tree Row (Telone)	200				
Land Preparation - Put Up Berms	15				
Mark, Plant, Dip Trees, Prune, Trunk Guards	192	5			
Trees: 110 Per Acre (1% Replant In 2nd Year)	522	5			
Irrigate	21				
Weed - Spray Berms (Treflan)	6				
Incorporate Treflan	5				
TOTAL PLANTING COSTS	1,668	10			
Cultural Costs:					
Training, Pruning, & Suckering	33	81	94	123	159
Stack and Burn Prunings		15	24	35	25
Winter Sanitation			30	138	148
Insect - Ants			13	13	13
Insect - Dormant (Asana, Oil)		*45	42	42	42
Insect - PTB (Diazinon)	15				
Insect - Mite (Agrimek)/Fertilize - (Zinc)	54	94			
Insect - Mite (Agrimek)			88		
Insect - Mite (Omite) - NOW (Imidan)			106	106	106
Disease - Shothole/Scab (Vangard, Ziram)				63	63
Disease - Brown Rot (Rovral)				34	34
Pollination			28	110	165
Irrigate	68	184	292	517	572
Vertebrate - Rodents (Bait)	10	19	19	23	23
Fertilizer – Nitrogen (Ammonium Nitrate-2Yr, UN32-3+Yr)	12	13	31	44	63
Fertilizer - (Zinc)	14	14			
Fertilize - Solubor (Boron)					10
Weed - Dormant Strip (Surflan, Goal)	66	66	66	66	66
Weed - Disc 4X, 5X, 1X	17	21	4		
Weed - Mow 4X, 6X, 6X			21	31	31
Weed - Spot Spray Tree Rows 2X	23	23	23	23	23
Weed – Orchard Floor, Preharvest (Roundup)			17	17	17
Weed - Float/Roll Middles			10		
Defoliate (Zinc Sulfate)		*24	21	21	21
Pest Control Advice	30	30	30	30	30
Pickup Truck Use	33	33	33	33	33
ATV (Use not included in above operations)	19	19	19	19	19
Leaf Analysis	2	2	2	2	2
TOTAL CULTURAL COSTS	396	683	1,013	1,490	1,665
Harvest Costs:					
Shake, Rake, Sweep, Haul			110	218	218
Hull Nuts			36	72	144
TOTAL HARVEST COSTS			146	290	362
Interest On Operating Capital @ 7.14%	91	12	19	28	33
TOTAL OPERATING COSTS/ACRE	2,155	705	1,178	1,808	2,060

*Includes handgun operator

Table 1. continued

	Cost Per Acre				
Year	1st	2nd	3rd	4th	5th
Meat Pounds Per Acre:			600	1,200	2,400
Cash Overhead Costs:					
Office Expense	50	50	50	50	50
Liability Insurance	6	6	6	6	6
Sanitation Fees	4	4	4	4	4
Safety Training and Equipment	5	5	5	5	5
Property Taxes	44	44	45	44	44
Property Insurance	9	9	9	9	9
Investment Repairs	40	40	40	40	40
TOTAL CASH OVERHEAD COSTS	158	158	159	158	158
TOTAL CASH COSTS/ACRE	2,313	863	1,337	1,966	2,218
INCOME/ACRE FROM PRODUCTION			660	1,320	2,640
NET CASH COSTS/ACRE FOR THE YEAR	2,313	863	677	646	
PROFIT/ACRE ABOVE CASH COSTS					422
ACCUMULATED NET CASH COSTS/ACRE	2,313	3,176	**3,853**	4,499	4,077
Non-Cash Overhead Costs:					
Capital Recovery Cost:					
Building	45	45	45	45	45
Land	197	197	197	197	197
Fuel Tanks	6	6	6	6	6
Shop Tools	11	11	11	11	11
Micro Sprinkler Irrigation System	96	96	96	96	96
Equipment	57	57	65	57	57
TOTAL NON-CASH OVERHEAD COST/ACRE	412	412	420	412	412
TOTAL COST/ACRE FOR THE YEAR	2,725	1,275	1,757	2,378	2,630
INCOME/ACRE FROM PRODUCTION			660	1,320	2,640
TOTAL NET COST/ACRE FOR THE YEAR	2,725	1,275	1,097	1,058	
NET PROFIT/ACRE ABOVE TOTAL COST					10
TOTAL ACCUMULATED NET COST/ACRE	2,725	4,000	5,097	6,155	6,145

UC COOPERATIVE EXTENSION

Table 2. COSTS PER ACRE TO PRODUCE ALMONDS

SAN JOAQUIN VALLEY - SOUTH 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Prune/Tie- Dormant	0.00	0	0	0	208	208	
Push, Stack, Burn Prunings	0.00	0	0	0	25	25	
Irrigate	2.80	26	0	546	0	572	
Pest-Gopher (Gopher Bait)	0.01	0	0	9	0	10	
Pest-Gopher (Squirrel Bait)	0.01	0	0	13	0	13	
Pest-Ants (Clinch or Distance)	0.01	0	0	13	0	13	
Pest-Disease: Brown Rot (Rovral)	0.31	5	3	27	0	34	
Pest-Disease: ShotHole (Vangard/Ziram)	0.31	5	3	55	0	63	
Pest-Dormant (Asana, Oil)	0.31	5	3	34	0	42	
Pest-Mite (Omite) -NOW (Imidan)	0.31	5	3	98	0	106	
Fertilize N (UN32) in irrigation	0.00	0	0	75	0	75	
Fertilize Boron (Solubor)	0.31	5	3	2	0	10	
Remove Leaves (ZnSO4)	0.31	5	3	13	0	21	
Fertilize-Leaf Samples 1/20ac	0.05	0	0	0	2	2	
Weed-Mow 6X	1.25	21	11	0	0	31	
Weed-Spot Spray (Roundup)	0.23	4	1	18	0	23	
Weed-Preharvest, Spray Orchard Floor (Roundup)	0.23	4	2	11	0	17	
Weed-Dormant (Surflan, Goal) Tree Row	0.23	4	1	62	0	66	
Pollination	0.00	0	0	0	165	165	
Winter Sanitation- Shake, Rake, Shred	0.17	3	1	0	145	149	
Pest Control Advisers	0.00	0	0	0	30	30	
Pickup	1.50	25	9	0	0	33	
ATV	1.00	16	2	0	0	19	
TOTAL CULTURAL COSTS	9.37	134	42	976	574	1,727	
Harvest:							
Harvest-Shake, Rake, Sweep, Haul	0	0	0	0	238	238	
Harvest-Hull/Shell	0	0	0	0	168	168	
TOTAL HARVEST COSTS	0	0	0	0	406	406	
Interest on operating capital @ 7.14%						35	
TOTAL OPERATING COSTS/ACRE		134	42	976	980	2,168	
CASH OVERHEAD:							
Office Expense						50	
Liability Insurance						6	
Sanitation Fee						4	
Safety Training/Equipment						5	
Property Taxes						64	
Property Insurance						22	
Investment Repairs						40	
TOTAL CASH OVERHEAD COSTS						191	
TOTAL CASH COSTS/ACRE						2,359	
NON-CASH OVERHEAD:		Per producing Acre		Annual Cost Capital Recovery			
Buildings		600		45		45	
Fuel Tanks		65		6		6	
Shop Tools		113		11		11	
Land		3,150		197		197	
Sprinkler-Micro		1,200		96		96	
Establishment Cost		3,853		327		327	
Equipment		496		57		57	
TOTAL NON-CASH OVERHEAD COSTS		9,477		738		738	
TOTAL COSTS/ACRE						3,097	

UC COOPERATIVE EXTENSION

Table 3. COSTS AND RETURNS PER ACRE TO PRODUCE ALMONDS

SAN JOAQUIN VALLEY - SOUTH 2003

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Almonds	2,800.00	lb	1.10	3,080	
OPERATING COSTS					
Custom:					
Prune Trees	1.00	acre	183.00	183	
Tie Trees	1.00	acre	25.00	25	
Push/Burn Brush	1.00	acre	25.00	25	
Leaf Analysis 1/20 acre	1.00	acre	1.50	2	
Pollination Fee	3.00	hive	55.00	165	
Shake - Harvest/Winter Sanitation	2.00	acre	35.00	115	
Poling - Winter Sanitation	1.00	acre	80.00	80	
Sweep/Blow -Winter Sanitation	1.00	acre	25.00	25	
Rake- Hand – Harvest & Winter Sanitation	2.00	acre	5.00	10	
PCA Pest/Nutrition	1.00	acre	20.00	20	
PCA Irrigation Specialist	1.00	acre	10.00	10	
Sweep - Harvest	1.00	acre	43.00	43	
Pickup -Harvest	1.00	acre	55.00	55	
Haul - Harvest	1.00	acre	55.00	55	
Hull/Shell - Harvest	2,800.00	lb	0.06	168	
Irrigation:					
Water - District	52.00	acin	10.50	546	
Rodenticide:					
Gopher Bait Rozol	3.00	lb	3.09	9	
Squirrel Bait Rozol	3.00	lb	4.29	13	
Insecticide:					
Clinch	1.00	lb	13.19	13	
Asana XL	4.00	floz	1.04	4	
Volck Supreme Oil	6.00	gal	5.00	30	
Imidan 70 WSB	4.30	lb	9.00	39	
Omite 30-WS	7.50	lb	7.89	59	
Fungicide:					
Rovral 4F	1.00	pint	26.52	27	
Vangard WG	7.50	oz	4.09	31	
Ziram WDG 76	8.00	lb	3.00	24	
Fertilizer:					
UN-32	240.00	lb N	0.31	75	
Boron (Solubor)	2.00	lb	0.98	2	
ZnS04 Solution 12% (10 gallons)	108.00	lb	0.12	13	
Herbicide:					
Roundup Ultra Max	3.25	pint	9.20	30	
Surflan 4AS	2.16	pint	16.33	35	
Goal 2 XL	1.62	pint	16.35	26	
Labor (machine)	7.82	hrs	13.70	107	
Labor (non-machine)	2.85	hrs	9.25	26	
Fuel - Gas	5.25	gal	1.58	8	
Fuel - Diesel	12.35	gal	1.11	14	
Lube				3	
Machinery repair				17	
Interest on operating capital @ 7.14%				35	
TOTAL OPERATING COSTS/ACRE				2,168	
NET RETURNS ABOVE OPERATING COSTS				912	

UC COOPERATIVE EXTENSION

Table 3. continued

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD:					
Office Expense				50	
Liability Insurance				6	
Sanitation Fee				4	
Safety Training/Equipment				5	
Property Taxes				64	
Property Insurance				22	
Investment Repairs				40	
TOTAL CASH OVERHEAD COSTS				191	
TOTAL CASH COSTS/ACRE				2,359	
NON-CASH OVERHEAD COSTS					
Buildings				45	
Fuel Tanks				6	
Shop Tools				11	
Land				197	
Sprinkler-Micro				96	
Establishment Cost				327	
Equipment				57	
TOTAL NON-CASH OVERHEAD COSTS				738	
TOTAL COSTS/ACRE				3,097	
NET RETURNS ABOVE TOTAL				-17	

UC COOPERATIVE EXTENSION

Table 4. MONTHLY CASH COSTS - ALMONDS

SAN JOAQUIN VALLEY - SOUTH 2003

Beginning JAN 03 Ending DEC 03	JAN 03	FEB 03	MAR 03	APR 03	MAY 03	JUN 03	JUL 03	AUG 03	SEP 03	OCT 03	NOV 03	DEC 03	TOTAL
Cultural:													
Prune/Tie- Dormant	208												208
Push, Stack, Burn Prunings	25												25
Irrigate	22	22	44	66	66	88	88	22	66	44	23	23	572
Pest-Rodent (Gopher Bait)			10										10
Pest-Rodent (Squirrel Bait)					13								13
Pest-Ants (Clinch or Distance)						13							13
Pest-Disease: Brown Rot (Rovral)		34											34
Pest-Disease: ShotHole (Vangard/Ziram)			63										63
Pest-Dormant (Asana, Oil)	42												42
Pest-Mite (Omite) -NOW (Imidan)						106							106
Fertilize N (UN32) in irrigation			38				38						75
Fertilize Boron (Solubor)										10			10
Remove Leaves (ZnSO4)											21		21
Fertilize-Leaf Samples 1/20ac						2							2
Weed-Mow 6X			5	10	5	5	5						31
Weed-Spot Spray (Roundup)			11				11						23
Weed-Preharvest, Orchard Floor (Roundup)								17					17
Weed-Dormant (Surflan, Goal) Tree Row												66	66
Pollination		165											165
Winter Sanitation- Shake, Rake, Shred												149	149
Pest Control Advisers	3	3	3	3	3	3	3	3	3	3	3	3	30
Pickup	3	3	3	3	3	3	3	3	3	3	3	3	33
ATV	2	2	2	2	2	2	2	2	2	2	2	2	19
TOTAL CULTURAL COSTS	304	228	177	83	91	221	149	46	73	61	51	244	1,727
Harvest:													
Harvest-Shake, Rake, Sweep, Haul								238					238
Harvest-Hull/Shell								168					168
TOTAL HARVEST COSTS								406					406
Interest on operating capital	2	3	4	5	5	7	7	10	-3	-2	-2	-2	35
TOTAL OPERATING COSTS/ACRE	306	231	181	88	96	227	156	462	70	58	49	244	2,168
OVERHEAD:													
Office Expense	4	4	4	4	4	4	4	4	4	4	4	4	50
Liability Insurance								6					6
Sanitation Fee	0	0	0	0	0	0	0	0	0	0	0	0	4
Safety Training/Equipment	0	0	0	0	0	0	0	0	0	0	0	0	5
Property Taxes	32						32						64
Property Insurance	11						11						22
Investment Repairs	3	3	3	3	3	3	3	3	3	3	3	3	40
TOTAL CASH OVERHEAD COSTS	52	8	8	8	8	8	52	15	8	8	8	8	191
TOTAL CASH COSTS/ACRE	356	240	189	96	104	236	207	476	78	67	57	252	2,359

UC COOPERATIVE EXTENSION

Table 5. RANGING ANALYSIS

SAN JOAQUIN VALLEY - SOUTH 2003

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE ALMONDS

	YIELD (lb/acre)						
	2,000	2,200	2,400	2,600	2,800	3,000	3,200
OPERATING COSTS/ACRE:							
Cultural Cost	1,727	1,727	1,727	1,727	1,727	1,727	1,727
Harvest Cost	327	346	366	386	406	426	446
Interest on operating capital	35	35	35	35	35	36	36
TOTAL OPERATING COSTS/ACRE	2,089	2,108	2,128	2,148	2,168	2,189	2,209
Total Operating Costs/lb	1.04	0.96	0.89	0.83	0.77	0.73	0.69
CASH OVERHEAD COSTS/ACRE	191	191	191	191	191	191	191
TOTAL CASH COSTS/ACRE	2,280	2,299	2,319	2,339	2,359	2,380	2,400
Total Cash Costs/lb	1.14	1.05	0.97	0.90	0.84	0.79	0.75
NON-CASH OVERHEAD COSTS/ACRE	738	738	738	738	738	738	738
TOTAL COSTS/ACRE	3,018	3,037	3,057	3,077	3,097	3,118	3,138
Total Costs/lb	1.51	1.38	1.27	1.18	1.11	1.04	0.98

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE	YIELD (lb/acre)						
$/lb	2,000	2,200	2,400	2,600	2,800	3,000	3,200
0.80	-489	-348	-208	-68	72	211	351
0.90	-289	-128	32	192	352	511	671
1.00	-89	92	272	452	632	811	991
1.10	111	312	512	712	912	1,111	1,311
1.20	311	532	752	972	1,192	1,411	1,631
1.30	511	752	992	1,232	1,472	1,711	1,951
1.40	711	972	1,232	1,492	1,752	2,011	2,271

NET RETURN PER ACRE ABOVE CASH COST

PRICE	YIELD (lb/acre)						
$/lb	2,000	2,200	2,400	2,600	2,800	3,000	3,200
0.80	-680	-539	-399	-259	-119	20	160
0.90	-480	-319	-159	1	161	320	480
1.00	-280	-99	81	261	441	620	800
1.10	-80	121	321	521	721	920	1,120
1.20	120	341	561	781	1,001	1,220	1,440
1.30	320	561	801	1,041	1,281	1,520	1,760
1.40	520	781	1,041	1,301	1,561	1,820	2,080

NET RETURNS PER ACRE ABOVE TOTAL COST

PRICE	YIELD (lb/acre)						
$/lb	2,000	2,200	2,400	2,600	2,800	3,000	3,200
0.80	-1,418	-1,277	-1,137	-997	-857	-718	-578
0.90	-1,218	-1,057	-897	-737	-577	-418	-258
1.00	-1,018	-837	-657	-477	-297	-118	62
1.10	-818	-617	-417	-217	-17	182	382
1.20	-618	-397	-177	43	263	482	702
1.30	-418	-177	63	303	543	782	1,022
1.40	-218	43	303	563	823	1,082	1,342

UC COOOPERATIVE EXTENSION

Table 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY - SOUTH 2003

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Total
03	66 HP 2WD Tractor	29,708	20	3,812	2,542	113	168	2,823
03	ATV 4WD	5,790	7	2,196	787	27	40	854
03	Mower/Chopper - 8'	6,713	10	1,187	834	27	40	900
03	Orchard PTO Sprayer 500 gal	19,741	15	1,895	1,986	73	108	2,167
03	Pickup 1/2 ton	16,500	7	1,650	2,787	61	91	2,939
03	Spot Sprayer 15 gal	225	10	40	28	1	1	30
03	Weed Sprayer 100 gal	3,947	10	698	490	16	23	529
TOTAL		82,624		11,478	9,454	318	471	10,243
60% of New Cost*		49,574		6,887	5,672	191	282	6,146

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Repairs	Total
Buildings 2,400 sqft	60,000	30		4,476	203	300	1,200	6,179
Establishment Cost	385,300	22		32,696	1,302	1,926	0	35,925
Fuel Tanks 2-500g	6,514	20	651	562	24	36	130	752
Land	315,000	22	315,000	19,688	0	3,150	0	22,837
Shop Tools	11,330	15	1,133	1,138	42	62	226	1,468
Sprinkler-Micro System	120,000	25		9,611	406	600	2,400	13,017
TOTAL INVESTMENT	898,144		316,784	68,172	1,977	6,075	3,956	80,179

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	100	acre	6.45	645
Office Expense	100	acre	50.00	5,000
Safety Training/Equipment	100	acre	5.00	500
Sanitation (2 months)	100	acre	4.36	436

UC COOPERATIVE EXTENSION

Table 7. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY - SOUTH 2003

Yr	Description	Actual Hours Used	COSTS PER HOUR: Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Operating Repairs	Operating Fuel & Lube	Operating Total Oper.	Total Costs/Hr.
03	66 HP 2WD Tractor	387.10	3.94	0.18	0.26	1.20	4.07	5.27	9.64
03	ATV 4WD	149.90	3.15	0.11	0.16	0.43	1.82	2.25	5.66
03	Mower/Chopper - 8'	141.60	3.53	0.11	0.17	2.78	0.00	2.78	6.59
03	Orchard PTO .Sprayer 500 gal	187.20	6.37	0.23	0.35	3.02	0.00	3.02	9.96
03	Pickup 1/2 ton	150.00	11.15	0.25	0.36	1.21	4.54	5.75	17.51
03	Spot Sprayer 15 gal	23.00	0.73	0.02	0.03	0.06	0.00	0.06	0.85
03	Weed Sprayer 100 gal	46.20	6.37	0.20	0.30	1.06	0.00	1.06	7.93

UC COOPERATIVE EXTENSION

Table 8. OPERATIONS WITH EQUIPMENT

SAN JOAQUIN VALLEY - SOUTH 2003

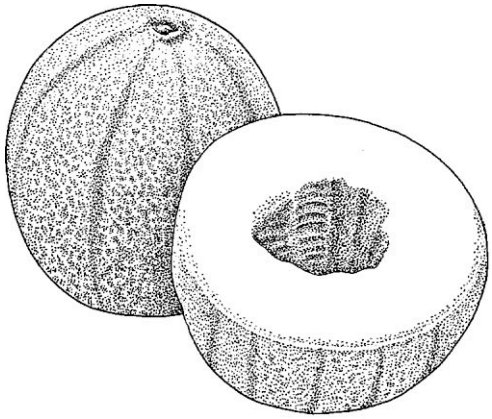
Operation	Month	Equipment: Tractor	Equipment: Implement	Material	Rate/acre*	Unit
Cultural:						
Prune/Tie- Dormant	January	Custom				
Push, Stack, Burn Prunings	January	Custom				
Irrigate	January			Water 2X	2.00	acin
	February			Water 2X	2.00	acin
	March			Water 4X	4.00	acin
	April			Water 6X	6.00	acin
	May			Water 6X	6.00	acin
	June			Water 8X	8.00	acin
	July			Water 8X	8.00	acin
	August			Water 2X	2.00	acin
	September			Water 6X	6.00	acin
	October			Water 4X	4.00	acin
	November			Water 2X	2.00	acin
	December			Water 2X	2.00	acin
Pest-Gopher (Gopher Bait)	March	ATV		Gopher Bait	3.00	lbs
Pest-Gopher (Squirrel Bait)	May	ATV		Squirrel Bait	3.00	lbs
Pest-Ants (Clinch or Distance)	June	ATV		Clinch	1.00	lbs
Pest-Disease: Brown Rot (Rovral)	February	66HP 2WD	Orchard Sprayer	Rovral	1.00	pt
Pest-Disease: ShotHole (Vangard/Ziram)	March	66HP 2WD	Orchard Sprayer	Vangard	7.50	oz
				Ziram	8.00	lbs
Pest-Dormant (Asana, Oil)	January	66HP 2WD	Orchard Sprayer	Asana	4.00	floz
				Supreme Oil	6.00	gal
Pest-Mite (Omite) -NOW (Imidan)	June	66HP 2WD	Orchard Sprayer	Omite	7.50	lbs
				Imidan	4.30	lbs
Fertilize N (UN32) in irrigation	March			UN32	120.00	lb N
	July			UN32	120.00	lb N
Fertilize Boron (Solubor)	October	66HP 2WD	Orchard Sprayer	Solubor	2.00	lb
Remove Leaves (ZnSO4)	November	66HP 2WD	Orchard Sprayer	Zinc Sulfate	108.00	lb
Fertilize-Leaf Samples 1/20ac	June					
Weed-Mow 6X	March	66HP 2WD	Mower/Chopper 8'			
	April	66HP 2WD	Mower/Chopper 8'			
	April	66HP 2WD	Mower/Chopper 8'			
	May	66HP 2WD	Mower/Chopper 8'			
	June	66HP 2WD	Mower/Chopper 8'			
	July	66HP 2WD	Mower/Chopper 8'			
Weed-Spot Spray (Roundup)	March	ATV	Spot Sprayer	Roundup	1.00	pt
	July	ATV	Spot Sprayer	Roundup	1.00	pt
Weed-Preharvest Orchard Floor	August	66HP 2WD	Weed Sprayer	Roundup	1.25	pt
Weed-Dormant (Surflan, Goal) Tree Row	December	ATV	Weed Sprayer	Surflan	2.16	pt
				Goal	1.62	pt
Pollination	February	Custom		Bee Hives	3.00	hives
Winter Sanitation- Shake, Rake, Shred	December	66HP 2WD	Mower/Chopper 8'			
		Custom		Shake/Sweep		
Pest Control Advisers	Annual	Custom				
Pickup	Annual	Pickup 1/2 T				
ATV	Annual	ATV				
Harvest:						
Harvest-Shake, Rake, Sweep, Haul	August	Custom				
Harvest-Hull/Shell	August	Custom				

*Rates are per broadcast acre

U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

CANTALOUPES



MID-BED TRENCHED

IMPERIAL COUNTY – 2004

Prepared by:
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For an explanation of calculations used for the study refer to the attached General Assumptions or call the author, Herman Meister, at the Imperial County Cooperative Extension office, (760)352-9474 or e-mail at hmeister@ucdavis.edu.

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University of California and the United States Department of Agriculture cooperating.

FOREWORD

We wish to thank growers, pest control advisors, chemical applicators and chemical dealers, custom farm operators, fertilizer dealers, seed companies, contract harvesters, equipment companies, and the Imperial County Agricultural Commissioner's office for providing us with the data necessary to compile this circular. Without their cooperation we could not have achieved the accuracy needed for evaluating the cost of production for the field crop industry in Imperial County.

The information presented herein allows one to get a "ballpark" idea of field crop production costs and practices in the Imperial County. Most of the information was collected through verbal communications via office visits and personal phone calls. The information does not reflect the exact values or practices of any one grower, but are rather an average of countywide prevailing costs and practices. Exact costs incurred by individual growers depend upon many variables such as weather, land rent, seed, choice of agrichemicals, location, time of planting, etc. No exact comparison with individual grower practice is possible or intended. The budgets do reflect, however, the prevailing industry trends within the region.

Overhead usually includes secretarial and office expenses, general farm supplies, communications, utilities, farm shop, transportation, moving farm equipment, accountants, insurance, safety training, permits, etc. Eleven to 13% of the total of land preparation, growing costs and land rent was used to estimate overhead. Hourly rates vary with each crop depending on the workman's compensation percentages.

Since all of the inputs used to figure production costs are impossible to document in a single page, we have included extra expense in man-hours or overhead to account for such items as pipe setting, motor grader, water truck, shovel work, bird and rodent control, etc. Whenever possible we have given the costs of these operations per hour listed on the cultural operations page. Some custom operators have indicated that they are instituting a "fuel surcharge" to reflect "spikes" in fuel cost.

Not included in these production costs are expenses resulting from management fees, loans, providing supervision, or return on investments. The crop budgets also do not contain expenses encumbered for road and ditch maintenance, and perimeter weed control. If all the above items were taken into account, the budget may need to be increased by 7-15%.

Where applicable we have used terminology that is commonly used in the agricultural industry. These terms are compiled in a glossary at the end of the circular. We feel that an understanding of these terms will be useful to entry-level growers, bankers, students and visitors.

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2004-2005 Tillage & Harvest Rates
IMPERIAL COUNTY

HEAVY TRACTOR WORK & LAND PREPARATION

OPERATION	$/ACRE
Plow	32.00
Subsoil 2nd gear	45.00
Subsoil 3rd gear	38.00
Landplane	14.00
Triplane	12.00
Chisel 15”	26.00
Wil-Rich chisel	17.00
Big Ox	25.00
Slip plow	43.00
Mark/disc borders	10.50
Make cross checks (taps)	6.75
Break border	6.50
Stubble disc/with cultipack	22.50/24.50
Regular disc/with cultipack	13.00/15.00
List 30”-12 row/40” 8 row	16.50
Float	11.50
Dump (scraper) borders	18.25
Corrugate	14.00

LIGHT TRACTOR WORK

Power mulch dry	27.50
Power mulch with herbicide	31.00
Shape 30” 6-row / 40” 4-row	12.75/12.75
Plant sugar beets & cotton 30”/40”	17.00/15.00
Plant vegetables	20.00
Mulch plant wheat	20.25
Plant alfalfa (corrugated)	18.50
Plant alfalfa (beds)	19.00
Plant bermudagrass	13.75
Plant with drill (sudangrass, wheat)	14.75
Plant corn slope	17.00
Cultivate 30”/40” beds 4-row	16.00/14.00
Spike 30”/40” beds 4-row	13.00/11.00
Spike and furrow out 30”/40” 4-row	14.00/12.00
Furrow out 30”/40” beds 4-row	13.00/11.00
Lilliston 30” 6-row / 40” 4-row	14.00/14.00
Lilliston 30” 6 row/ 40” 4-row/ herb	15.50/15.50
Inj fert & fur out 30”/ 40” beds 4-row	16.50/14.50
Fertilize dry & fur out 30”/ 40” 4-row	17.00/15.00
Inject fertilizer flat	15.00
Broadcast dry fertilizer	8.00
Ground spray 30”/40” 8-row	12.00
Chop cotton stalks 30”/40”beds	16.00/14.00
List 80” melon beds	20.00
Plant 80” melon slope beds	22.00
Back fill furrow (melons)	9.5
Cultivate 80” melon slope beds	18.00
Center 80” melon beds	17.00
Re-run 80” melon beds	11.00
Inject fertilizer & furrow out 80” melon beds	18.00
Bust out 80” melon beds	12.00

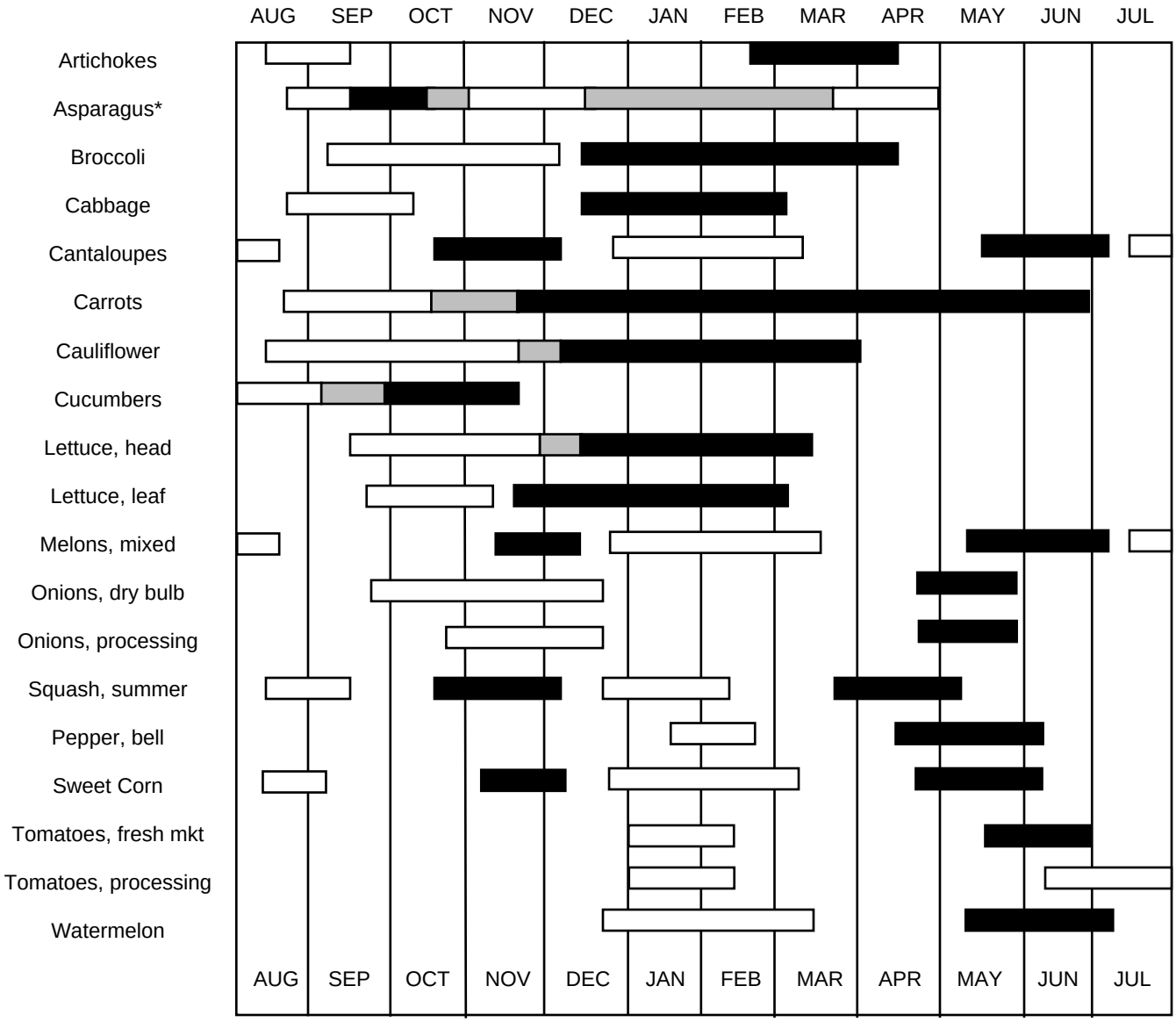
HARVEST COSTS-FIELD CROPS

	BY UNIT
Windrow alfalfa seed	17.50/acre
Combine alfalfa seed	41.00/acre
Swath bermudagrass	13.75/acre
Rake bermudagrass	5.50/acre
Swath sudangrass	11.25/acre
Rake sudangrass	6.00/acre
Swath alfalfa	8.75/acre
Rake alfalfa	5.00/acre
Bale (all types of hay- small bale)	0.70/bale
Haul & stack hay – small bale	0.27/bale
Bale (large bale 4X4)	7.50/bale
Haul & stack big bale	3.50/bale
Load with hay squeeze	62.50 / load
Dig sugar beets	2.65/clean ton
Haul sugar beets	2.50/clean ton
Combine wheat	16.00 per acre + 0.60 /cwt. over 1 ton
Haul wheat	5.00/ton
Combine bermudagrass seed 1st time	42.50/acre
Combine bermudagrass seed 2nd time	26.50/acre
Haul bermudagrass seed (local)	175/load
Pick Cotton 1st/2nd	03cts/lb/35.00/acre

MISCELLANEOUS RATES BY THE HOUR

	$/HR
Motor grader	55.00
Backhoe	50.00
Water truck	40.00
Wheel tractor	35.00
Scraper	36.00
Versatile	60.00
D-6	56.00
D-8	73.00
Buck ends of field	35.00
Pipe setting (2 men)	38.00
Laser level	90.00
Work ends (disc out rotobucks)	40.00

VEGETABLE CROPS
PLANTING & HARVESTING CALENDAR
IMPERIAL VALLEY, CALIFORNIA



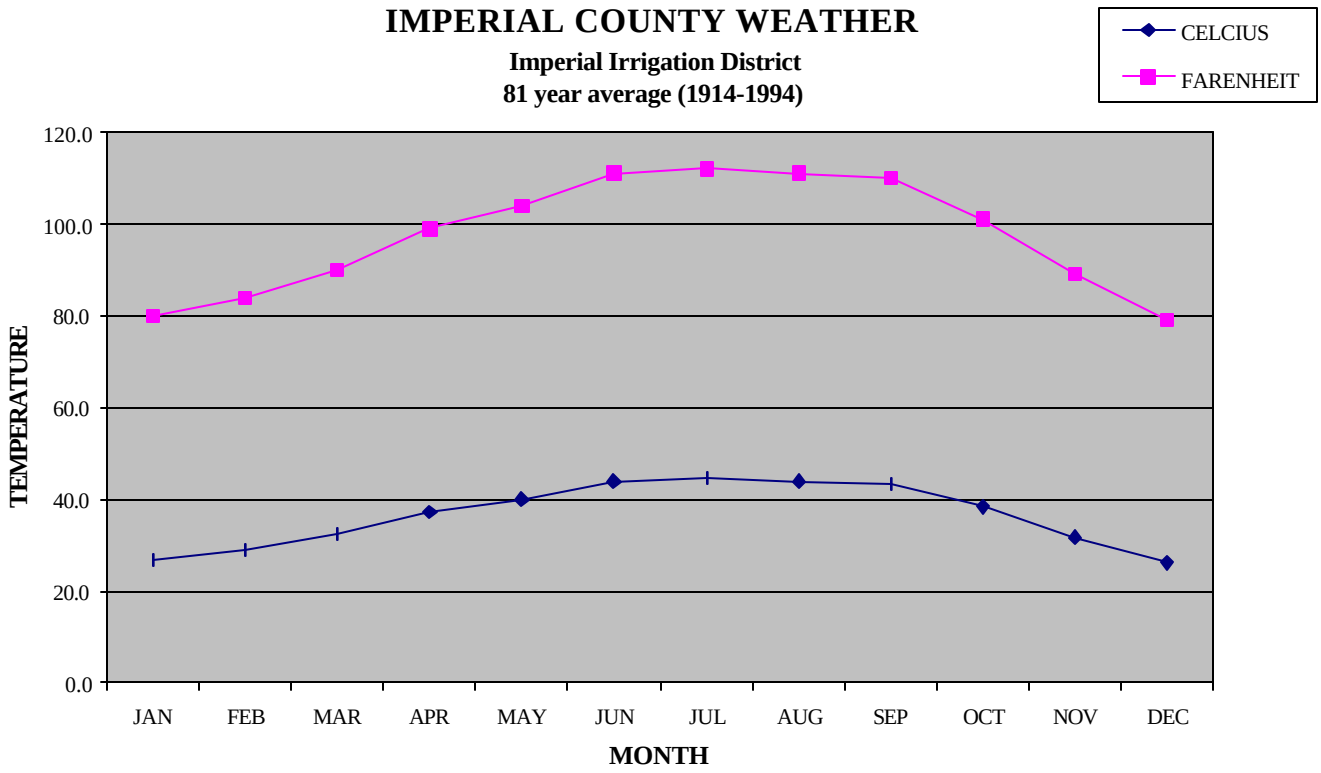
MONTH

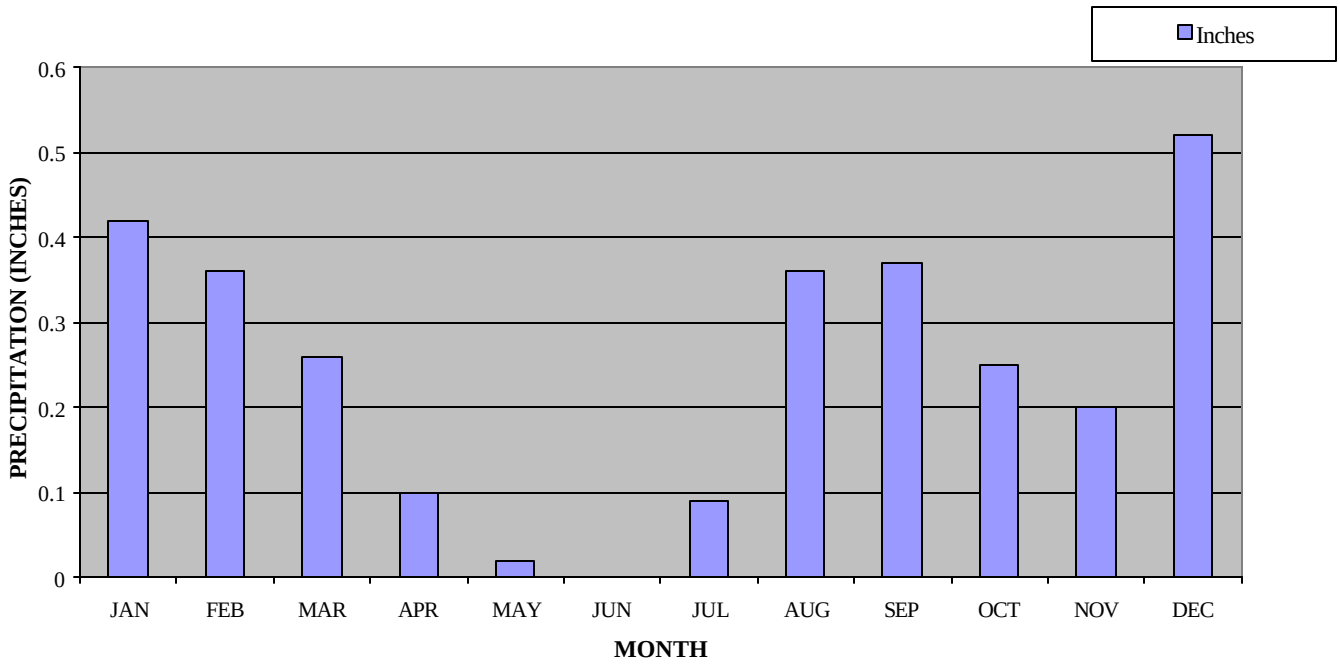
planting

planting/harvesting

harvesting

* perennial


IMPERIAL COUNTY WEATHER
Imperial Irrigation District
81 year average (1914-1994)
CELCIUS
FARENHEIT
TEMPERATURE
120.0
100.0
80.0
60.0
40.0
20.0
0.0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH


Inches
PRECIPITATION (INCHES)
0.6
0.5
0.4
0.3
0.2
0.1
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

DAYS REQUIRED FOR SEEDLING EMERGENCE* AT VARIOUS SOIL TEMPERATURES

	Soil Temperature (°F)								
Vegetable	**32**	**41**	**50**	**59**	**68**	**77**	**86**	**95**	**104**
Asparagus	NG	NG	53	24	15	10	12	20	28
Beet	/	42	17	10	6	5	5	5	/
Cabbage	/	/	15	9	6	5	4	/	/
Cantaloupe	/	/	/	/	8	4	3	/	/
Carrot	NG	51	17	10	7	6	6	9	NG
Cauliflower	/	/	20	10	6	5	5	/	/
Celery	NG	41	16	12	7	NG	NG	NG	/
Cucumbers	NG	NG	NG	13	6	4	3	3	/
Eggplant	/	/	/	/	13	8	5	/	/
Lettuce	49	15	7	4	3	2	3	NG	NG
Okra	NG	NG	NG	27	17	13	7	6	7
Onion	136	31	13	7	5	4	4	13	NG
Parsley	/	/	29	17	14	13	12	/	/
Parsnip	172	57	27	19	14	15	32	NG	NG
Peppers	NG	NG	NG	25	13	8	8	9	NG
Radish	NG	29	11	6	4	4	3	/	/
Spinach	63	23	12	7	6	5	6	NG	NG
Sweet Corn	NG	NG	22	12	7	4	4	3	NG
Tomato	NG	NG	43	14	8	6	6	9	NG
Watermelon	/	NG	/	/	12	5	4	3	/

*planting depth = 0.5 inches; NG = no germination; / = not tested; Source: Harrington, J. F. and P. A. Minges, Vegetable Seed Germination. California Agricultural Extension Mimeo Leaflet (1954).

SEED CALCULATIONS (M)

Number of seed (x1000) required[1] per acre for common plant spacing combinations within rows and between beds. Commonly coded as "M" or 1000 seed

	Spacing between beds[3] (inches)					
Plant spacing within rows[2] (inches)	**30**	**40**	**42**	**60**	**66**	**80**
1	209.1	156.8	149.4	104.5	95.0	78.4
1.5	139.4	104.5	99.6	69.7	63.4	52.3
2	104.5	78.4	74.7	52.3	47.5	39.2
2.5	83.6	62.7	59.7	41.8	38.0	31.4
3	69.7	52.3	49.8	34.8	31.7	26.1
4	52.3	39.2	37.3	26.1	23.8	19.6
6	34.8	26.1	24.9	17.4	15.8	13.1
8	26.1	19.6	18.7	13.1	11.9	9.8
10	20.9	15.7	14.9	10.5	9.5	7.8
12	17.4	13.1	12.4	8.7	7.9	6.5
14	14.9	11.2	10.7	7.5	6.8	5.6
24	8.7	6.5	6.2	4.4	4.0	3.3
36	5.8	4.4	4.1	2.9	2.6	2.2

[1] Seeds per acre was calculated assuming one seed per spacing combination. Factors influencing the actual amount of seed needed are seed delivery method and seed viability; [2] Values are based on beds with a single row. For multiple rows, multiply by the number of rows per bed; [3] Beds are measured from center to center.

Linear feet per acre for common bed widths

Bed width (inches)	Linear feet per acre
30	17,424
40	13,068
42	12,446
60	8,712
66	7,920
80	6,534

IMPERIAL COUNTY MIDBED-TRENCH CANTALOUPE PROJECTED PRODUCTION COSTS 2004-2005

40 Acre Field

Hand labor at $9.95 per hour ($6.75 plus SS,unemployment insurance, workman's compensation and fringe benefits)

Yield--550 cartons per acre. 120 days to maturity. Hybrid variety

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per acre
LAND PREPARATION						
Stubble disc / ring roller	24.50					24.50
Big Ox	25.00					25.00
Disc 2x	13.00					26.00
Triplane	12.00					12.00
Border, cross check and break borders	23.75					23.75
Flood		Water 1 ac-ft	16.00	1	9.95	25.95
Disc 2x	13.00					26.00
Triplane	12.00					12.00
Fertilzer, spread	8.00	500 lbs. 11-52-0	75.00			83.00
List beds	20.00					20.00
Pre shape beds	10.00					10.00
TOTAL LAND PREPARATION						**288.20**
GROWING PERIOD						
Shape beds and plant		Hybrid seed 20M	225.00			225.00
with plastic	55.00	Plastic	90.00			145.00
with insecticide		Admire	60.00			60.00
Weed control 1X ground	12.50	Herbicide	16.00			28.50
Dispose/remove plastic	10.00			6	59.70	69.70
Thin / weed				15	149.25	149.25
Cultivate 2x	15.00					30.00
Spike 2x	11.00					22.00
Inject fertilize/furow-out	18.00	80 lb. N as UAN 32	30.40			48.40
Weed control-layby	12.50	Herbicide	5.00			17.50
Pollination		2 hives @ $27	54.00			54.00
Irrigate 5x		Water 4 ac/ft	64.00	3	29.85	93.85
Water-run fertilizer		40lb. N as UAN 32	15.20			15.20
Insect Control- 1x air 10 gpa night	14.00	Insecticides	20.00			34.00
Disease control 2x	11.00	Fungicides	26.00			48.00
Bust beds (cleanup)	12.00					12.00
TOTAL GROWING PERIOD						**1,052.40**
GROWING PERIOD & LAND PREPARATION COSTS						1,340.60
Land Rent (net acres)						200.00
Cash Overhead------	13 % of preharvest costs & land rent					200.28
TOTAL PREHARVEST COSTS						**1,740.88**
HARVEST (field pack)*						
Pick, pack, haul, cool, and sell	550 cartons @	4.00	per carton			2,200.00
TOTAL OF ALL COSTS						**3,940.88**

PROJECTED PROFIT OR LOSS PER ACRE

		Price/carton (dollars)					Break-even
		5.00	**6.00**	**7.00**	**8.00**	**9.00**	**$/carton**
	400	-1341	-941	-541	-141	259	8.35
Cartons	**450**	-1291	-841	-391	59	509	7.87
per	**500**	-1241	-741	-241	259	759	7.48
acre	**550**	-1191	-641	-91	459	1009	7.17
	600	-1141	-541	59	659	1259	6.90

* Harvest cost may vary with the shipper, the field conditions and the market value.

IMPERIAL COUNTY CANTALOUPE CULTURE 2004-2005

Annual acreage, yield, and value of spring cantaloupes
in Imperial County, CA (1999-2003)

Year	Acres	Yield/Acre*	Value/Acre
2003	8,656	530	$3821
2002	8,963	567	$3266
2001	9,339	490	$3,077
2000	11,318	419	$2,480
1999	14,664	380	$2,315

* 40 lb cartons
Source: I.C. Agricultural Commissioner's Reports 1999-2003

PLANTING-HARVESTING DATES: Some spring cantaloupes are planted in December under plastic in mid bed trenches. Other spring melons are planted in late January on slant beds and comprise of approximately 60-75% of the total acreage depending on the year. Harvesting begins in May and continues through mid- July.

The fall crop is generally planted from mid-July through late August for harvest in mid-October or until the first frost. It is primarily drip irrigated from emergence to harvest. Only a small acreage is planted due to the difficulty of controlling high silverleaf whitefly populations

VARIETIES: Popular cantaloupe varieties include: Impac *Seminis*; Magellan *Seminis*; Pacstart *Seminis*; Laredo *Seminis*; Mission *Seminis;* Hymark *Seminis;* Sol Real *Syngenta;* Ocotillo *Syngenta;* Esteem *Syngenta;* Zeus *Seminis;* RML 7930 *Syngenta;* Gold Rush *Harris Moran;* Primo *Syngenta*; and Goldmine *Harris Moran.*

PLANTING INFORMATION: Slant-bed or "Yuma-bed" culture was developed to orient the south face of the bed toward the winter sun. The sun's rays strike the soil surface at a nearly perpendicular angle, converting light energy into heat. Flat beds reflect a greater portion of the incoming radiation and are therefore cooler. Maximum bed heating is achieved when the bed angle is roughly 35-37 degrees from horizontal.

Seed is planted ½ inch deep on 80 -inch beds. Custom-built, slant-bed planters using primarily vacuum-air planters are used for precision planting. Seed lines are located midway up the slope. Care must be taken to locate the correct seed line position as the beds will be reworked and reformed during the season. Forming a bed with a depression at the crown of the plant will increase the incidence of fruit and root rotting fungi.

After the melons are thinned to approximately 12 inches in-row, the beds are worked to relocate the seed line. Soil is shaved off the top of the beds and into the furrow. After several passes with small tractor-mounted discs, the field is virtually flat with seed lines 80 inches apart. Sidedress fertilizer is applied and new furrows are made for irrigation.

The mid-bed trench system involves the use of a bed shaper to produce a trench or groove in the center of an 80-inch wide bed. The shape of the trench varies from grower to grower, but normally they are 6-10 inches wide at the bottom, 20 inches wide at the top, and 12 inches deep. Trenches are seeded at the bottom using a random flow planter or an air-type, vacuum precision planter. Pre-emergence herbicide is sprayed in the trench. A tractor-mounted, plastic-mulch laying machine is used to stretch a 40-inch wide sheet of 1-1½m plastic sheet over the trench and to secure the edges with soil. After the threat of frost is past, and before temperatures reach the mid-eighties, the plastic is removed. Holes will be punched in the plastic to provide some ventilation once the plants are well established.

Some late spring melons are direct seeded on alternate N-S oriented 40-inch flat beds to minimize excessive heat to the seed lines. Later, the off beds are split and the planted beds are reformed to a full 80- inch bed.

SOILS: Well-drained soils are preferred. Sandy or silt loams are sometimes selected for the earliest crop. Heavier soils are preferred because of their greater water holding capacity, which slows the onset of vine collapse. Beds should be left cloddy to allow for maturing melons to develop with minimal soil contact and good aeration.

Fields located in the northern portion of the Imperial Valley near the Salton Sea are preferred for the early melon crops. This area is less subject to freezing due to the climatic influence of the sea. Spring cantaloupes are also planted in Winterhaven (eastern Imperial County).

IRRIGATION: Slant-bed cantaloupes are usually furrow irrigated. Sprinkling tends to cool the soil and cantaloupes do not respond well to prolonged or frequent irrigation.

After planting, the tops of the beds are shaved to fill the furrows and bring the furrow water closer to the seed lines. The beds are then irrigated and water is "subbed" (moved by capillary action) past the seed line. This may take several days.

Following emergence, water is often withheld for several weeks. This is done to maintain soil warmth and promote early growth. The last irrigation is normally scheduled one week prior to harvest. Excessive moisture during harvest may increase ground spotting, rotted fruit, and soft fruit.

FERTILIZERS: Most growers apply liquid 10-34-0 fertilizer injected into the beds at planting or broadcast 11-52-0 prior to listing the beds. Up to 150 pounds of actual nitrogen may be sidedressed. Normally UAN32 or AN20 is used.

POLLINATION: At least one colony of bees per acre is recommended and 1½ colonies are better. The

bees should be distributed on at least two sides of a 40-acre field; distribution of bees within fields is even better. Research has indicated that yields are increased with heavy bee saturation.

Flowers that are bisexual (i.e. fruit-producing flowers) are only open for one day. On the average, a well-pollinated flower will receive at least 15 bee visits during this time. If the flower is poorly pollinated, the flower aborts.

The highest quality, earliest maturing, and largest fruit are produced near the crown of the plant. For this reason it is important that an adequate supply of bees be delivered to the field when the first male blossoms develop.

PEST CONTROL: Spring cantaloupes are subject to a number of insect problems including darkling ground beetles, cutworms, aphids, mites, loopers, silverleaf whiteflies, leafhoppers, and leafminers. The silverleaf whitefly can cause yellowing, wilting and death of plants. They remove a large quantity of plant sap during feeding. The excrement from whiteflies called "honeydew" falls on the fruit and foliage. Black-colored fungi develop on the nutrient-rich excrement causing an undesirable appearance of the fruit. Field packing becomes nearly impossible, as the fruit need to be washed to remove the discoloration. Neonicitinoid insecticides applied at planting or through the drip system followed by foliar insecticide sprays are used to control whiteflies on melons.

Various *Pythium* sp. cause sudden wilt symptoms, which can kill the vine after fruit set. Careful water management can reduce the likelihood of the occurrence of this disease.

Mosaic viruses including zucchini yellow mosaic (ZYMV), watermelon mosaic II (WMVII), papaya ringspot (PRSV), and cucumber mosaic (CMV) are vectored by various aphid species during the spring. There is no control.

Powdery mildew, caused by *Sphaerotheca fuliginea* or *Erysiphe cichoracearum*, is a foliar diseases favored by warm weather and moisture. Dusting sulfur and various fungicides are used for control. Other diseases of lesser importance include charcoal rot caused by *Macrophomina phaseolina*, root rots caused by *Fusarium* spp., *Pythium* spp., and *Rhizoctonia solani*, and gummy stem blight caused by *Didymella bryonia*.

Melon vine decline (*Monosporascus cannonballus)* can cause serious damage at harvest. Other than soil fumigation by methyl bromide, there is no control.

Fusarium fruit rot, caused by *F. roseum*, can cause severe damage. Control measures must be applied as a preventative (i.e. before disease occurs) in order to be effective. Otherwise, control measures are useless.

WEED CONTROL: Weeds are a serious problem in melon production. Few herbicides are registered on melons for weed control under desert conditions. Currently, growers rely on hand weeding and cultivation during the bed reconstruction process to kill unwanted weeds.

HARVESTING: Most of the crop is field-harvested on tractor-pulled platforms that span 12 beds. The basic harvest crew consists of 14 to 17 people including a field supervisor. A harvesting crew can

harvest 50 to 60 cartons per hour. The decision to "break" a field is determined by many factors: market price, sugar content of the fruit, weather, and anticipated yield.

Cantaloupes should have at least 10 percent soluble solids (sugar) for good dessert quality. However, the minimum legal standard is 8 percent. High quality, crown-set fruit may have 14 percent soluble solids or more. While cantaloupes ripen and soften after harvest, they do not increase in sugar content.

The preferred shape for a cantaloupe is round and symmetrical. Triangular-shaped melons are difficult to pack and rattle in the box.

Picking is done according to melon background color. Full-slip, straw-colored melons are no longer the industry standard. Greenish cast cantaloupe hybrid varieties are acceptable provided they contain sufficient sugar.

First impressions of the fruit coming from a district are important in establishing a good report with buyers. This makes it important to pack a good carton at the beginning of the season.

Rough handling resulting in scuffing or bruising of the net and puncturing or cracking of the fruit will increase the incidence of decay and dehydration.

Melon packers size and cull the melons to be packed. Approximately 3 to 15 percent of the fruit (off-sizes and blemished fruit) are discarded back into the field. Sizing is by "feel" with packed sizes being 9, 12, 15, 18, 23, or 30 fruit per carton. Carton weight is approximately 40 pounds. Most of the time there are no 30's shipped. Presentation is important in establishing repeat melon sales. Care should be taken to pack high quality melons free of defects and sunburn.

Cartons are stacked 42 per pallet and 12 to 14 pallets per trailer. It takes 2 to 2-½ hours to fill a trailer. Filled trailers are taken to pressure or "forced air" type coolers to remove field heat. Hydrocooling is also used, but only with shed packed fruit, not field pack.

One method of circumventing the need for pressure cooling in remote areas is to harvest at night, using lights or packing early in the morning before the melons heat up. Cool melons are placed under refrigeration.

Major losses of potentially harvestable fruit occur from mechanical damage and sunburn. Vine coverage has a lot of influence on the incidence of sunburned fruit. Once the roots quit pumping moisture to the fruit, the melons will heat and burn.

POSTHARVEST HANDLING: Cantaloupes may be stored for roughly two weeks at 36-41°F and 95 percent relative humidity. At lower temperatures, chilling injury may occur.

For more information, see "Cantaloupe Production in California", DANR Publication 7218 available from the Imperial County Cooperative Extension Office or for a free download from the Internet go to http://anrcatalog.ucdavis.edu/specials.ihtml

GLOSSARY

Air spray The application of chemicals by aircraft.
Back fill furrows To shave soil off the top of melon beds and place it into a furrow in order to bring the irrigation water closer to the melon seedline.
Bed Mounded soil that is shaped and used for planting; beds are separated by furrows.
Bell Bell pepper.
Big Ox A chisel with 7 shanks used to rip soil 18-24 inches deep.
Blacken the beds To wet/darken a bed with irrigation water.
Black Ice Ice formation on asparagus that is clear and therefore difficult to detect.
Blanks Lack of individual kernel formation in corn.
Brassicas Plants belonging to the genus *Brassica*, of the mustard family (Cruciferae), including cabbage, kale, broccoli, cauliflower, turnip, and mustard; all brassicas are crucifers, but not all crucifers are brassicas.
Break a field To harvest a crop the first time in a season.
Break borders To tear down flat flood borders or flat crop borders.
Breaker A tomato fruit that is beginning to show color change from green to pink on the blossom end; preceded by the *mature green* stage.
Brix A measure of sugar content, especially in tomatoes; a graduated scale, used on a hydrometer, that indicates the weight of sugar per volume of solution.
Brown bead A physiological disorder of broccoli thought to be related to lack of calcium uptake and excessive heat during head formation.
Buck ends of field The remaking of beds at the end of a field in order to channel irrigation water properly; a necessary practice when beds at the end of a field are destroyed due to insufficient turn around space for farm equipment.
Cateye A condition in broccoli where some beads begin breaking into yellow flower; also called *starring*.
Cello Poly bags which hold one or two pounds of carrots; from "cellophane".
Chisel A tractor-mounted, knife-like implement used to rip soil about 20 inches deep.
'choke Artichoke
Cole crops Any of various plants of the genus *Brassica*, of the mustard family.
Cos Romaine Lettuce
Cross checks Small dikes at perpendicular angles to borders used for water diversion into a field.
Crucifers Plants belonging to the Cruciferae or mustard family (e.g., broccoli, brussel sprouts, cabbage, cauliflower, etc.).
Cucurbits Plants belonging to the melon or gourd family (e.g., cantaloupe, watermelon, pumpkin, cucumbers, squash, etc.).
Cull To separate unwanted product from desirable product.
Cultipacker A farm implement used to break up clods of soil; consists of groups of knobbed metal rings stacked together.
Cultivate To work beds after planting in order to control weeds, loosen soil, and allow for application of fertilizer.
Curd The edible portion of marketed cauliflower.
Custom rate The value assigned to a cultural operation by farmers for cost accounting; normally includes the cost of the operator.
Damping-off A fungal disease of seedlings that causes rotting of the stem at the soil level and collapse of the plant.
Doubles The placement of two seeds rather than one when one is intended.
Drift Agrichemicals, dust or pests, which inadvertently fall on nearby (usually adjacent) non-target crops; usually the result of spraying products (especially products of small particle size) on windy days or of poor equipment operation.
Drip Irrigation The slow application of low pressure water in tubes or pipes (buried or on the surface): sometimes called trickle irrigation.
Edema (oedema) A physiological disorder of plant resulting from over-watering; numerous small bumps on the lower side of leaves or on stems divide, expand, and break out of the normal leaf surface and at first form greenish-white swellings or galls; the exposed surface

later becomes rusty colored and has a corky texture; especially common in cabbage.
Excelsior Fine wood shavings; used for stuffing, packing, etc.
Feathering Premature flowering of asparagus due to high temperatures.
Flats Flattened asparagus spears caused by certain varietal characteristics.
Float A large, wooden frame pulled with a tractor for rough leveling of the soil surface.
Flood irrigation A method of irrigation where water is applied to a field by gravity; the water is applied to a field by gravity; the water is channeled by earth borders that are usually 70 feet apart.
'flower Cauliflower
Forking The division of a tap root (especially carrots and lettuce) into branches; can be caused by nematode feeding, soil-borne pathogens, and soil texture.
Frost kissed Produce that has been frozen in the field and has a frosty appearance.
Furrow irrigation A method of irrigation where water is applied to fields by gravity flow down furrows; the water enters the bed by capillary action.
Furrow out The removal of soil from furrows by tractor-mounted shovels.
Gated pipe Large diameter pipes used to deliver low pressure water to each furrow; used to keep head end of field dry for cultivation or harvesting.
Green line A term used to describe the appearance of an emerging row crop as plants germinate and emerge above the soil line, a *green line* appears; often growers switch from sprinkler to furrow irrigation when a field can be *green-lined.*
Ground spray The application of an agrichemical by a tractor-mounted sprayer.
Hollow stem A physiological disorder in broccoli resulting from excessive plant spacing.
Honeydew Sweet excrement from aphids and whiteflies as a result of feeding on plant sap. Honeydew attracts ants and will support the growth of fungi (sooty mold).
Hydrocool To cool produce using ice cold water.
Inject fertilizer The application of liquid fertilizer in the top or sides of a bed.
Jelly Gelatinous material present in *mature-green* tomatoes (see also *locule*).
Landplane A large, tractor-pulled, land leveling machine.
Laser level A land surface leveler that uses a laser guiding device to maintain an accurate grade.
Layby To apply an herbicide or other agrichemical at the last opportunity to enter a field with a tractor prior to harvest.
Lilliston A rolling cultivator with curved tines which uses ground speed to assist in working up the soil surface in order to destroy weeds.
Listing Throwing soil in to a mound to make beds.
Locules Tomato fruit seed cavity.
Mature-green A stage of tomato fruit development when the fruit is fully grown and shows brownish ring at the stem scar after removal of the calyx; color at the blossom end has changed from light green to yellow-green and the seeds are surrounded by *jelly*.
Motor grader A large grader normally used to cut tail ditches for draining off excess surface water.
Naked pack Head lettuce packed without a wrapper.
Pegging the emergence of a *radicle* from seed and its placement in the soil.
Pipe setting Installing 2-inch plastic tubes through a soil berm with a hydraulic ram; the pipes are used to control the flow or irrigation water.
Power mulch A tractor-mounted, power rototiller.
Precision planter Planters which drop seeds at exact intervals; may function mechanically or by vacuum.
Primed seed Lettuce seed that has been *primed* for germination by soaking in *osmotic* solutions (e.g., polyethylene glycol [PEG]) as a preventative to *thermodormancy.*
Pull borders To make flood berms used to channel the water.
Punching pipe see *pipe setting.*
Putting the crop to sleep A phrase used to describe the over-watering of tomatoes by furrow irrigation following sprinkler irrigation; encourages shallow rooting and decreased plant growth.
Radicle The embryonic root.

Random flow planter A non-precision planter; seed drop is regulated by agitating the seed in a hopper over a hole; planting rate depends upon hole size and tractor speed.
Ricing Undesirable granulation of floret tips in cauliflower.
Roll beds A large, metal roller used to firm beds prior to thinning.
Rototill To mechanically mix soil.
Row A line of plants or a bed with a single line of plants.
Seedline A line down a bed in which seeds are planted.
Sidedress To place agrichemicals in a band next to a row of plants.
Silking Period of corn ear formation when silky threads emerge from the ear tip.
Slant bed A culturing technique where beds are slanted towards the winter sun (35-37 degrees from horizontal) such that the bed is perpendicular to the sun's rays.
Slip plow An implement pulled by a caterpillar and used to make deep cuts into the soil whereby soil from below is carried upward into the cut; used to improve drainage.
Slush-ice-cooling A cooling method used on broccoli; a mixture of water and ice is forced rapidly into cartons to cool the product.
Spike The running of tractor-mounted shanks into the soil or beds to improve aeration and drainage.
Sprinkler irrigate The application of irrigation water by pressurized injection into the air.
Starring see *cateye*
Stinger A root emerging from seed; a *radicle*
Stubble disc An implement used to chop crop residue and incorporate it into the soil; the blades are scalloped and operate like a pizza cutter.
Subbing Irrigation method where water is applied to a field in furrows and allowed to travel across beds by capillary action.
Subsoil The pulling of large, hard-faced shanks through the soil up to 42 inches deep; used to shatter soil layers and improve drainage.
Swamper Watermelon harvesting crew member.
Swath To cut a tall crop such as asparagus fern.
Taps See *cross checks*
Tasseling The emergence of corn inflorescence.
Thermodormancy A condition of lettuce seed where high temperatures (>86°F) make seed go dormant, thus inhibiting germination.
Thin The removal of excess crop plants and weeds in the seedline in order to achieve desired plant spacing.
Tillering Emergence of multiple stalks from the same root in corn.
Tip burn A condition, especially in lettuce, where leaf tips are burned; thought to be due to lack of calcium uptake; foliar applications of calcium do not correct the problem.
Trio A head lettuce having crew unit consisting of two cutters and a packer; only used in *naked pack* lettuce.
Triplane A smaller, three-wheeled version of a *landplane*.
Triwall cardboard Triple-layered, corrugated cardboard used to make very sturdy fiberboard containers for watermelon.
Vacuum cooling A cooling method whereby commodities are placed in a strong-walled room, air pressure is reduced and heat consumed in the process cools the product.
Versatile A large caterpillar-sized tractor with rubber tread; used to pull discs and other implements; safe for crossing asphalt roads.
Water run An application of an agrichemical in irrigation water (i.e., furrow irrigation).
White star White markings at the blossom end of tomatoes that turn from green to white as the fruit matures; an indicator of maturity in tomatoes.
Wil-rich chisel plow An implement used to work wet or moist soils prior to making beds.
Wind whip Girdling of seedling stems due to high winds. Seedlings are especially susceptible following thinning or weeding; cole crops are most susceptible.

VEGETABLE RESEARCH AND INFORMATION CENTER

Vegetable Production Series

CANTALOUPE PRODUCTION IN CALIFORNIA

Timothy K. Hartz, University of California Cooperative Extension Specialist, Department of Vegetable Crops, University of California, Davis; Keith S. Mayberry and Jesús Valencia, University of California Cooperative Extension Farm Advisors, Imperial and Stanislaus Counties, respectively

PRODUCTION AREAS AND SEASONS

California has two primary cantaloupe (muskmelon; *Cucumis melo* L.) production areas: the southern desert valleys (Imperial and southern Riverside Counties) and the San Joaquin Valley (Kern, Fresno, Kings, Merced, and Stanislaus Counties). Melons in the southern desert valleys are planted from late December through March for harvest from May through early July. In the San Joaquin Valley, planting begins in February in the south and continues northward through July; harvest begins in late June and continues into October. Overall, plantings are timed to provide a continuous supply of melons from early May through October.

CANTALOUPE ACREAGE AND VALUE

Year	Acreage	Average yield (*tons/acre*)	Gross value/acre
1994	59,300	9.5	$3,021
1993	65,000	9.5	$2,907
1992	64,000	9.0	$2,520

Source: Annual California County Agricultural Commissioners' Report Data (Sacramento: California Department of Food and Agriculture, 1992–1995).

CLIMATIC REQUIREMENTS

Cantaloupe is a warm-season annual plant that is sensitive to freezing temperatures at any growth stage. Growth is very slow below 60°F (16°C) and optimal from 85° to 95°F (30° to 35°C). Cantaloupe can tolerate temperatures in excess of 104° (40°C). Since fruit set requires bee pollination, weather conditions that reduce bee activity (cold, rain, high wind, or prolonged cloud coverage) may reduce yield.

VARIETIES AND PLANTING TECHNIQUES

Both hybrid and open-pollinated cantaloupe varieties are used. In the southern desert valleys hybrid varieties predominate, based on earliness and higher yield potential under stressful spring conditions. Commonly used hybrids include Caravelle, Cruiser, HyMark, Mission, and Primo; Topmark is an open-pollinated standard. The use of hybrid varieties is increasing in the San Joaquin Valley and now constitutes about 50 percent of the acreage. Hybrid varieties used include Caravelle, Durango, HyMark, Mission, and Primo, and TopMark and other open-pollinated lines are still in common use. Statewide, virtually all cantaloupes are direct seeded.

Growers in the southern desert valleys use several specialized techniques to promote earliness. A widely used planting system is the mid-bed trench, which involves the use of a bed shaper to produce a trench, or groove, in the center of an 80-inch (2-m) bed. A single line of seed is planted in the trench, which is then capped with a sheet of clear polyethylene. This system stimulates early growth and provides some frost protection. At thinning the polyethylene is ventilated, then removed, and the bed is reshaped into a standard configuration. Slant-bed culture, in which sloping 80-inch (2-m) beds are oriented east-west, is also commonly used. One row of seed is planted on the south-facing slope of the bed; increased soil temperature from solar heating stimulates seed germination. After crop establishment, the bed is reshaped to leave the plant row centered on a standard 80-inch bed.

In the San Joaquin Valley fields are generally preirrigated, either by furrow or sprinkler, to ensure a full soil moisture profile. When dry enough for tillage, fields are worked into either 40-inch or 80-inch (1- or 2-m) raised beds. A single seed line is planted per bed. Seed is planted into moist soil just below the tilled zone, with 3 to 6 inches (7.5–15 cm) of loose soil over the seeded row to hold in moisture. After seed germination, this soil "cap" is removed. Where 40-inch beds are used, every second bed is seeded; after thinning, the unused bed is split and tilled to widen the planted bed to 80 inches with the plant row in the center.

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Statewide, seeding rates vary from 0.5 to 1.0 pound per acre (0.6–1.1 kg/ha) for hybrid varieties, 1 to 2 pounds per acre (1.1–2.2 kg/ha) for open-pollinated varieties. Desired final in-row spacing is 8 to 16 inches (20–40 cm).

SOILS

Many soil textures are used for cantaloupe production. Sandy soils are used for the earliest plantings because they warm more rapidly in the spring. Loam and clay loam soils are preferred for main-season production due to greater water-holding capacity, which favors a prolonged harvest period. Regardless of texture, all cantaloupe soils should be well drained, since the crop is sensitive to root diseases that thrive in poorly aerated soils.

IRRIGATION

The majority of California cantaloupe fields are furrow-irrigated. There are typically two to five irrigations (depending on region and soil type) after crop establishment, the last one 7 to 10 days before the initiation of harvest. Excessive irrigation late in the season can compromise fruit quality and increase the severity of root disease. Under representative California conditions, cantaloupe consumes about 10 to 15 inches (250–375 mm) of water. Seasonal water applications vary considerably, depending on irrigation efficiency, leaching requirements, and the need for pre-irrigation. Less than 10 percent of cantaloupe acreage is drip-irrigated, usually with semipermanent buried systems. Drip irrigation scheduling is determined by potential evapotranspiration (ET_o) estimates and crop growth stage; frequency of irrigation can vary from once a week early in the season to daily during times of peak water demand. Regardless of irrigation technique, care is taken to keep the tops of the beds dry to minimize fruit contact with moist soil, which can result in unsightly ground spots and fruit rots.

FERTILIZATION

Cantaloupe has modest nutrient needs. Typical fertilizer application rates are 80 to 150 pounds per acre (90–168 kg/ha) of nitrogen (N) and 40 to 80 pounds per acre (45–90 kg/ha) of P_2O_5. Phosphorus (P) and a small amount of N are applied preplant, with the remaining N applied as a sidedressing after thinning or in irrigation water. In the southern desert valleys and the San Joaquin Valley, soil potassium (K) levels are usually sufficient for melon production, except in sandy soils with extractable K levels below 100 ppm. Application of microelements is not generally needed, with the exception of zinc, which may be needed in some San Joaquin Valley soils.

POLLINATION

At least one colony of bees per acre is required for optimum cantaloupe yields. Honeybees are the only efficient pollinators of melons; approximately 10 to 15 bee visits are required to adequately pollinate a bisexual (fruit-producing) melon flower. Distribution of bee colonies around the field is important, since research has shown that bee activity and yield decline with distances over 600 feet (180 m) from the colony. Bee colonies should be set out just prior to the appearance of bisexual flowers and remain in place for 2 to 3 weeks. Care in pesticide usage during this period is critical to minimize bee kill.

INTEGRATED PEST MANAGEMENT

(Detailed information about IPM for cantaloupe is available by contacting the UC IPM World Wide Web site at http://www.ipm.ucdavis.edu. Herbicides, insecticides, and fungicides should always be used in compliance with label instructions.)

Weed management. Annual and perennial weeds can be serious problems in cantaloupe production; many weed control practices are used. Some growers use a preplant banded application of a broad-spectrum herbicide in the plant row. Where fields are pre-irrigated and planted in moist soil, cultivation is the primary in-row weed control method. Most fields receive at least one hand-hoeing, usually in conjunction with thinning of the melon seedlings. A lay-by, incorporated herbicide application is common after thinning to provide season-long weed control in the furrows and edges of the bed.

Insect identification and management. Cantaloupes are subject to damage by a number of insects. Wireworms (*Limonius* spp.), cutworms (*Athetis mindara* and related species), and seed-corn maggots (*Delia platura*) can damage or kill seedlings. Aphids (*Myzus persicae* and *Aphis gossypii*), cucumber beetles (*Acalymma* and *Diabrotica* spp.), leafhoppers (*Empoasca* spp.), leafminers (*Liriomyza* spp.), and spider mites (*Tetranychus* spp.) can damage foliage and fruit, periodically requiring chemical control. The most potentially devastating insect pest is the silverleaf whitefly (*Bemisia argentifolii*). Its effective range is presently confined to the southern desert valleys and the southern third of the San Joaquin Valley. Although present year-round, the whitefly population builds to damaging levels only during late summer or early fall. Although pesticide application may be required, whitefly damage to spring-planted melons is minimal. However, fall production in heavily infested areas is problematic, with control measures ineffective or prohibitively expensive.

Disease and nematode identification and management. Powdery mildew (*Sphaerotheca fuliginae* and *Erysiphe cichoracearum*) can occur on susceptible varieties throughout the entire production season and may require chemical control. Downy mildew (*Pseudoperonospora cubensis*), which requires prolonged presence of free water on leaf surfaces for spores to germinate, is seldom seen, except during rainy periods in the fall in the San Joaquin Valley.

Losses to vascular root diseases such as *Verticillium* (*V. dahliae*) and *Fusarium* (*F. oxysporum*) wilts are generally minimized by selection of resistant varieties. There are a number of other soilborne fungi that frequently act in concert to cause substantial root damage. There is no generally useful chemical control; rather, the root rot complex of organisms is combated by careful water management to minimize root stress and by crop rotation. Soil fumigation may reduce losses to soil pests but is seldom an economically viable practice for cantaloupe production.

By far the most important disease problem is the complex of aphid-vectored viruses that can cause serious economic losses. The most prevalent viruses are cucumber mosaic virus (CMV), watermelon mosaic virus (WMV), and zucchini yellows mosaic virus (ZYMV). Severity of losses varies from season to season and area to area; outbreaks are a function of several factors, but high numbers of migratory aphids are required for an epidemic to occur. Insecticide applications may minimize in-field virus spread but are ineffective in preventing transmission by migratory aphids. Maintaining good sanitation (control of weeds, rapid plow-down of crop residues) may also minimize virus spread. Providing physical separation of early and late plantings may reduce virus severity in the late plantings.

Root knot nematodes (*Meloidogyne* spp.) can cause devastating losses but are generally confined to light-textured soils. Preplant treatment is justified if soil sampling or previous crop history suggests the presence of a high population.

HARVESTING AND HANDLING

Cantaloupes are normally hand-harvested at "full-slip" stage (when the fruit will cleanly separate from the vine with light pressure). Depending on variety, the external color at this stage may still have a greenish cast. Fields are harvested 8 to 10 times over a 10- to 14-day period. Fruit of good quality will have a Brix level of at least 10 percent soluble solids. Melons are either loaded into bulk trucks for transit to a conventional packing shed or are packed in the field into the industry-standard 40-pound (18-kg) cartons. Fruits are sized mechanically or by sight and packed 9, 12, 15, 18, or 23 per carton.

POSTHARVEST HANDLING

Rapid removal of field heat is required to maximize postharvest life. The most common approach is forced-air (pressure) cooling, although some packing sheds still utilize hydrocooling. Once properly cooled, cantaloupes can be stored for 2 weeks or more at 34° to 40°F (1° to 4°C). Water loss through areas of the surface netting scuffed during harvest and handling can reduce cosmetic quality during storage; the problem is minimized by careful handling and maintenance of high humidity during storage.

MARKETING

Palletized cartons are shipped primarily by truck to terminal markets and wholesale receivers across the United States and Canada. There are limited exports of California cantaloupe by ocean transport to Pacific Rim nations.

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2003

SAMPLE COSTS TO PRODUCE

COTTON

PIMA TYPE

SAN JOAQUIN VALLEY

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

SAMPLE COST TO PRODUCE COTTON – PIMA VARIETY
SAN JOAQUIN VALLEY - 2003

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INTRODUCTION

Sample costs for SJV Pima cotton production in the San Joaquin Valley (SJV) are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on production procedures considered typical for growing conditions in the San Joaquin Valley region. Sample costs given for labor, materials, equipment and contract services are based on current figures. Some costs and practices used in this study may not be applicable to your situation. A blank *Your Cost* column is provided to enter your actual costs on Tables 1 and 2.

For an explanation of calculations used for the study refer to the Assumptions or call the Department of Agricultural and Resource Economics, University of California- Davis, (530) 752-3589 or the UC Cooperative Extension Farm Advisor in the county of interest**.**

Sample cost and return studies for many commodities are available and can be requested through the Department of Agricultural and Resource Economics, UC Davis. Current studies can be downloaded from the department website at http://coststudies.ucdavis.edu or obtained from selected county UC Cooperative Extension offices.

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ASSUMPTIONS

The following assumptions give background information relevant to the values shown in Tables 1 to 6 and pertain to sample costs for producing SJV Pima cotton in the San Joaquin Valley region. **The costs are based on typical cultural practices used by farmers in the San Joaquin Valley and are not University of California recommendations.** Some farming practices described may not be used during every production year or on every farm, while some operations not described may be needed. *The use of trade names 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.*

Land. The farm consists of 1,500 acres of non-contiguous land, which includes 750 acres rented and planted to Pima cotton. The remaining acres are planted to other field and row crops including processing tomatoes, corn, wheat, alfalfa, barley, onions, garlic, carrots, lettuce and broccoli. Land rental costs are described in the "Cash Overhead Costs" section of the text and tables. The owner manages the farm.

Production Operating Costs

Tables 1-3 show the costs associated with ground preparation, planting, growing, and harvesting cotton. Land preparation is done from October to March and the cotton is harvested in October and November. The crop year in this study is November to November.

Land Preparation. The ground is ripped or subsoiled in two passes, 2 to 3 feet deep, to break up compaction, which affects root penetration and water infiltration. In this study subsoiling is done once every three years and one-third of the cost is allocated to the crop each year. The ground is then disced twice with a stubble disc to break up large clods and smooth the surface. The ground is again disced twice with a finish disc (offset disc) – once while applying an herbicide and once to further incorporate the herbicide and smooth the surface. Afterwards the beds are listed.

Row Spacing. The assumption for this Pima study is 38 or 40 inch row spacing. Unlike the Acala types of cotton, for which there is data to support a different cost study for 30 inch versus 40 inch row spacing, yield response comparisons for Pima under these different row spacings are quite limited.

Planting. A Pima cotton variety is seeded at a rate of 15 to 20 pounds per acre on 38 or 40-inch beds during April. Cotton is planted using a six-row planter. Enough seed is planted to achieve a desirable stand of 40,000 to 50,000 plants per acre. Populations can range from about 30,000 to 65,000 plants per acre, without any significant effects on total production. Available yield data on responses to plant population in Pima suggest that except under conditions of low vigor (compacted soil, low nutrients, saline soil), plant populations significantly higher than 60,000 to 70,000 plants per acre are likely to reduce yields and delay harvest. The seed cost includes the San Joaquin Valley Cotton Board assessment. (See Assessment Section).

Irrigation. In this study a water cost of $60 per acre-foot is used. Grower applied water ranges from 2.0 to 3.5 acre feet based upon soil type, irrigation method, water application uniformity, crop rooting depth in some soils, evaporation, and runoff. Based on current information it is estimated that 2.5 acre-feet of water is applied during the growing season for cotton in this region, though this amount is dependent upon soil and climatic factors. Water cost for irrigation represents a combination of district water and pumped water. Price

per acre-foot for water will vary by grower depending on the irrigation district, its limits on available water, and changes in energy costs by the district or grower for running irrigation wells where groundwater is available as a backup water supply. Water costs depending on irrigation district or pumping variables can range from $20 per acre-foot to over $140 per acre-foot for late season irrigation in water-short districts.

Most University or USDA irrigation studies comparing Pima and Acala cotton water use in the SJV indicate similar water use in the two types of cotton, although some more recent studies indicated slightly higher (5% to a maximum of 10% higher) water use in Pima cotton due to the potential for a longer growing season with some recent Pima varieties. Growers may consider factoring in higher water use estimates for Pima if that matches their practice or experience.

In this example, the rented land has an irrigation system adequate to irrigate the total cotton acreage The irrigation system cost, therefore, is included as part of the land rental cost, which is under the category later described as "Cash Overhead Costs". A ditch-based furrow irrigation system is assumed for this example.

Fertilization. Nitrogen is the primary nutrient applied to cotton throughout the growing season. UN-32 (32-0-0) is sidedressed at a rate of 150 pounds of N per acre during May. A fertilizer applicator is rented from the fertilizer dealer to sidedress the N. Thirty pounds of N as UN-32 is water run in July. The labor for the water run N is included in the irrigation labor costs. Cotton is very responsive to nitrogen, but excessive applications can cause rank or vegetative growth and lead to increased pest problems, poor defoliation, lower yields, and nitrate leaching. The desirability of the water run nitrogen in July is largely dependent upon the yield potential of the plant and relative plant vigor (i. e. the better the yield potential on the plant, or the lower the vigor, the more likely that a favorable and cost-effective response will be obtained with later water-run nitrogen applications). Care must be exercised in particular with late-season nitrogen management in Pima cotton, as many Pima varieties have a pronounced tendency to sustain vegetative growth well into late-summer and early fall, and can be hard to prepare for a timely harvest. If the crop rotation includes heavily-fertilized vegetable crops or alfalfa, or if dairy waste or manure applications are common practices on individual fields, residual soil nitrogen and even potassium may be high. These situations would then present an opportunity to reduce input costs and lower applied nitrogen, resulting in fewer problems with excessive growth, delayed harvest, and leaching losses.

Pest Management. The pesticides, rates, and cultural practices mentioned in this cost study are listed in the *UC IPM Pest Management Guidelines-Cotton* **Pesticides mentioned in this study are not recommendations, but those commonly used in the region.** For information and pesticide use permits, contact the local county Agricultural Commissioner's office. For information on other pesticides available, pest identification, monitoring, and management, visit the UC IPM website at www.ipm.ucdavis.edu. **Pest control costs can vary considerably each year depending upon local conditions and pests in any given year. Ranges can be as dramatic as $50 per acre for one year and $200 the next.**

Pest Control Adviser (PCA). Written recommendations are required for many pesticides and are made by licensed pest control advisers. In addition the PCA or an agronomist consultant will monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study, a fee is allocated for a PCA.

Insects. In the absence of clear data to the contrary, Pima cotton should be monitored for insects and mites using the same techniques and economic thresholds as for Upland varieties. Common observations among University researchers as well as PCA's are that: (1) Pima varieties typically exhibit lower spider mite populations and a higher tolerance to spider mites than Acala types of cotton; (2) cotton aphids and silverleaf whitefly build up faster and can cause more problems in Pima than in Acala cotton; and (3) fruit loss in Pima varieties can be worse than in Acala types at similar Lygus bug populations. Since under typical management, most Pima varieties require a longer growing season to mature than Acala types, Pima has a longer potential period of exposure to late-season insect pests than typical for Acala types of cotton, which could increase insect control costs. This information should be kept in mind when planning for Pima production costs, but without clear documentation of higher costs in University studies, assumed insect management practices will be the same as in the Acala cost study.

In this study, pest management is for mites, aphids, and lygus. An aerial application of Zephyr is made in May for mite control, Warrior insecticide in June for lygus control, and Provado insecticide in July for aphid control. Monitoring of insect populations is necessary to determine if and when to treat the crop.

Lygus bugs feed on the squares (flower buds) and small fruit (bolls). Damaged squares will usually drop off while damaged bolls at a minimum may have stained lint and damaged seeds, or can be lost if damaged when bolls are less than 10 to 12 days of age past the flower stage. In cases where there are repeated or sustained infestations of lygus bugs, it is not uncommon for growers to need more than the assumed one insecticide application for lygus control.

Aphids cause physical damage to the leaves and/or contaminate the lint with their honeydew production. Also, their feeding may reduce the carbohydrates needed for boll maturation, resulting in yield loss. Mites feeding on the leaves reduce plant vigor and result in extensive defoliation.

Cost estimates do not include insecticide applications for beet armyworm control. In some years and/or locations, beet armyworm can develop in populations capable of significant yield reductions, and their control may be an additional expense in some situations.

Cost estimates also do not include control measures for silverleaf whitefly, which can be a major late-season pest in parts of the southern and even central San Joaquin Valley. Silverleaf whitefly has the potential to cause sticky cotton and reduce the value of cotton lint (fiber). Insect growth regulators and insecticides are available to aid in control, but costs are highly variable by location and timing of infestations, choice of control measures, and the number of applications required. Similarly, if aphid problems continue into the late-season when bolls open and cotton lint is exposed to aphid honeydew, another insecticide application in addition to the assumed one application may be required to prevent sticky cotton.

Weeds. In November, a pre-emergent herbicide (Treflan) is applied and incorporated in the fields at discing. This application will control many early season annual broadleaves and grasses. An "over-the-top" herbicide, Staple in this study, for broadleaf weed control is sprayed in May. Cultivation begins in late April (depending upon planting date) and continues until the end of June. A total of four cultivations are done in this study, using rolling cultivators. The first cultivation is made prior to planting in March and the remaining three are done from April to June. The fields are hand hoed in June. Also, a post-directed herbicide/layby treatment with Caparol is made in June.

Growth Regulator & Defoliation. A plant growth regulator (mepiquat chloride, also known as "Pix" or other trade names) is applied at one pint per acre in late June or July and again a second time at one-half pint in late-July or early August. The total number of applications and rates used can vary with a number of factors in the range of current production practices used in the SJV. Considerations include: (1) the degree to which growers use delayed irrigations to aid in limiting vegetative growth; (2) the lateness of the crop; (3) soil factors such as as prevailing nitrogen levels or salinity levels. Under low vigor conditions such as in saline soil, or compacted soil conditions, caution is warranted to avoid negative impacts of too high a rate of growth regulator application.

Harvest aid chemicals, often called by the group name "Defoliants" are applied in September and/or October. Typical harvest aid applications include two application timings, with materials such as Prep and Ginstar applied in the first application, and a second application 14 days or more later with materials such as Defol and Gramoxone Max.

Plant growth regulators control excessive vegetative growth and promote a balance between vegetative and reproductive growth. Defoliants are applied prior to picking to aid harvest by causing the leaves to drop. Defoliation reduces the amount of trash collected with the cotton, and reduces staining of the lint. Because of the more indeterminate growth than upland varieties, the Pima varieties may need additional applications as well as the use of higher rates.

Harvest. The farm in this study owns two four-row cotton pickers and two module builders. The cotton is dumped from the harvester directly into the module builder that presses loose seed cotton into a dense and economical unit for transportation to the gin. A tractor and tractor driver monitor each module. Two laborers maintain the area – cleaning cotton off the ground – during the harvest.

The assumption for this cost study is that Pima cotton requires two harvests, with the second harvest required to collect seed-cotton from later-maturing bolls. For the second harvest, the grower again uses two pickers, but only one module builder due to reduced yields per acre. Harvest time is reduced due to faster harvesting speeds compared to the first picking and less time required for dumping. Pima cotton matures over a longer time than upland cotton; better quality is obtained in the first pick due to favorable weather conditions earlier in the season. Depending on the value of Pima seed and lint, in years with good early boll set and warm pre-harvest weather, many newer Pima varieties can mature more evenly and require only one pick for harvest. Growers may choose to adjust the harvest costs accordingly if that is the typical harvest experience in their area.

Typical custom picking costs for Pima cotton are $80 to $90 per acre for the first pick and $30 per acre second pick. Growers may choose to own cotton pickers and module builders, purchased either new or used, or hire a custom harvester to perform the harvest. Many factors are important in deciding which harvesting option a grower uses. The decision to invest in cotton harvesting equipment requires consideration of differences in production practices and equipment requirements for all of the crops in rotation as well as the direct cost of the harvesting equipment. These factors and appropriate method of analysis are discussed by Blank et al, (1992). Though their report specifically addresses hay harvesting, the same principles and methodology can be used with cotton harvesting.

Yields. The crop yield used for calculations in this study is 1,150 pounds of lint and 2,067 pounds of seed per acre. Pima cotton is assumed to yield 92 to 93% of Acala, based upon long-term differences in statewide average yields between the two varieties. Since a yield of 1,250 pounds of lint per acre was used in the Acala cost studies, the 1,150 pounds of lint per acre yield represents 92% of the yield used in the Acala study. Returns for various lint yields are shown in Table 6.

Returns. An estimated price of $0.90 per pound of lint is used to calculate returns. The price is based on current returns and from county averages over the last five years. Some cooperative cotton gins pay growers as much as $5 to $25 per bale for seed credit above grower ginning costs, but is not a regular practice. Table 6 shows grower returns based on varying yields.

Revenue from federal government programs. The typical revenue available for the Acala's (Upland cotton) is not available to the Pima (Extra Long Staple [ELS]) producers.

Nonrecourse Marketing Assistance Loans. If market conditions are not good, the grower can store the crop and borrow on it to pay the accumulated production costs. He can later sell the crop, repay the loan, accrued storage and related costs. The ELS cotton loan rate is $0.7977 per pound. The price in the study is above the loan rate, so the crop would not go into loan. For additional information, contact your USDA Farm Service Agency.

Transportation. Transportation costs are based on roundtrip distances from the field to the gin. Most gins within a close radius of the field do not charge because the cost is included in the ginning fee. Longer hauls (over 40 miles round trip) will have a hauling charge. Hauling companies may also have a surcharge for modules less than a minimum weight.

Ginning. Commercial cotton gins normally keep the cottonseed and give growers a credit to cover ginning and transportation costs; therefore, most growers do not see a ginning charge. In this study, ginning fees are covered by the seed credit and are not included as a line-item cost. Some gins especially cooperatives may return to the grower a net difference of $5 to $25 per bale between the seed value and ginning costs.

Cotton gins charge growers for compressing lint into universal density (UD) bales for shipping. In this study a fee of $7.00 per bale is charged which includes hydraulic compressing, a sample for the merchant, and a loading charge. Some ginners also charge a $1 invoicing fee, but the fee is not included in this study.

Assessments. Most assessments are collected by the gin or handler and deducted from the growers' gross returns. Both mandatory and voluntary assessments are discussed below.

USDA-HVI. The USDA levies a fee for High Volume Instrumentation (HVI) classing. This determines the marketing classification cotton grade. Growers are mandated with a $1.55 per bale fee.

Cotton Incorporated. Cotton Incorporated was created by a federal marketing order and is overseen by the Cotton Board. Cotton Inc. provides funds for industry research and promotion and currently requires growers to pay $1.00 per bale plus a supplemental 0.5% lint assessment on the current gross value lint returns per bale. The supplemental assessment in this study is $1.75 per bale ($0.70 x .005 x 500 lb bale).

Pink Bollworm Project. The California State Department of Food and Agriculture (CDFA) manages and enforces the Pink Bollworm Project. This program, which through detection and legislated postharvest practices, controls pink bollworm in the San Joaquin Valley and other cotton growing districts in the state. The Pink Bollworm Project maintains several control districts to administer the program. Under the project growers are assessed a fee only if cotton is ginned within a project district. CDFA has a current charge of $2.00 per bale.

National Cotton Council. The National Cotton Council, a voluntary organization, collects an assessment to provide lobbying, advocacy, and public relations for the cotton industry at the national level. The current assessment rate paid by growers is $0.45 per bale.

California Cotton Growers And Ginners Association. The California Cotton Growers And Ginners Association assists California cotton growers in advocating their position in the legislature. The growers are charged $0.15 per bale and the ginners are charged $0.15 per bale. Participation in this organization is voluntary.

San Joaquin Valley Cotton Board. The board reviews test program data and approves variety releases. Most of the money goes to the University of California for variety evaluation. The assessment is added to the seed price. The current assessment paid by the grower is $3.75 per planting seed hundredweight. Revenue collected by the board in 2001 averaged $0.85 per producing acre.

Supima Association. The Supima Association, composed of American Pima cotton growers, promotes U.S. Pima cotton, and is also involved in quality assurance, research programs, and working with government agencies to maintain a viable marketing environment. The voluntary assessment is $3.00 per bale. The funds are collected by the first post-ginning handler of the cotton.

Pickup. Two pickups – one-half ton and three-quarter ton – are used on the ranch. It is assumed that each pickup travels 4,998 miles each year for total ranch use.

Labor. Basic hourly wages for workers are $9.51 per hour for machine operators and $8.23 per hour for non-machine workers. Adding 34% for the employers share of federal and state payroll taxes and other benefits raises the total labor costs to $12.74 per hour for machine operators and $11.02 per hour non-machine labor. The labor for operations involving machinery is 20% higher than the operation time to account for the additional time involved in equipment set up, moving, maintenance and repair.

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 Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are $1.11 and $1.58 per gallon, respectively. The fuel prices are a January 2003 average based on four California delivery locations. The cost includes a 2.25% sales tax (effective September 2001) on diesel fuel and 7.25% sales tax on gasoline. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. 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 5 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest on Operating Capital. Interest on operating capital is based on cash production costs and is calculated monthly until harvest at a nominal rate of 7.14% 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.

Risk. The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect the profitability and economic viability.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, equipment repairs, and management.

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 property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% 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 0.676% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $1,246 for the entire farm.

Office Expense. Office and business expenses are estimated at $30 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, shop, and office utilities, and miscellaneous administrative charges.

Land Rent. The land is rented on a cash basis for $150 per acre. The agreement includes the use of the irrigation system on the property. The general consensus from those in the industry is that Pima is grown on the so called “better land” as compared the the Acala cotton. Thus the grower pays a higher rent per acre for Pima than Acala cottons.

Investment Repairs. Annual maintenance is calculated as 2% of the purchase price.

Non-Cash Overhead Costs

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase 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 formula

for the calculation of the annual capital recovery costs is ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE, 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 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 that corresponds to the interest rate used and the life of the machine.

Interest Rate. The interest rate of 6.25% used to calculate capital recovery cost is the USDA-ERS's ten-year average of California's agricultural sector long-run rate of return to production assets from current income. It is used to reflect the long–term realized rate of return to these specialized resources that can only be used effectively in the agriculture sector. In other words, the next best alternative use for these resources is in another agricultural enterprises.

Land. The grower owns 750 acres of row-crop land valued at $3,300 per acre. Values for land with relatively secure irrigation water supplies in the region range from $700 per acre to $5,000, depending upon location and soil condition. The site for the cotton in this study is rented land enrolled in the government subsidy program, but is not available for Pima growers.

Building. The buildings are metal buildings erected on a cement slab and cover approximately 2,400 square feet.

Tools. This includes shop tools, hand tools, and miscellaneous field tools. The number is not based upon an actual or average inventory.

Fuel Tanks. Diesel and gasoline fuel tanks with electric pumps are set up in a cement containment pad that meets federal, state, and county regulations.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in Table 6. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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

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For information concerning the above mentioned University of California publications contact UC DANR Communications Services (1-800-994-8849) or your local county Cooperative Extension office.

UC COOPERATIVE EXTENSION

Table 1. COSTS PER ACRE to PRODUCE PIMA COTTON

SAN JOAQUIN VALLEY - 2003

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre					
		Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Rip Fields 1X/3Yrs	0.27	4	7	0	0	11	
Primary Discing 2X	0.25	4	7	0	0	11	
Weed Control - Apply Herbicide	0.20	3	4	5	0	12	
Weed Control - Incorporate Herbicide w/Disc	0.14	2	3	0	0	5	
List Beds	0.07	1	1	0	0	2	
Make Ditch	0.06	1	1	0	0	2	
Irrigate (Labor includes water run UN32)	5.00	55	0	150	0	205	
Fertilizer - Water Run UN32	0.00	0	0	8	0	8	
Close Ditch	0.06	1	1	0	0	2	
Cultivate – Preplant	0.10	2	1	0	0	3	
Plant	0.12	2	2	22	0	26	
Uncap Beds	0.08	1	1	0	0	2	
Cultivate - 3X	0.31	5	4	0	0	9	
Fertilizer - Sidedress UN32	0.14	2	2	39	2	45	
Weed Control - Over-The-Top Spray	0.20	3	2	18	0	24	
Insect Control - Mites	0.00	0	0	36	8	43	
Weed Control - Hand Hoe	5.00	55	0	0	0	55	
Weed Control - Post Directed/Layby Spray	0.20	3	2	16	0	21	
Insect Control - Lygus	0.00	0	0	9	8	16	
Insect Control - Aphids	0.00	0	0	16	8	24	
Growth Regulator	0.00	0	0	23	15	38	
Defoliate Cotton 2X	0.00	0	0	54	15	69	
PCA	0.00	0	0	0	12	12	
Pickup Truck Use	0.44	7	2	0	0	9	
TOTAL CULTURAL COSTS	12.64	151	40	395	67	653	
Harvest:							
Harvest 2X	0.50	8	32	0	0	40	
Build Module and Haul 2X	0.50	13	7	0	0	20	
TOTAL HARVEST COSTS	1.00	20	39	0	0	60	
Gin:							
Gin (paid by seed credit)	0.00	0	0	0	0	0	
Gin Compression Charge	0.00	0	0	0	16	16	
TOTAL GIN COSTS	0.00	0	0	0	16	16	
Assessment:							
Assessments	0.00	0	0	23	0	23	
TOTAL ASSESSMENT COSTS	0.00	0	0	23	0	23	
Postharvest:							
Chop Stalks	0.13	2	2	0	0	3	
Disc Residue - 2X	0.24	4	7	0	0	11	
TOTAL POSTHARVEST COSTS	0.37	5	9	0	0	14	
Interest on operating capital @ 7.14%						25	
TOTAL OPERATING COSTS/ACRE		176	89	418	83	791	
Cash Overhead:							
Land Rent Cotton						150	
Office Expense						30	
Liability Insurance						1	
Property Taxes						5	
Property Insurance						4	
Investment Repairs						3	
TOTAL CASH OVERHEAD COSTS						192	
TOTAL CASH COSTS/ACRE						983	

UC COOPERATIVE EXTENSION
Table 1. continued

			Total Costs	Your Costs
Non-Cash Overhead:	Per Producing Acre	Annual Cost Capital Recovery		
Buildings 2,400sqft	40	3	3	
Fuel Tanks 2-500 gal	4	0	0	
Shop/Field Tools	8	1	1	
Siphon Pipes 3"x 90"	5	1	1	
Service Truck 2-Ton	84	10	10	
Equipment	725	89	89	
TOTAL NON-CASH OVERHEAD COSTS	866	104	104	
TOTAL COSTS/ACRE			1,087	

UC COOPERATIVE EXTENSION

Table 2. COSTS AND RETURNS PER ACRE to PRODUCE PIMA COTTON

SAN JOAQUIN VALLEY - 2003

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Lint	1,150.00	lb	0.90	1,035	
OPERATING COSTS					
Herbicide:					
Treflan HFP	1.50	pt	3.50	5	
Staple	0.38	floz	48.23	18	
Caparol	1.50	qt	10.57	16	
Water:					
Water	30.00	acin	5.00	150	
Seed:					
Seed	15.00	lb	1.48	22	
Insecticide:					
Zephyr	6.00	floz	6.00	36	
Warrior	3.20	oz	2.73	9	
Provado	3.75	oz	4.27	16	
Growth Regulator:					
Pix	1.50	pt	15.16	23	
Fertilizer:					
UN32	180.00	lb N	0.26	47	
Defoliant:					
Prep	2.00	pt	6.24	12	
Ginstar	13.00	floz	1.83	24	
Defol 6	1.00	gal	10.00	10	
Gramoxone Max	1.31	pt	5.78	8	
Assessment:					
Cotton Incorporated	2.33	bale	1.00	2	
Cotton Incorporated Supplemental	2.33	bale	1.75	4	
California Ginners and Cotton Growers	2.33	bale	0.15	0	
National Cotton Council	2.33	bale	0.45	1	
Pink Bollworm Project	2.33	bale	2.00	5	
USDA Classing Fee	2.33	bale	1.40	3	
Supima Association	2.33	bale	3.00	7	
Rent:					
Fertilizer Applicator	1.00	acre	2.00	2	
Custom:					
Air Application	7.00	acre	7.50	53	
Gin Compression Charge	2.33	bale	7.00	16	
Gin Charge (Paid by seed credit)	2.33	bale	0.00	0	
Contract:					
PCA/Consultant Fee	1.00	acre	12	12	
Labor (machine)	4.79	hrs	12.74	61	
Labor (non-machine)	10.45	hrs	11.02	115	
Fuel – Diesel	37.22	gal	1.11	41	
Lube				6	
Machinery repair				41	
Interest on operating capital @ 7.14%				25	
TOTAL OPERATING COSTS/ACRE				791	
NET RETURNS ABOVE OPERATING COSTS				244	

UC COOPERATIVE EXTENSION
Table 2. continued

	Value or Cost/Acre	Your Costs
CASH OVERHEAD COSTS:		
Land Rent Cotton	150	
Office Expense	30	
Liability Insurance	1	
Property Taxes	5	
Property Insurance	4	
Investment Repairs	3	
TOTAL CASH OVERHEAD COSTS/ACRE	192	
TOTAL CASH COSTS/ACRE	983	
NON-CASH OVERHEAD COSTS (Capital Recovery)		
Buildings 2,400sqft	3	
Fuel Tanks 2-500 gal	0	
Shop/Field Tools	1	
Siphon Pipes 3"x 90"	1	
Service Truck 2-Ton	10	
Equipment	89	
TOTAL NON-CASH OVERHEAD COSTS/ACRE	104	
TOTAL COSTS/ACRE	1,087	
NET RETURNS ABOVE TOTAL COSTS	-52	

UC COOPERATIVE EXTENSION

Table 3. MONTHLY CASH COSTS PER ACRE to PRODUCE PIMA COTTON

SAN JOAQUIN VALLEY - – 2003

Beginning NOV 02 Ending NOV 03	NOV 02	DEC 02	JAN 03	FEB 03	MAR 03	APR 03	MAY 03	JUN 03	JUL 03	AUG 03	SEP 03	OCT 03	NOV 03	TOTAL
Cultural:														
Rip Fields 1X/3Yrs	11													11
Primary Discing 2X	11													11
Weed: Apply Herbicide	12													12
Incorporate Herbicide	5													5
List Beds	2													2
Make Ditch				1			1		1					2
Irrigate				51				38	77	39				205
Close Ditch				1				1			1			2
Cultivate - 4X					3	3	3	3						11
Plant						25								25
Uncap Beds						2								2
Fertilizer – Sidedress UN32							45							45
Weed Control - Over-The-Top							24							24
Insect Control - Mites							43							43
Weed Control - Hand Hoe								55						55
Weed Control - Direct/Layby								21						21
Insect Control - Lygus								16						16
Insect Control - Aphids									24					24
Apply Growth Regulator 2X									23	15				38
Fertilizer - Water Run UN32									8					8
Defoliate Cotton 2X												69		69
PCA	1	1	1	1	1	1	1	1	1	1	1	1	1	12
Pickup Truck Use	1	1	1	1	1	1	1	1	1	1	1	1		9
TOTAL CULTURAL COSTS	43	2	2	54	4	33	117	136	133	55	2	71	1	653
Harvest:														
Harvest 2X													40	40
Build Module 2X													20	20
Gin Compression Charge													16	16
TOTAL HARVEST COSTS													76	76
Assessment:														
Assessments													23	23
TOTAL ASSESSMENT COSTS													23	23
Postharvest:														
Chop Stalks													3	3
Disc Residue - 2X													11	11
TOTAL POSTHARVEST COSTS													14	14
Interest on operating capital	0	0	0	1	1	1	2	2	3	4	4	4	5	25
TOTAL OPERATING COSTS/ACRE	43	2	2	55	5	33	119	138	136	59	6	74	118	791
TOTAL OPERATING COSTS/LB	0.04	0.00	0.00	0.05	0.00	0.03	0.10	0.12	0.12	0.05	0.01	0.06	0.10	0.69
OVERHEAD:														
Land Rent Cotton													150	150
Office Expense	2	2	2	2	2	2	2	2	2	2	2	2	2	30
Liability Insurance			1											1
Property Taxes			3						3					5
Property Insurance						2						2		4
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0	0		3
TOTAL CASH OVERHEAD COSTS	3	3	6	3	3	4	3	3	5	3	3	4	152	192
TOTAL CASH COSTS/ACRE	46	4	8	57	8	38	121	141	142	61	8	79	152	990
TOTAL CASH COSTS/LB	0.04	0.00	0.01	0.05	0.01	0.03	0.11	0.12	0.12	0.05	0.01	0.07	0.13	0.86

UC COOPERATIVE EXTENSION

Table 4. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, and BUSINESS OVERHEAD

SAN JOAQUIN VALLEY – 2003

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Total
03	105 hp 2wd Tractor	62,000	10	18,314	7,151	271	402	7,824
03	105 hp 4wd Tractor	75,000	10	22,154	8,650	328	486	9,464
03	150 hp 4wd Tractor	110,000	10	32,492	12,687	482	712	13,881
03	230 hp track-type	154,000	10	45,489	17,761	674	997	19,433
03	Cultivator Rolling 20' #1	6,800	5	2,215	1,234	30	45	1,310
03	Cultivator Rolling 20' #2	6,800	5	2,215	1,234	30	45	1,310
03	Disc - Finish 21'	19,595	12	2,714	2,211	75	112	2,398
03	Disc-Stubble 18' #1	42,000	10	7,427	5,217	167	247	5,632
03	Disc-Stubble 18' #2	42,000	10	7,427	5,217	167	247	5,632
03	Ditcher - 8'	7,800	15	749	785	29	43	856
03	Harvester 4-Row #1	265,000	10	49,987	32,684	1,065	1,575	35,324
03	Harvester 4-Row #2	265,000	10	49,987	32,684	1,065	1,575	35,324
03	Lister 6 Row 20'	5,500	12	762	621	21	31	673
03	Module Builder #1	24,000	10	4,244	2,981	95	141	3,218
03	Module Builder #2	24,000	10	4,244	2,981	95	141	3,218
03	Mower-Flail 20'	14,445	15	1,387	1,453	54	79	1,586
03	Pickup - 1/2 Ton	24,000	5	10,756	3,838	117	174	4,129
03	Pickup - 3/4 Ton	28,000	5	12,549	4,477	137	203	4,817
03	Planter-6 Row 20'	15,015	15	1,442	1,511	56	82	1,648
03	Rear Blade - 10'	2,581	18	172	237	9	14	261
03	Saddle Tank 300gal #1	3,218	5	1,048	584	14	21	620
03	Saddle Tank 300gal #2	3,218	5	1,048	584	14	21	620
03	Spray Boom 20' #1	913	3	380	224	4	6	235
03	Spray Boom 20' #2	913	3	380	224	4	6	235
03	Subsoiler 10'	14,800	10	2,617	1,838	59	87	1,984
03	Uncapper-6 row 20'	8,500	10	1,503	1,056	34	50	1,140
	TOTAL	1,225,098		283,702	150,127	5,100	7,544	162,770
	60% of New Cost *	735,059		170,221	90,076	3,060	4,526	97,662

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Cash Overhead Repairs	Total
Buildings 2,400 sqft	60,000	30		4,476	203	300	1,200	6,179
Fuel Tanks 2-500 gal	6,514	20	651	562	24	36	130	752
Service Truck 2-Ton	125,500	10	25,000	15,379	509	752	2,510	19,151
Shop/Field Tools	12,000	15	1,200	1,205	45	66	240	1,556
Siphon Pipes 200 3"x 90"	8,024	10		1,103	27	40	160	1,330
TOTAL INVESTMENT	212,038		26,851	22,726	807	1,194	4,240	28,968

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Land Rent Cotton	750	acre	150.00	112,500
Liability Insurance	1,500	acre	0.83	1,246
Office Expense	1,500	acre	30.00	45,000

UC COOPERATIVE EXTENSION
Table 5 HOURLY EQUIPMENT COSTS
SAN JOAQUIN VALLEY - SOUTH 2002

			COSTS PER HOUR					
			Cash Overhead		Operating			
Yr	Description	Actual Hours Used	Capital Recovery	Insur-ance	Taxes	Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
03	105 hp 2wd Tractor	1,343.60	3.19	0.12	0.18	2.81	7.78	10.59	14.09
03	105 hp 4wd Tractor	1,599.60	2.34	0.12	0.18	1.94	7.78	9.72	13.27
03	150 hp 4wd Tractor	1,730.90	4.40	0.17	0.25	2.86	11.11	13.97	18.78
03	230 hp track-type	1,600.20	6.66	0.25	0.37	4.00	17.04	21.04	28.32
03	Cultivator Rolling 20' #1	231.80	3.20	0.08	0.12	0.65	0.00	0.65	4.05
03	Cultivator Rolling 20' #2	154.50	4.43	0.11	0.16	0.65	0.00	0.65	5.35
03	Disc - Finish 21'	273.20	4.85	0.16	0.24	3.11	0.00	3.11	8.37
03	Disc-Stubble 18' #1	199.50	15.69	0.50	0.74	6.79	0.00	6.79	23.73
03	Disc-Stubble 18' #2	200.00	15.65	0.50	0.74	6.79	0.00	6.79	23.69
03	Ditcher - 8'	130.00	3.62	0.13	0.20	1.19	0.00	1.19	5.14
03	Harvester 4-Row #1	207.10	94.70	3.08	4.56	38.51	19.26	57.77	160.13
03	Harvester 4-Row #2	207.10	94.70	3.08	4.56	38.51	19.26	57.77	160.13
03	Lister 6 Row 20'	165.70	2.25	0.08	0.11	1.10	0.00	1.10	3.54
03	Module Builder #1	263.20	6.80	0.22	0.32	3.25	0.00	3.25	10.59
03	Module Builder #2	113.20	15.80	0.51	0.75	3.25	0.00	3.25	20.30
03	Mower-Flail 20'	130.20	6.69	0.25	0.36	6.33	0.00	6.33	13.64
03	Pickup - 1/2 Ton	399.60	5.76	0.18	0.26	1.78	2.55	4.33	10.53
03	Pickup - 3/4 Ton	399.60	6.72	0.21	0.30	2.08	2.55	4.63	11.86
03	Planter-6 Row 20'	132.70	6.83	0.25	0.37	2.96	0.00	2.96	10.41
03	Rear Blade - 10'	160.00	0.89	0.03	0.05	0.37	0.00	0.37	1.35
03	Saddle Tank 300gal #1	400.00	0.88	0.02	0.03	0.02	0.00	0.02	0.95
03	Saddle Tank 300gal #2	400.00	0.88	0.02	0.03	0.02	0.00	0.02	0.95
03	Spray Boom 20' #1	500.00	0.27	0.01	0.01	0.25	0.00	0.25	0.53
03	Spray Boom 20' #2	500.00	0.27	0.01	0.01	0.25	0.00	0.25	0.53
03	Subsoiler 10'	200.00	5.52	0.18	0.26	3.34	0.00	3.34	9.29
03	Uncapper-6 row 20'	60.70	10.43	0.33	0.49	1.73	0.00	1.73	12.98

UC COOPERATIVE EXTENSION
Table 6. RANGING ANALYSIS
SAN JOAQUIN VALLEY - 2003

COSTS PER ACRE AT VARYING YIELD TO PRODUCE PIMA COTTON

	YIELD (lbs lint/acre)							
	750	1,000	**1,150**	1,250	1,500	1,750	2,000	2,250
OPERATING COSTS/ACRE								
Cultural Cost	653	653	653	653	653	653	653	653
Harvest Cost	41	52	60	64	76	88	100	112
Assessment Cost	15	20	23	25	30	35	40	44
Ginning/Compression Cost	11	14	16	18	21	25	28	32
Postharvest Cost	14	14	14	14	14	14	14	14
Interest on operating capital	25	25	25	25	25	25	26	26
TOTAL OPERATING COSTS/ACRE	759	778	791	799	819	840	861	881
TOTAL OPERATING COSTS/LB	1.01	0.78	0.69	0.64	0.55	0.48	0.43	0.39
CASH OVERHEAD COSTS/ACRE	192	192	192	192	192	192	192	192
TOTAL CASH COSTS/ACRE	951	970	983	991	1,011	1,032	1,053	1,073
TOTAL CASH COSTS/LB	1.27	0.97	0.85	0.79	0.67	0.59	0.53	0.48
NON-CASH OVERHEAD COSTS/ACRE	104	104	104	105	105	105	105	105
TOTAL COSTS/ACRE	1,055	1,074	1,087	1,096	1,116	1,137	1,158	1,178
TOTAL COSTS/LB	1.41	1.07	0.95	0.88	0.74	0.65	0.58	0.52

UC COOPERATIVE EXTENSION
Table 6. continued

NET RETURNS PER ACRE ABOVE OPERATING COSTS FOR PIMA COTTON

PRICE ($/lb)	YIELD (lbs lint/acre)							
Lint	750	1,000	**1,150**	1,250	1,500	1,750	2,000	2,250
0.70	-234	-78	27	76	231	385	539	694
0.75	-197	-28	85	139	306	473	639	807
0.80	-159	22	142	201	381	560	739	919
0.85	-122	72	200	264	456	648	839	1,032
0.90	-84	122	257	326	531	735	939	1,144
0.95	-47	172	315	389	606	823	1,039	1,257
1.00	-9	222	372	451	681	910	1,139	1,369

NET RETURNS PER ACRE ABOVE CASH COST FOR PIMA COTTON

PRICE ($/lb)	YIELD (lbs lint/acre)							
Lint	750	1,000	**1,150**	1,250	1,500	1,750	2,000	2,250
0.70	-426	-270	-165	-116	39	193	347	502
0.75	-389	-220	-108	-54	114	281	447	615
0.80	-351	-170	-50	9	189	368	547	727
0.85	-314	-120	8	72	264	456	647	840
0.90	-276	-70	65	134	339	543	747	952
0.95	-239	-20	123	197	414	631	847	1,065
1.00	-201	30	180	259	489	718	947	1,177

NET RETURNS PER ACRE ABOVE TOTAL COST FOR PIMA COTTON

PRICE ($/lb)	YIELD (lbs lint/acre)							
Lint	750	1,000	**1,150**	1,250	1,500	1,750	2,000	2,250
0.70	-530	-374	-269	-221	-66	88	242	397
0.75	-493	-324	-212	-159	9	176	342	510
0.80	-455	-274	-154	-96	84	263	442	622
0.85	-418	-224	-97	-34	159	351	542	735
0.90	-380	-174	-39	29	234	438	642	847
0.95	-343	-124	19	92	309	526	742	960
1.00	-305	-74	76	154	384	613	842	1,072

Lint Price when comparing to other cotton studies = Lint + LDP
Bold = data in study

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2005

SAMPLE COSTS TO ESTABLISH AND PRODUCE WINE GRAPES

SAN JOAQUIN VALLEY

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UC COOPERATIVE EXTENSION

SAMPLE COSTS TO ESTABLISH AND PRODUCE WINE GRAPES
San Joaquin Valley - 2005

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INTRODUCTION

Sample costs to establish and produce wine grapes in the southern San Joaquin Valley are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are considered typical for the crop and area, but these practices will not apply to every farming operation. The sample costs for labor, materials, equipment and custom services are based on current figures. A blank column, "*Your Costs*", in Tables 2 and 3 is provided for entering your farm costs.

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 call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-3589 or your local UC Cooperative Extension office.

Sample Cost of Production Studies for many commodities can be downloaded at http://coststudies.ucdavis.edu, requested through the Department of Agricultural and Resource Economics, UC Davis, (530) 752-4424 or obtained from the local county UC Cooperative Extension offices. Some archived studies are also available on the website.

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ASSUMPTIONS

The assumptions refer to Tables 1 to 8 and pertain to sample costs to establish the vineyard and produce wine grapes in the San Joaquin Valley. The cultural practices described represent production operations and materials considered typical on a well-managed vineyard in the region. Costs, materials, and practices in this study will not apply to all farms. Timing of and types of establishment and cultural practices will vary among growers within the region and from season to season due to variables such as weather, soil, and insect and disease pressure. The study does not represent a single farm and is intended as a guide only. **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.**

Land. The hypothetical vineyard, owned and operated by the grower, is located on previously farmed land in the San Joaquin Valley. The farm is comprised of 120 acres, 40 acres of wine grapes being established and 75 acres of raisin grapes. Roads, irrigation systems, and farmstead occupy the remaining five acres.

Establishment Operating Costs (Table 1)

Site Preparation. This vineyard is established on ground previously planted to vineyards or orchards. Land coming from vines or trees should be fallowed for two years except for possible grain crops. The land is assumed to be fairly level. A custom operator chisels (subsoil) the ground twice to a depth of 4 to 5 feet. The grower floats the land to smooth and level the surface. Afterwards the ground is disced twice to apply and incorporate preplant herbicide. Nematode samples should be taken from land formerly in vines or trees and fumigated if necessary. Most operations that prepare the vineyard for planting are done in the year prior to planting, but costs are shown in the first year.

Trellis System. A commercial company installs the trellis system in December of the first year or January of the second year (January in this report). The trellis system is a vertical two-wire design. Trellis materials include 1.25 lb x 7-ft T-posts, 4 lb x 9.5-ft rail end posts, 1/4 x 40-inch rod, 12.5 gauge fruit and catch wires. Also a 14-guage wire is strung at 24-inches to hold the drip tubing.

Planting. Planting starts by laying out and marking vine sites in late winter. In the spring, holes are dug and the vines are planted and protected with an open carton placed over the vine. The vines are planted on a 7-ft x 11-ft (vine x row) spacing at 565 vines per acre. In the second year 2% or 11 vines per acre are replanted for those lost in the first year.

Vines. No specific variety is planted in this study, but the data refers to spur pruned varieties, such as white varieties - French Colombard, Chenin Blanc - and red varieties – Rubired, Ruby Cabernet, Barbera. The vines in this report are purchased as dormant vines that have been bench grafted or field budded onto nematode/phylloxera resistant rootstock. The life of the vineyard at planting is expected to be 25 years and the grapevines are expected to begin yielding fruit in three years.

Training/Pruning. Training and pruning to establish the vine framework will vary with variety and trellis system. Training includes tying, shoot thinning, shoot positioning and pruning. Bilateral cordon training and spur pruning is the selection of the main shoot and its upper laterals or branches that form the trunk and cordon. They are tied to the stake and cordon wire while unwanted shoots are removed, including any suckers arising from the rootstock. Quadrilateral cordon training requires the addition of crossarms. Dormant pruning

begins in January of the second year. The young vines are pruned back to a 2-bud spur. Shoot thinning is done twice a month in April and May, shoot thinning and cordon training twice a month in June and July. In the third year, shoot thinning and shoot positioning are done in April and May, respectively. For more information on trellis and training systems please refer to *Wine Grape Varieties in California*, UC publication 3419.

Irrigation. In this study, the water is assumed to cost $5.67 per acre-inch or $68.00 per acre-foot. Water costs plus labor constitute the irrigation cost. Water costs vary considerably among districts and the water cost in this report represents a cost within that range. Irrigations occur during the growing season from March through September. No assumption is made about effective rainfall or runoff. The amount of water applied to the vines during the establishment years is shown in Table A. The drip irrigation system is described under Non-Cash Overhead.

Table A. Applied Irrigation Water

Year	AcIn/Year
1	8
2	18
3+	30

Pest Management. The pesticides and rates mentioned in this cost study as well as other materials available are listed in *UC Integrated Pest Management Guidelines, Grapes.* Pesticides mentioned in the study are commonly used, but other materials may be available.

Insects. Beginning in the third year, Kryocide insecticide is applied in early May at bloom (combined with Rubigan and zinc) to control worms (grape leaffolder, omnivorous leafroller, western grapeleaf skeletonizer). Provado insecticide is applied in July to control leafhoppers. Additionally, insects such as mealybugs should be monitored each year and may add additional costs if found. If mealybugs are found during vineyard establishment, the grower should consult with a PCA, farm advisor, and/or Ag commissioner to develop management strategies.

Diseases. The major disease treated in this study is powdery mildew. A dusting and spraying program for these diseases begins the third year with a wettable sulfur application soon after budbreak in late March or early April. Dusting sulfur is applied twice in April and once in June. A sterol inhibitor (SI) - Rubigan in this study - is applied in May during early bloom (combined with worm and zinc spray) and once in June, two weeks after bloom.

Weeds. Treflan herbicide is applied and incorporated during land preparation in the fall of the first year prior to planting. Vineyard floor management begins in late winter, February of the second year, with a strip spray in the vine row with Roundup, Surflan, and Goal. In the first year, the middles are mowed twice and disced twice. In the second and subsequent years, the row middles are disced in April and mowed in March, May, June, and August. The vine rows are spot treated with Roundup in late April and late July or early August.

Fertilization. Liquid nitrogen fertilizer - UN32, containing 32% nitrogen (N) - is applied in equal amounts through the drip system in May and June. Five pounds of N is applied in the first year, 10 in the second year, and 20 in the third year. Zinc as neutral zinc is applied with the bloom spray (Kryocide and Rubigan).

Harvest. Harvest begins the third year. The crop is mechanically harvested by a custom harvest operator and hauled to the processor by a custom hauler.

Yields. The average vineyard yields are six-tons per acre in the third year and 10-tons in the fourth.

Returns. In this study, the grapes are sold to a winery for which the grower receives $200 per ton, the current estimated market price

Production Years Operating Costs

Pruning. Pruning is done during the winter months – December and/or January. The vines are mechanically hedged or box pruned, followed with hand pruning to touch-up and clean the vines. The prunings are mechanically raked from the vine row, then shredded during the first mowing and incorporated into the soil with the April discing. Canopy skirting (mechanical) is done with the grower's equipment in June and in July.

Trellis/Vines. Trellis repairs are done annually (January in this study) and the cost is not taken from any specific data. Weak or missing vines are replaced by layering. One year-old canes from neighboring vines are buried (layered) in the soil next to the stake and allowed to root. After rooting, the canes are cut and the plant is trained on the trellis. Trellis repair and vine replacement increases with vineyard age.

Fertilization. Forty pounds per acre of nitrogen (N) as UN32 is divided and applied through the drip lines in equal amounts in May and June. Neutral zinc at five pounds of material per acre is applied in May with the disease and insect application.

Irrigation. Water costs plus labor, which includes checking the drip lines, constitute the irrigation cost. Irrigation labor includes servicing the clock and filters, set-up and injection of chemicals, checking, replacing, and repairing drip lines and laterals. In this study, water is calculated to cost $5.67 per acre-inch or $68.00 per acre-foot. Water costs vary considerably among districts and the water cost in this report represents a cost within that range. Thirty acre-inches are applied during the growing season from April through late September. No assumption is made about effective rainfall and runoff. Deficit irrigation may be used in mature vineyards in the San Joaquin Valley, but is not addressed in this study.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC Integrated Pest Management Guidelines, Grapes.* For information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. Information and pesticide use permits are available through the local county agricultural commissioner's office. Pesticides mentioned in this study are used to calculate rates and costs. Although growers commonly use the pesticides mentioned, many other pesticides are available. Adjuvants are recommended for use with many pesticides for effective control, but the adjuvants and their costs are not included. Pesticide costs may vary by location, brand, and grower volume. Pesticide costs in this study are from a single dealer and shown as full retail.

Pest Control Adviser (PCA). Written recommendations are required for many commercially applied pesticides and are made by licensed pest control advisers. In addition, the PCA can monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. No costs for a PCA are included in this report.

Weeds. Surflan, Goal and Roundup herbicides are applied as a winter strip spray to the vine row in February. Vine row weeds that germinate during the growing season are controlled with two Roundup spot sprays – April, July. The row middles are mowed four times – March for frost control and to shred prunings, May, June, and August prior to harvest. The middles are also disced in April for weed control and to incorporate the vine prunings.

Insects. Vine Mealybug (*Pseudococcus sp.*) is treated with Lorsban insecticide in late February to early March (dormant vines). Western grapeleaf skeletonizer (*Harrisina brillians*) is treated at bloom with Kryocide in late April or early May (combined with powdery mildew and foliar fertilizer spray). Provado insecticide is applied in July to control grape leafhoppers (*Erythroneura elegantula*). The materials are applied with the

grower's equipment. Growers with heavy mealybug infestations may apply split applications of Admire insecticide through the drip line around bloom to fruit set (mid-May) and then again 21-45 days later on light to medium textured soils. See the UC IPM guidelines for alternative management strategies if heavier soils are involved. A calculated cost for the split Admire applications is $130 per acre. It may be necessary to use multiple insecticides to control some mealybug species. Wineries may have restrictions on the use of some insecticides, so growers should consult with their winery prior to application.

Diseases. The major disease considered in this study is powdery mildew (*Uncinula necator*). Wettable sulfur is applied soon after budbreak in late March or early April. A second application is made in April. Dusting sulfur is applied once in April, in May, and in June. A sterol inhibitor, Rubigan, is applied in May at early bloom (with the worm and zinc spray) and a strobilurin fungicide, Flint, in June two weeks after bloom. Mildew is controlled during the season with various fungicide applications at 7 to 21 day intervals, depending on the fungicide used. Growers have the option of using sterol inhibitors (SI), quinolins, strobilurins, or sulfur (micronized, wettable, dust, flowable), as well as other fungicides to control powdery mildew. These materials are classes of fungicides with different modes of action. Check the IPM website under grapes for management options to control powdery mildew. It is recommended that applicators use fungicides with different modes of action in order to avoid fungicide resistance in powdery mildew populations. Growers should consult with wineries to determine cut-off dates for fungicide restrictions.

Harvest. A custom operator mechanically harvests the crop. Harvest costs in this report are $225 per acre, which is a mid-range of costs provided by the growers. A commercial trucker hauls the grapes to the processor for $10 per ton. Hauling costs will vary depending upon the hauling distance.

Yields. An average yield of 12-tons per acre is assumed over the remaining life of the vineyard.

Returns. The market price in this report, based on *2003 Final Grape Crush Report,* CDFA Agricultural Statistics Branch, depending on variety ranges from $124 to $270 per ton. An average of $200 per ton for both white and red varieties is used in this report to show a range of returns over various yields (Table 5).

Pickup/ATV. It is assumed that the grower uses the pickup for business and personal use. Estimated business mileage for the ranch is 3,300 miles. The all terrain vehicle (ATV) is used for spot spraying weeds and is included in that cost. It is assumed that the ATV will be used another two-hours per acre for checking the vineyards including the irrigation system.

Labor. Labor rates of $12.73 per hour for machine operators and $11.05 for general labor includes payroll overhead of 34%. The basic hourly wages are $9.50 for machine operators and $8.25 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for vineyards (code 0040), 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 final rate as of January 1, 2004 (California Department of Insurance). Labor for operations involving machinery are 20% higher than the operation time given in Table 2 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

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 Agriculture Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are $1.50 and $1.95 per gallon, respectively. The fuel prices are averaged based on two California delivery locations. The cost includes a 2% sales tax on diesel

fuel and 7.25% sales tax on gasoline. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in Table 2 is determined by multiplying the total hourly operating cost in Table 7 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.65% 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.

Risk. The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability. Growers may purchase Federal crop insurance to reduce the production risk associated with specific natural hazards. Insurance policies vary and range from a basic catastrophic loss policy to one that insures losses for up to 75% of a crop. Crop insurance is not included in this report, but insurance costs will depend on the type and level of coverage.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

Property Taxes. Counties charge a base property tax rate of 1% 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% 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 0.690% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $661 per year for the entire farm.

Office Expense. Office and business expenses for 120 acres are estimated at $75 per producing acre or $8,625 annually for the farm. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, road maintenance, etc. The cost is assumed and not taken from any specific data.

Sanitation Services. Sanitation services provide double portable toilets with washbasins for 10 months. The cost includes delivery and weekly cleaning service. The number of sanitation facilities and length of time the service is required will vary depending upon local regulations and size of labor force. In many cases labor contractors furnish the sanitation facilities for their crews and the cost is included in the contractor's labor overhead.

Management/Supervisor Wages. Salary is not included. Returns above costs are considered a return to management.

Investment Repairs. Annual maintenance is calculated as 2% of the purchase price.

Non-Cash Overhead Costs

Non-cash overhead is calculated as the annual capital recovery cost for ownership of equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase 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 formula for the calculation of the annual capital recovery costs is ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE by the annual hours of use in this operation. For other investments including irrigation systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for equipment and investments are shown in Table 6.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. The amortization factor is a table value that corresponds to the interest rate used and the life of the machine.

Interest Rate. The interest rate of 6.01% used to calculate capital recovery cost is the USDA-ERS's ten-year average of California's agricultural sector long-run rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can only be used effectively in the agricultural sector. In other words, the next best alternative use for these resources is in another agricultural enterprise.

Establishment Cost. Costs to establish the vineyard are used to determine capital recovery expenses on investment for the production years. Establishment cost is the sum of the costs for land preparation, trellis system, planting, vines, cash overhead and production expenses for growing the vines through the first year that grapes are harvested minus any returns from production. The Total Accumulated Net Cash Cost on Table 1, in the third year represents the establishment cost. For this study the cost is $7,104 per acre or $284,160 for the 40-acre vineyard. The establishment cost is spread over the remaining 22 years of the 25 years the vineyard is in production.

Irrigation System. The previous vineyard is assumed to have an irrigation system that has been refurbished. The drip line is laid on the ground prior to planting. After the trellis system is installed, the drip line is clipped to the bottom trellis wire. The system includes the installation labor, filters, fertilizer injector, time clock, and valves. Although the materials will have a useful life equivalent to the vineyard, the irrigation system can be included in the vineyard establishment costs or as in this case an improvement to the property with a 25-year life.

Land. The land was formerly a vineyard, but has been out of production for two years. The open land was planted to grain crops. Land in the San Joaquin Valley for grape production ranges from $4,500 to $6,500 per acre (CA Association of Farm Manager and Real Estate Appraisers). For this report, a land value of $5,800 per acre or $6,052 per producing acre is used (five of the 120 acres are not planted). It is assumed the grower originally purchased the land with an established vineyard. The annual cost of land is interest only since land does not depreciate.

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

Tools. This includes shop tools, hand tools, and miscellaneous field tools such as pruning tools.

Fuel Tanks. Two 250-gallon fuel tanks using gravity feed are on metal stands. The tanks are setup in a cement containment pad that meets federal, state, and county regulations.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in Table 6. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in a previous section. 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

Table 1. SAMPLE COSTS PER ACRE TO ESTABLISH A VINEYARD

SAN JOAQUIN VALLEY - 2005

	Cost Per Acre		
Year:	1st	2nd	3rd
Tons Per Acre:	0.0	0.0	6.0
Planting Costs:			
Land Prep: Chisel 2X (Custom)	300		
Land Prep: Level (Float)	7		
Land Prep: Disc/Apply Herbicide (Treflan) 1st pass	12		
Land Prep: Disc (Incorporate Herbicide) 2nd pass	7		
Plant: Survey & Layout Vineyard	76		
Plant: Dig, Plant, Place Vines Guards	170	2	
Vines: 565 Per Acre (2% Replant In 2nd Year)	1,497	29	
Install Trellis System		3,000	
TOTAL PLANTING COSTS	2,069	3,031	0
Cultural Costs:			
Prune: Dormant		55	133
Prune/Training: (Sucker, Tie & Train)		442	110
Fertilize: applied through drip line (UN32)	3	5	9
Irrigate: (water & labor)	79	132	204
Weed: Winter Strip-vine row- Spray (Goal, Surflan, Roundup)		79	79
Weed: Disc Middles Yr 1, 2X. Yr 2+, 1X.	14	7	7
Weed: Spot Spray (Roundup) 2X.		28	28
Weed: Mow Middles Yr 1 2X. Yr 2+ 4X.	16	25	25
Weed: Hand Hoe	33		
Insect: Leafhoppers (Provado)			54
Disease: Mildew (Wettable Sulfur) 2X			44
Disease: Mildew (Dusting Sulfur) 3X			26
Disease: Mildew (Flint)			46
Insect: Worms (Kryocide,). Disease: Mildew (Rubigan). Fertilize: (Zn)			54
Pickup: Business Use	41	41	41
ATV: General Use	33	33	33
TOTAL CULTURAL COSTS	219	847	893
Harvest Costs:			
Harvest: (Machine) & Haul			285
TOTAL HARVEST COSTS	0	0	285
Interest On Operating Capital	102	201	26
TOTAL OPERATING COSTS/ACRE	2,390	4,079	1,204
Cash Overhead Costs:			
Office Expense	75	75	75
Liability Insurance	6	6	6
Sanitation Services	20	20	20
Property Taxes	70	70	71
Property Insurance	6	7	8
Investment Repairs	32	32	32
TOTAL CASH OVERHEAD COSTS	209	210	212
TOTAL CASH COSTS/ACRE	2,599	4,289	1,416
INCOME/ACRE FROM PRODUCTION	0	0	1,200
NET CASH COSTS/ACRE FOR THE YEAR	2,599	4,289	216
PROFIT/ACRE ABOVE CASH COSTS	0	0	0
ACCUMULATED NET CASH COSTS/ACRE	2,599	6,888	**7,104**

UC COOPERATIVE EXTENSION
Table 1. continued

	Cost Per Acre		
Year:	1st	2nd	3rd
Tons Per Acre:	0	0	6.0
Capital Recovery Cost:			
Land	364	364	364
Drip Irrigation System	74	74	74
Shop Building	46	46	46
Shop Tools	10	10	10
Fuel Tank & Pump	2	2	2
Equipment	25	26	60
TOTAL CAPITAL RECOVERY COST	521	522	556
TOTAL COST/ACRE FOR THE YEAR	3,120	4,811	1,972
INCOME/ACRE FROM PRODUCTION	0	0	1,200
TOTAL NET COST/ACRE FOR THE YEAR	3,120	4,811	772
NET PROFIT/ACRE ABOVE TOTAL COST	0	0	0
TOTAL ACCUMULATED NET COST/ACRE	3,120	7,931	8,703

UC COOPERATIVE EXTENSION

Table 2. COSTS PER ACRE TO PRODUCE WINE GRAPES

SAN JOAQUIN VALLEY - 2005

Operation	Operation Time (Hrs/A)	Cash and Labor Cost per acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost
Cultural:						
Vines: Layering Missing Vines	1.00	11	0	0	0	11
Trellis: Repair	2.00	22	0	10	0	32
Prune: (mechanical)	0.00	0	0	0	85	85
Prune: Clean Up Vines (hand prune)	4.00	44	0	0	0	44
Prune: Rake Prunings (mechanical)	0.23	4	2	0	0	5
Weed: Winter Strip Spray (Roundup, Goal, Surflan)	0.54	8	4	67	0	79
Irrigate: (water & labor)	3.05	34	0	170	0	204
Weed: Mow 4X	0.94	14	8	0	0	22
Insect: Mealybug (Lorsban)	0.83	13	8	27	0	49
Weed: Spot Spray 20% acres 2X (Roundup)	1.15	18	2	9	0	28
Weed: Disc	0.31	5	2	0	0	7
Disease: Mildew (Wettable Sulfur)	1.67	25	17	1	0	44
Disease: Mildew (Dusting Sulfur)	0.92	14	7	5	0	26
Fertilize: through drip (UN32)	0.10	1	0	16	0	17
Insect: Skeletonizer (Kryocide). Disease: Mildew (Rubigan). Fertilizer: (Zn)	0.83	13	8	33	0	54
Prune: Skirt Vines (mechanical)	0.50	8	4	0	0	11
Disease: Mildew (Flint)	0.83	13	8	25	0	46
Insect: Leaf Hopper (Provado)	0.83	13	8	33	0	54
Pickup: Business use for vineyard	1.50	23	18	0	0	41
ATV: Miscellaneous vineyard use	2.00	31	2	0	0	33
TOTAL CULTURAL COSTS	23.24	312	100	396	85	893
Harvest:						
Harvest: Machine Harvest & Haul	0.00	0	0	0	345	345
TOTAL HARVEST COSTS	0.00	0	0	0	345	345
Interest on operating capital						28
TOTAL OPERATING COSTS/ACRE		312	100	396	430	1,265
Cash Overhead:						
Office Expense						75
Liability Insurance						6
Sanitation						20
Property Taxes						107
Property Insurance						32
Investment Repairs						174
TOTAL CASH OVERHEAD COSTS						415
TOTAL CASH COSTS/ACRE						1,680
Non-Cash Overhead:		Per producing Acre		Annual Cost Capital Recovery		
Land		6,052		364		364
Drip Irrigation System		950		74		74
Buildings		522		46		46
Tools-Shop/Field		104		10		10
Fuel Tanks		30		2		2
Vineyard Establishment		7,104		590		590
Equipment		496		67		67
TOTAL NON-CASH OVERHEAD COSTS		15,259		1,153		1,153
TOTAL COSTS/ACRE						2,834

UC COOPERATIVE EXTENSION

Table 3. COSTS AND RETURNS to PRODUCE WINE GRAPES

SAN JOAQUIN VALLEY - 2005

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Wine Grapes	12.00	Ton	200.00	2,400	
OPERATING COSTS					
Trellis System:					
Trellis Materials	1.00	acre	10.00	10	
Custom:					
Prune Mechanical	1.00	acre	85.00	85	
Machine Harvest	1.00	acre	225.00	225	
Haul to Crusher	12.00	ton	10.00	120	
Herbicide:					
Roundup Ultra Max	1.66	pint	8.56	14	
Goal 2XL	1.00	pint	16.21	16	
Surflan 4 AS	2.64	pint	16.96	45	
Irrigation:					
Water	30.00	acin	5.67	170	
Fungicide:					
Wettable Sulfur	6.00	lb	0.21	1	
Dusting Sulfur	30.00	lb	0.18	5	
Rubigan EC	4.00	floz	2.50	10	
Flint	1.50	oz	16.49	25	
Fertilizer:					
UN 32	40.00	lb N	0.41	16	
Neutral Zinc 50%	5.00	lb	0.92	5	
Insecticide:					
Lorsban 4E	4.00	pint	6.86	27	
Kryocide	6.00	lb	3.00	18	
Provado 1.6 Solupak	0.75	oz	43.96	33	
Labor (machine)	15.71	hrs	12.73	200	
Labor (non-machine)	10.15	hrs	11.05	112	
Fuel - Gas	7.93	gal	1.95	15	
Fuel - Diesel	27.34	gal	1.50	41	
Lube				8	
Machinery repair				35	
Interest on operating capital @ 7.65%				28	
TOTAL OPERATING COSTS/ACRE				1,265	
NET RETURNS ABOVE OPERATING COSTS				1,135	
Cash Overhead:					
Office Expense				75	
Liability Insurance				6	
Sanitation				20	
Property Taxes				107	
Property Insurance				32	
Investment Repairs				174	
TOTAL NON-CASH OVERHEAD COSTS				415	
TOTAL COSTS/ACRE				1,680	
Non-Cash Overhead:					
Land				364	
Drip Irrigation System				74	
Buildings				46	
Tools-Shop/Field				10	
Fuel Tanks				2	
Vineyard Establishment				590	
Equipment				67	
TOTAL NON-CASH OVERHEAD COSTS				1,153	
TOTAL COSTS/ACRE				2,834	
NET RETURNS ABOVE TOTAL COSTS				-434	

UC COOPERATIVE EXTENSION

Table 4. MONTHLY CASH to PRODUCE WINE GRAPES

SAN JOAQUIN VALLEY - 2005

Beginning JAN 05 Ending DEC 05	JAN 05	FEB 05	MAR 05	APR 05	MAY 05	JUN 05	JUL 05	AUG 05	SEP 05	OCT 05	NOV 05	DEC 05	TOTAL
Cultural:													
Vines: Layering Missing Vines	11												11
Trellis: Repair	32												32
Prune (mechanical)	85												85
Prune: Clean Up Vines (hand prune)	44												44
Prune: Rake Prunings (mechanical)	5												5
Weed: Winter Strip Spray (Roundup, Goal, Surflan)		79											79
Irrigate: (water & labor)			11	15	22	46	52	32	26				204
Weed: Mow 4X (March includes shred prunings)			8		5	5		5					22
Insect: Mealybug, (Lorsban)			49										49
Weed: Spot Spray 20% acres (Roundup)				14			14						28
Weed: Disc				7									7
Disease: Mildew (Wettable Sulfur)				44									44
Disease: Mildew (Dusting Sulfur)				9	9	9							26
Fertilize: through drip (UN32)					9	9							17
Insect: Worms (Kryocide). Disease: Mildew (Rubigan). Fertilizer: (Zn)					54								54
Prune: Skirt Vines						6	6						11
Disease: Mildew (Flint)						46							46
Insect: Leaf Hopper (Provado)							54						54
Pickup: Business use for vineyard	3	3	3	3	3	3	3	3	3	3	3	3	41
ATV 4WD: Miscellaneous vineyard use	3	3	3	3	3	3	3	3	3	3	3	3	33
TOTAL CULTURAL COSTS	184	85	74	94	104	126	132	43	32	6	6	6	893
Harvest:													
Harvest: Machine Harvest & Haul								345					345
TOTAL HARVEST COSTS								345					345
Interest on operating capital @ 7.65%	1	2	2	3	3	4	5	8	0	0	0	0	28
TOTAL OPERATING COSTS/ACRE	185	87	76	97	108	131	137	395	32	6	6	6	1,265
Cash Overhead:													
Office Expense	6	6	6	6	6	6	6	6	6	6	6	6	75
Liability Insurance	6												6
Sanitation	2	2	2	2	2	2	2	2	2				20
Property Taxes	54						54						107
Property Insurance	16						16						32
Investment Repairs	15	15	15	15	15	15	15	15	15	15	15	15	174
TOTAL CASH OVERHEAD COSTS/ACRE	99	23	23	23	23	23	93	23	23	21	21	21	415
TOTAL CASH COSTS/ACRE	284	110	99	120	131	154	230	418	55	27	27	27	1,680

UC COOPERATIVE EXTENSION
Table 5. RANGING ANALYSIS
SAN JOAQUIN VALLEY - 2005

COSTS PER ACRE AT VARYING YIELD TO PRODUCE WINE GRAPES

	YIELD (ton/acre)						
	8.00	9.00	10.00	11.00	12.00	13.00	14.00
OPERATING COSTS:							
Cultural Cost	893	893	893	893	893	893	893
Harvest Cost	305	315	325	335	345	355	365
Interest on operating capital	27	27	28	28	28	28	28
TOTAL OPERATING COSTS/ACRE	1,225	1,235	1,246	1,256	1,266	1,276	1,286
Total Operating Costs/ton	153	137	125	114	106	98	92
CASH OVERHEAD COSTS/ACRE	415	415	415	415	415	415	415
TOTAL CASH COSTS/ACRE	1,640	1,650	1,661	1,671	1,681	1,691	1,701
Total Cash Costs/ton	205	183	166	152	140	130	122
NON-CASH OVERHEAD COSTS/ACRE	1,153	1,153	1,153	1,153	1,153	1,153	1,153
TOTAL COSTS/ACRE	2,793	2,803	2,814	2,824	2,834	2,844	2,854
Total Costs/ton	349	311	281	257	236	219	204

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE	YIELD (ton/acre)						
$/ton	8.00	9.00	10.00	11.00	12.00	13.00	14.00
100.00	-425	-335	-246	-156	-66	24	114
125.00	-225	-110	4	119	234	349	464
150.00	-25	115	254	394	534	674	814
175.00	175	340	504	669	834	999	1,164
200.00	375	565	754	944	1,134	1,324	1,514
225.00	575	790	1,004	1,219	1,434	1,649	1,864
250.00	775	1,015	1,254	1,494	1,734	1,974	2,214

NET RETURNS PER ACRE ABOVE CASH COST

PRICE	YIELD (ton/acre)						
$/ton	8.00	9.00	10.00	11.00	12.00	13.00	14.00
100.00	-840	-750	-661	-571	-481	-391	-301
125.00	-640	-525	-411	-296	-181	-66	49
150.00	-440	-300	-161	-21	119	259	399
175.00	-240	-75	89	254	419	584	749
200.00	-40	150	339	529	719	909	1,099
225.00	160	375	589	804	1,019	1,234	1,449
250.00	360	600	839	1,079	1,319	1,559	1,799

NET RETURNS PER ACRE ABOVE TOTAL COST

PRICE	YIELD (ton/acre)						
$/ton	8.00	9.00	10.00	11.00	12.00	13.00	14.00
100.00	-1,993	-1,903	-1,814	-1,724	-1,634	-1,544	-1,454
125.00	-1,793	-1,678	-1,564	-1,449	-1,334	-1,219	-1,104
150.00	-1,593	-1,453	-1,314	-1,174	-1,034	-894	-754
175.00	-1,393	-1,228	-1,064	-899	-734	-569	-404
200.00	-1,193	-1,003	-814	-624	-434	-244	-54
225.00	-993	-778	-564	-349	-134	81	296
250.00	-793	-553	-314	-74	166	406	646

UC COOPERATIVE EXTENSION

Table 6. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT,

SAN JOAQUIN VALLEY - 2005

ANNUAL EQUIPMENT COSTS

						Cash Overhead		
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
05	60HP 4WD Narrow Tractor	36,000	15	7,009	3,408	149	215	3,772
05	ATV 4WD	6,700	5	3,003	1,058	34	49	1,140
05	Brush Rake	6,500	10	1,149	796	27	38	861
05	Brush Shredder 6 ft	9,000	15	864	890	34	49	974
05	Cane Cutter	2,500	20	130	215	9	13	237
05	Disc - Tandem 8 ft	6,800	10	1,203	833	28	40	901
05	Duster - 3 Pt	5,000	5	1,629	898	23	33	954
05	Mower-Rotary 6 ft	2,050	10	363	251	8	12	272
05	Vine Sprayer 500 gal	20,378	5	6,638	3,662	94	135	3,890
05	Pickup Truck 1/2 Ton	26,000	7	9,863	3,484	124	179	3,788
05	Sprayer ATV 20 gal	350	10	62	43	1	2	46
05	Weed Sprayer 3PT 100 gal	3,500	10	619	429	14	21	464
	TOTAL	124778		32,532	15,968	545	787	17,300
	60% of New Cost *	74,867		19,519	9,581	327	472	10,380

* Used to reflect a mix of new and used equipment.

ANNUAL INVESTMENT COSTS

					Cash Overhead			
Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Repairs	Total
Building 2,400 sqft	60,000	20		5,235	208	300	1,200	6,943
Drip Irrigation System	38,000	25		2,975	132	190	760	4,057
Vineyard Establishment	284,160	22		23,619	985	1,421	5,683	31,707
Fuel Tanks 2-250 gal	3,500	30	350	250	13	19	70	353
Land	696,000	25	696,000	41,830	0	6,960	0	48,790
Tools: Shop/Field	12,000	15	1,133	1,188	46	66	240	1,539
TOTAL INVESTMENT	1,093,660		697,483	75,097	1,383	8,956	7,953	93,389

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	115	acre	5.74	660
Office Expense	115	acre	75.00	8,625
Sanitation Fee	115	acre	20.43	2,349

UC COOPERATIVE EXTENSION

Table 7. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY - 2005

			COSTS PER HOUR						
		Actual		Cash Overhead		Operating			
Yr	Description	Hours Used	Capital Recovery	Insur-ance	Taxes	Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
05	60HP 4WD Narrow Tractor	1,066	1.96	0.08	0.12	.89	5.08	5.97	8.09
05	ATV 4WD	400	1.59	0.05	0.07	0.50	0.75	1.25	2.96
05	Brush Rake	250	1.91	0.06	0.09	0.91	0.00	0.91	2.98
05	Brush Shredder 6 ft	131	4.03	0.15	0.22	4.04	0.00	4.06	8.47
05	Cane Cutter	100	1.29	0.05	0.08	0.95	0.00	0.95	2.38
05	Disc - Tandem 8 ft	200	2.51	0.08	0.12	1.10	0.00	1.10	3.81
05	Duster - 3 Pt	240	2.25	0.06	0.08	0.73	0.00	0.73	3.12
05	Mower-Rotary 6 ft	200	0.75	0.03	0.04	0.98	0.00	0.98	1.79
05	Vine Sprayer 500 gal	401	5.49	0.14	0.20	3.59	0.00	3.59	9.42
05	Pickup Truck 1/2 Ton	285	7.34	0.26	0.38	1.91	10.28	12.19	20.16
05	Sprayer ATV 20 gal	150	0.17	0.01	0.01	0.10	0.00	0.10	0.28
05	Weed Sprayer 3PT 100 gal	200	1.28	0.04	0.06	0.61	0.00	0.61	1.99

UC COOPERATIVE EXTENSION

Table 8. OPERATIONS WITH EQUIPMENT

SAN JOAQUIN VALLEY - WINE GRAPES 2005

Operation	Operation Month	Tractor	Implement	Material	Broadcast Rate/acre	Unit
Cultural:						
Vines: Layer vines	January			Labor	1.00	hrs
Trellis: Repair	January			Labor	2.00	hrs
				Materials	10.00	ac
Prune (mechanical)	January	Custom				
Prune: Clean up vines (hand prune)	January			Labor	4.00	hrs
Prune: Rake Prunings (mechanical)	January	60HP 4WD	Brush Rake			
Prune: Skirt Vines (mechanical)	June	60HP 4WD	Cane Cutter			
	July	60HP 4WD	Cane Cutter			
Weed: Winter Strip	February	60HP 4WD	Weed Sprayer 3 Pt	Roundup	0.66	pt
				Goal	1.00	pt
				Surflan	2.64	pt
Weed: Mow	March	60HP 4WD	Shredder			
	May	60HP 4WD	Mower - Rotary			
	June	60HP 4WD	Mower - Rotary			
	August	60HP 4WD	Mower - Rotary			
Weed: Spot Spray	April	ATV	ATV Sprayer	Roundup	0.50	pt
	July	ATV	ATV Sprayer	Roundup	0.50	pt
Weed: Disc	April	60HP 4WD	Disc - Tandem			
Irrigate:	March			Water	1.00	acin
	April			Water	2.00	acin
	May			Water	3.00	acin
	June			Water	7.00	acin
	July			Water	8.00	acin
	August			Water	5.00	acin
	September			Water	4.00	acin
Disease: Mildew	April	60HP 4WD	Vine Sprayer	Wettable Sulfur	3.00	lb
	April	60HP 4WD	Vine Sprayer	Wettable Sulfur	3.00	lb
	April	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
	May	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
	June	60HP 4WD	Vine Sprayer	Flint	1.50	oz
	June	60HP 4WD	Duster	Dusting Sulfur	10.00	lb
Insect. Disease. Fertilize	May	60HP 4WD	Vine Sprayer	Kryocide (Skeletonizer)	6.00	lb N
				Rubigan (Mildew)	4.00	floz
				Neutral Zinc	5.00	lb
Insect: Mealybug	March	60HP 4WD	Vine Sprayer	Lorsban	6.00	pint
Insect: Leafhopper	July			Provado	0.75	oz
Fertilize: through drip	May			UN32	20.00	lb N
	June			UN32	20.00	lb N
Harvest: Machine Pick and Haul	August	Custom				

LT-CC-01-2

U.C. COOPERATIVE EXTENSION

SAMPLE PRODUCTION COSTS FOR ROMAINE LETTUCE MONTEREY & SANTA CRUZ COUNTIES

2000 – 2001

Prepared by:

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For information about the calculations used in this report, refer to the attached narrative, call Laura Tourte, UCCE Santa Cruz County (831) 763-8040, or Richard Smith, UCCE Monterey County (831) 759-7350. Copies of this study may be requested through UCCE Santa Cruz and Monterey Counties. It may also be accessed at the following website: http://www.agecon.ucdavis.edu/outreach/outreach.

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SAMPLE PRODUCTION COSTS FOR ROMAINE LETTUCE
MONTEREY & SANTA CRUZ COUNTIES – 2000-2001

The practices described in this study are considered common for leaf (romaine) lettuce production in Monterey and Santa Cruz Counties. Sample costs are given for labor, materials, and custom services, and are based on current figures. However, changes in energy costs may effect the production costs represented in this report. The costs and practices detailed in this study may also not be applicable to all situations or used in each production year. This study is intended as an estimate or guide, which can be helpful in making production decisions, determining potential returns, preparing budgets and evaluating production loans. Individual growers may use this study as a template and modify to more accurately reflect their own situations. The use of trade names does not constitute an endorsement or a recommendation by the University of California.

Production Statistics. In both Monterey and Santa Cruz Counties romaine lettuce consistently ranks as a major crop both in terms of yield and value of production. The following table presents information on annual acreage, yield per acre and value of production from 1995-1999 for Monterey County. Similar yields and values of production can be expected for Santa Cruz County.

Annual Acreage, Yield and Value of Production for Romaine Lettuce[†‡] in Monterey County 1995-1999.

Year	Acreage	Yield/Ac[§]	Value/Acre ($)	Value/Carton ($)
1995	18,300	767	5,462	7.12
1996	20,053	748	4,954	6.62
1997	21,149	922	6,345	6.88
1998	19,200	886	7,057	7.96
1999	26,877	887	6,901	7.78

[†] Source: Monterey County Agricultural Commissioner's Crop Reports.
Similar yields and values can be expected for Santa Cruz County.
[‡] Includes all pack types.
[§] Yield/Ac assumes 37-pound cartons.

Varieties. Varieties of romaine lettuce types planted in this area include Paris Island Cos, Pic Bos, Darkland Cos, Capril, Pybas 714 and Green Towers.

Yield and Returns. Yield for romaine lettuce can range from 700 to 1,000 24-count 35-pound cartons per acre depending upon many variables including production conditions and location. Price for romaine lettuce can range from $5 to $14 per carton depending upon market conditions. The tables that follow give more information on yield and price ranges, as well as associated breakeven price per carton.

Land Preparation. Land preparation includes subsoiling, discing, preirrigating, listing, applying a preplant fertilizer, bed shaping and cultivating with a Lilliston cultivator. Some growers use minimum tillage techniques on a portion of their acreage, which decreases the number of operations associated with land preparation.

Soil amendments, which can include such materials as composted manure, gypsum and/or lime, are applied during land preparation. Growers often plant cover crops such as Merced Rye on a portion of their acreage during each production year. Cover crops are planted to build soil organic matter and improve soil structure.

Cultural Operations. Romaine lettuce is planted in Monterey and Santa Cruz Counties from late December through mid August for harvest between April and October. It can be grown on a variety of soil types provided soil has good structure and drainage. Although Monterey County has a "host or lettuce free period" (December 7 to December 21) during which time lettuce may not be planted, Santa Cruz County does not. The purpose of the host free period is to break pest cycles and decrease the incidence of Lettuce Mosaic Virus (LMV). Both counties require lettuce seed to be indexed and shown to be free of LMV prior to planting.

Romaine lettuce can be direct seeded or transplanted. This study assumes lettuce is direct seeded with pelleted seed using a precision planter on 40-inch double-line beds. It should also be noted that romaine lettuce for the "hearts" market is also produced on 80-inch five to six line beds. Costs for this type of production are not included in this study.

Seedbeds are sprinkler irrigated after planting, with sprinkler irrigation most often used as the season progresses. As an alternative, furrow irrigation is sometimes used during the season. Labor costs include time to set up and monitor the system for proper function.

Fertilizers. Fertilizer costs include a preplant fertilizer (400 pounds of 15-15-15), which is applied at the time beds are listed. In addition, beds are side dressed with 132 units of N (AN20) after planting, and 40 units of N (CAN17) as a water-run application later in the growing season.

Pest Management. Weeds are managed using one herbicide application at planting, mechanical cultivations, and hand weeding. Material applications for insect and disease management vary from year to year and location to location. An average cost per acre for materials and custom application is included in this study.

Cash Overhead. Overhead costs are included in this report as 10% of production costs (excluding land rent) to account for a variety of administration and office expenses, which include, but are not limited to, telephone, supplies, utilities bookkeeping and accounting. Land rent impacts production costs and returns in that it varies significantly from location to location in Monterey and Santa Cruz Counties. Two different analyses are included here to illustrate potential cost variations.

Harvest Operations. Harvest is either performed by the grower or a custom operator. In this study, harvest costs for romaine lettuce are calculated at $3.50 per 24-count 35-pound carton for cutting, packing and hauling. Cooling and selling costs are an additional $1.50 per carton. Costs will vary depending on the pack type and packing company, with some packs increasing costs considerably.

Acknowledgements. Appreciation is expressed to the growers, packers and other industry representatives who provided information, assistance and expertise for this study. This study was funded by the California Lettuce Research Board.

Additional Information. *Leaf Lettuce Production in California*, a publication of the University of California Division of Agriculture and Natural Resources, is available at many county UC Cooperative Extension offices. The same publication may be accessed through the internet at http://vric.ucdavis.edu/selectnewcrop.lettuce.

U.C. Cooperative Extension
Sample Production Costs for Romaine Lettuce* 2000 - 2001
North Monterey and South Santa Cruz Counties

Yield per Acre:	900 24-count 35-pound cartons	Labor Rate:	$13.40 machine labor
Price per Carton:	$8.00		$11.40 non-machine labor

Operation	No. of Times/ Crop/Acre	Cost/ Time/Acre	Material Cost/Acre	Non-Machine Labor Hours/ Acre	Non-Machine Labor Cost/ Acre	Total Cost ($/Acre)
Land Preparation:						
Cover Crop	.20	75	25			20
Disc	4X	13				52
Soil Amendments	1X	10	50			60
Subsoil	2X	35				70
Chisel	2X	21				42
Minimum Tillage	.10	40				4
Laser Level	.25	160				40
Land Plane	.25	12				3
List & Preplant Fertilizer	1X	15	60			75
Preirrigate	1X		8	1	11.40	18
Lilliston	2X	8				16
Bed Shape/Preparation	1X	15				15
Total Land Preparation Costs						*415*
Cultural:						
Precision Plant	1X	8	118			126
Irrigate	8X		64	9	11.40	167
Thin	1X			13	11.40	148
Cultivate & Fertilize	1X	10	92			102
Cultivate & Break Bottoms	1X	17				17
Herbicide	1X	8	40			48
Insect & Disease Management	Mult					310
Hand Weed	1X			5	11.40	57
Water Run Fertilizer	1X	8	29			37
Total Cultural Costs						*1,012*
Cash Overhead:						
Overhead–10% of Prod. Costs						143
Land Rent – N. Mont./S. SC.						1,100
Total Cash Overhead Costs						*1,243*
Harvest:						
Cut, Pack, Haul @ $3.50/crtn						3,150
Cool & Sell @ 1.50/crtn						1,350
Total Harvest Costs						*4,500*
Total Cash Costs/Crop/Acre						*7,170*
Total Cash Costs/Carton						*7.97*

* *Costs will vary depending on many factors including individual grower, production location, land rent, water costs, material inputs, weather conditions and energy costs.*

Net Returns Above Cash Costs for Romaine Lettuce 2000 - 2001
North Monterey and South Santa Cruz Counties

Cartons/ Acre	Price/Carton ($) 6.00	7.00	8.00	9.00	10.00	Breakeven $/Carton
700	-1,970	-1,270	-570	130	830	8.81
800	-1,870	-1,070	-270	530	1,330	8.34
850	-1,820	-970	-120	730	1,580	8.14
900	-1,770	-870	30	930	1,830	7.97
1,000	-1,670	-670	330	1,330	2,330	7.67

U.C. Cooperative Extension
Sample Production Costs for Romaine Lettuce* 2000 - 2001
South Monterey County

Yield per Acre: 900 24-count 35-pound cartons
Price per Carton: $8.00

Labor Rate: $13.40 machine labor
$11.40 non-machine labor

Operation	No. of Times/ Crop/Acre	Cost/ Time/Acre	Material Cost/Acre	Non-Machine Labor Hours/ Acre	Non-Machine Labor Cost/ Acre	Total Cost ($/Acre)
Land Preparation:						
Cover Crop	.20	75	25			20
Disc	4X	13				52
Soil Amendments	1X	10	50			60
Subsoil	2X	35				70
Chisel	2X	21				42
Minimum Tillage	.10	40				4
Laser Level	.25	160				40
Land Plane	.25	12				3
List & Preplant Fertilizer	1X	15	60			75
Preirrigate	1X		8	1	11.40	18
Lilliston	2X	8				16
Bed Shape/Preparation	1X	15				15
Total Land Preparation Costs						*415*
Cultural:						
Precision Plant	1X	8	118			126
Irrigate	10X		80	11	11.40	205
Thin	1X			13	11.40	148
Cultivate & Fertilize	1X	10	92			102
Cultivate & Break Bottoms	1X	17				17
Herbicide	1X	8	40			48
Insect & Disease Management	Mult					310
Hand Weed	1X			5	11.40	57
Water Run Fertilizer	1X	8	29			37
Total Cultural Costs						*1,050*
Cash Overhead:						
Overhead – 10% of Prod. Costs						147
Land Rent – S. Mont. County						400
Total Cash Overhead Costs						*547*
Harvest:						
Cut, Pack, Haul @ $3.50/crtn						3,150
Cool & Sell @ $1.50/crtn						1,350
Total Harvest Costs						*4,500*
Total Cash Costs/Crop/Acre						*6,512*
Total Cash Costs/Carton						*7.24*

* *Costs will vary depending on many factors including individual grower, production location, land rent, water costs, material inputs, weather conditions and energy costs.*

Net Returns Above Cash Costs for Romaine Lettuce 2000 - 2001
South Monterey County

Cartons/ Acre	Price/Carton ($) 6.00	7.00	8.00	9.00	10.00	Breakeven $/Carton
700	-1,312	-612	88	788	1,488	7.87
800	-1,212	-412	388	1,188	1,988	7.52
850	-1,162	-312	538	1,388	2,238	7.37
900	-1,112	-212	688	1,588	2,488	7.24
1,000	-1,012	-12	988	1,988	2,988	7.01

VEGETABLE RESEARCH AND INFORMATION CENTER

Vegetable Production Series

ICEBERG LETTUCE PRODUCTION IN CALIFORNIA

Louise Jackson, *Associate Professor/Cooperative Extension Specialist, Department of Vegetable Crops, University of California, Davis;* ***Keith Mayberry,*** *University of California Cooperative Extension Farm Advisor, Imperial County;* ***Frank Laemmlen,*** *University of California Cooperative Extension Farm Advisor, Santa Barbara County;* ***Steve Koike,*** *University of California Cooperative Extension Farm Advisor, Monterey County;* ***Kurt Schulbach,*** *University of California Cooperative Extension Farm Advisor, Monterey County; and* ***William Chaney,*** *University of California Cooperative Extension Farm Advisor, Monterey County*

PRODUCTION AREAS AND SEASONS

The major production areas for iceberg (crisphead) lettuce *(Lactuca sativa)* in California are the central coast (Monterey, San Luis Obispo, San Benito, Contra Costa, and Santa Clara Counties), the southern coast (Santa Barbara and Ventura Counties), the Central Valley (Fresno, Kings, and Kern Counties), and the southern deserts (Imperial and Riverside Counties). Production is highest in Monterey County, followed by Imperial County.

Planting to harvest takes 70 to 80 days for midsummer plantings and as long as 130 days for late-fall plantings. In the southern deserts, iceberg lettuce is planted from mid-September to mid-November for harvest from early December to January and February. In the lettuce-growing areas of the central coast, where temperatures are fairly uniform year-round, lettuce is planted from late December to mid-August for harvest from early April to November. Southern coastal plantings are made from November to August for harvest from April to December. In the Central Valley, iceberg lettuce is planted from early August to early September for harvest from late October to mid-November. Spring plantings are made from early November to late December for harvest in April.

ICEBERG LETTUCE ACREAGE AND VALUE

Year	Acreage	Average yield (*tons/acre*)	Gross value/acre
1994	128,500	17	$4,862
1993	141,000	18	$5,940
1992	147,000	18	$4,680

Source: California Agricultural Statistics 1994 (Sacramento: California Department of Food and Agriculture, 1995).

CLIMATIC REQUIREMENTS

Lettuce is a cool-season crop with distinct temperature requirements. The optimal growing temperatures are 73°F (23°C) during the day and 45°F (7°C) at night. Most California growing regions have daytime temperatures from 63° to 83°F (17° to 28°C) and night temperatures from 37° to 53°F (3° to 12°C). At the high end of the temperature range, lettuce may bolt, causing bitterness and loose, fluffy heads, and tipburn is also common. At temperatures near freezing, young plants are not damaged, but growth is slow. Freezing can damage the outer leaves of mature lettuce, leading to decay in handling and storage.

VARIETIES AND PLANTING TECHNIQUES

Lettuce varieties are adapted to specific planting periods in the Southern California deserts. Planting a variety out of slot will result in nonheading, puffiness, or bolting. Moderately high temperatures can occur in early spring. As the season progresses, temperatures change from extremely hot days to cooler days and freezing nights. Varieties commonly planted in Southern California include Empire, Fall Green, Tres Equis, Niner, Gilaben, Trendsetter, Del Rey, Annie, Diplomat, Rico, Desert Storm, Merit, Desert Queen, Honcho II, Early Giant, New Dominion, Winterset, Mt. Signal, Shilo, Kofa, Barn Burner, Pybas 251, Palmetto, Yuma, Sedona, Cool Breeze, Vancrisp, Vanmax, MOR 109, Vanmor, Prime Time, Winterhaven, Winter Supreme, Domingos 43, Red Coach 74, Coolguard, and Vanguard 75.

In the central coast, resistance to downy mildew and corky root diseases are important considerations for variety selection. Current varieties are the Salinas types, El Dorado, Target, Bronco, Pybas 251, Marksman, Vista Verde, Magnum, Wrangler, Premier, Stinger, Top Gun,

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Cowboy, Pybas 101, Pybas 102, Mustang, and Legacy. In the Central Valley, fall-planted varieties include Empire, Acacia, Desert Queen, Marvel, Raider, Fall Green, Gilaben, Diplomat, Maverick, Tres Equis, Redondo, Miner, Daybreak, Sundowner, and Fortuna. Tiber, a new USDA release, looks promising for tipburn resistance. Spring-planted varieties include Honcho II, Yuma, Coach Supreme, Westland, Winterset, Vanguard 75, and Vanmax. Late-spring plantings include Salinas, Titan, Vansal, Spector, Diamond, El Dorado, and Legacy.

Most iceberg lettuce is planted using pelleted seed and a precision planter; very little lettuce is transplanted in California. Seed are planted 2 to 3 inches (5–7.5 cm) apart in rows on 42-inch (105-cm) beds. At a 2-inch (5-cm) spacing there will be 157,000 seed per acre (388,000 seed/ha). The cost of seed varies with variety, coating, spacing, seed enhancement and priming (osmoconditioning) treatments. Nonprimed, natural lettuce seed may be susceptible to thermodormancy when ambient temperatures are above 90°F (32°C) for an extended period. Priming allows the seed to overcome thermodormancy and germinate at higher temperatures. Thermodormancy can also be broken by starting the initial irrigation in the late afternoon so the seed can imbibe water and germinate during the cooler hours of the night.

SOILS

Iceberg lettuce grows best in silt loams and sandy soils in the southern deserts. Lighter-textured soils provide better drainage during cold weather and warm up more readily. In the central coast and Central Valley, lettuce can be grown on heavy clay soils as long as there is good soil structure and adequate drainage. Lettuce has a moderately low degree of salt tolerance: excess salinity results in poor seed germination and small heads.

IRRIGATION

In the southern deserts, most growers use sprinklers for the first 5 to 7 days or until the seedlings emerge. The field is then furrow-irrigated for the remainder of the season. In the southern deserts 3 acre-feet (3,700 cu. m) of water per acre is typically used to grow a lettuce crop. The majority of the water is applied in the last 30 days before harvest. Care must be taken not to oversaturate the beds when growing early-season lettuce—excess moisture favors the development of bottom rot. Gated pipe is also used to deliver water, especially near harvest. Gated pipe allows uniform application of water down furrows and maintains a dry head basin so that harvest equipment can turn around on dry soil.

In the central coast, most fields are pre-irrigated with about 2 inches (5 cm) of water to soften the soil for seedbed preparation. Both seeded and transplanted lettuce are sprinkle-irrigated frequently until seedlings emerge or are established (usually 6 to 10 days). For direct-seeded lettuce, another sprinkler irrigation is applied about 2 to 3 weeks later to prepare the field for thinning. (Proper soil moisture makes it easier to thin the closely spaced seedlings.) After thinning, about two-thirds of the acreage is furrow-irrigated using gated pipe until harvest. Depending on soil type and terrain, some fields are sprinkled to maturity with hand-move, linear-move, or permanently buried sprinkler systems. In late summer or fall when corky root disease can be a problem, sprinkler irrigation is often used because the plants' root systems are degraded. Water application is typically 1.0 to 1.5 acre-feet (1,233–1,850 cu. m) per acre for a lettuce crop in the central coast. As the crop approaches maturity, excess water and fertilizer causes heads to become large and puffy, reducing their value.

A small but growing acreage of lettuce is drip-irrigated in the central coast. Both buried and surface drip tape are used. Water is applied with drip irrigation after the post-thinning cultivation. With buried drip systems, the tape is placed 7 to 12 inches (17.5–30 cm) deep in the center of the bed. Most growers use a manifold system so lines can be fed from either end of the field. This allows easy flushing of the system and prevents drought if there is a leak or blowout in the center of a row. Arizona/Sundance-style cultivation and field renovation equipment are used with buried drip systems. High iron content in water in some areas of the central coast create major plugging problems for subsurface drip users. Plugging by other precipitates, gopher damage, blowout, and cultivation and harvesting equipment damage are other common problems. Some microirrigation users prefer to lay surface drip tape down the center of the bed immediately after the post-thinning cultivation. The tape may be laid on the surface or buried 2 to 3 inches (5–7.5 cm) deep. Surface fabric pipe is used to deliver water to the tape. Lay-flat tape is often reeled in just before harvest; shallow-buried tape is reeled in after harvest has been completed.

FERTILIZATION

In the southern deserts, 500 pounds per acre (560 kg/ha) of 11-52-0 is usually broadcast prior to listing. Nitrogen (N) is sidedressed just after thinning and during later growth. Early, warm-season lettuce requires less N than a crop grown in January and February. About 150 pounds of N per acre (168 kg/ha) is used for early-season crops, while 200 to 250 pounds per acre (224–280 kg/ha) is applied during cold weather.

In the central coast, fertilization begins with applying 50 to 70 gallons per acre (468–655 l/ha) of 6-16-6, 3-10-10, or 9-9-9 into the bed at listing. An alternate practice is to apply about 300 pounds per acre (336 kg/ha) of 6-20-20 in the bed at listing. There are usually from two to

four sidedressings applied at and after thinning. At thinning, 300 pounds per acre (336 kg/ha) of 15-8-4 is sidedressed into the beds, or 35 to 40 gallons per acre (327–374 l/ha) of UAN-32 (urea–ammonium nitrate, 32-0-0) or 500 pounds per acre (560 kg/ha) of 16-20-0 is siedressed. Two to three weeks later, 35 gallons per acre (327 l/ha) of UAN-32 or CAN-17 (calcium–ammonium nitrate, 17-0-0), or 40 to 45 gallons per acre (374–421 l/ha) of AN-20 (ammonium nitrate, 20-0-0) is applied to finish out the crop. A final application of 10 to 15 gallons per acre (94–140 l/ha) of AN-20 may be water-run if the grower feels the crop will run short of N prior to harvest. Typically, 200 to 220 pounds of N per acre (224–246 kg/ha) is applied to the early crops when the soil is cool, and 170 to 180 pounds per acre (190–202 kg/ha) of N is applied to the summer or fall crops. When corky root disease is high, growers increase application of N to compensate for the shallow, degraded root system. In some soils, lettuce will respond to applications of zinc.

Lettuce is very sensitive to overdoses of ammoniacal fertilizers. Seedling injury will be expressed by root burn, yellowing of the leaves, and dead plants. Fertilizer injury later in the season is expressed by wilting of the outer leaves and a rusty reddish discoloration in the middle of the plant root.

Manures and composts are rarely used in production of lettuce in the southern deserts. About two-thirds of the growers in the Salinas Valley, however, apply at least some manure to their lettuce. Manure is commonly applied at a rate of 4 tons per acre (9 t/ha) and is primarily applied to maintain good soil structure. In the Salinas Valley there is growing interest in using compost, which is applied at about the same rate as manure.

INTEGRATED PEST MANAGEMENT

Contact the UC Davis IPM World Wide Web site at http://www.ipm.ucdavis.edu or your local county Farm Advisor for current pest management information (*UC IPM Pest Management Guidelines*, DANR Communication Services Publication 3339).

Weed management. Several herbicides are used for lettuce weed control. Some herbicides have greater activity on specific weed problems. Consult your weed control Farm Advisor for more details as to the best ones to use. Herbicides used on lettuce may be disked into the soil before bedding or applied preplant, postplant, or by air, depending on the product.

Insect identification and control. The most important insect pests of lettuce in California are worms, aphids, leafminers, and whiteflies. These pests cause problems according to the geographical region and time of year. In coastal areas, the pea leafminer (*Liriomyza huidobrensis*) is the most important pest. This insect removes plant tissue and can contaminate the harvested crop. Control strategies should be aimed at the larvae, not the more mobile, insecticide-resistant adults.

In Southern California, the silverleaf whitefly (*Bemisia argentifolii*) has caused slow growth and delayed maturity of the crop. Although this pest can be controlled with registered materials, it may become resistant if one chemical is used too heavily.

In all production areas, various worms, green peach aphids, and lettuce root aphids are always potential problems at various times of year and weather conditions. These should be managed by using selective materials to avoid making other problems more severe. Crops should be rotated to slow insecticide resistance.

Disease identification and management. In the southern deserts, the most serious diseases affecting iceberg lettuce are lettuce big vein virus, bottom rot, and lettuce drop. In coastal areas, young lettuce seedlings are rarely seriously affected by diseases, with the exception of downy mildew, which can cause damage during all phases of growth. Lettuce mosaic virus, corky root disease, and bacterial leaf spot can also be a problem in coastal areas. In the Central Valley, lettuce can be affected by *Fusarium* wilt and lettuce drop.

Lettuce mosaic (LMV), big vein (LBVa), beet western yellows (BWY), and turnip mosaic (TuMV) are viral diseases that affect lettuce. With the exception of LMV, these viruses are of moderate concern and control measures are rarely needed. LMV can be controlled by using mosaic-free seed (i.e., no virus in 30,000 seed). Other management steps include selecting resistant cultivars, controlling aphid vectors, removing weed hosts, and plowing down harvested fields that can harbor viruses. A lettuce-free period, which creates a break in the virus cycle during the winter, is mandated by county ordinance in some coastal areas.

Lettuce drop (*Sclerotinia minor* and *S. sclerotiorum*) is a serious soilborne fungal disease that can affect crops from rosette stage until harvest. Rotate crops and use protectant fungicides after thinning and before leaves get too large to provide some protection. Lettuce drop caused by *S. sclerotiorum*, rarely found in coastal areas, is common in the southern deserts.

Bottom rot (*Rhizoctonia solani*) can cause serious losses in the San Joaquin Valley and the southern desert areas; it is rarely seen elsewhere in the state. The disease is most prevalent on early-season lettuce that matures between the end of November and mid-January. Use fungicidal sprays to control this disease.

Downy mildew (*Bremia lactucae*) is managed by planting resistant cultivars and applying protectant fungicides. However, the genetic variability of this pathogen results in some strains that are not controlled by fungicides or resistant cultivars.

Bacterial leaf spot (*Xanthomonas campestris* pv. *vitians*), varnish spot (*Pseudomonas cichorii*), anthracnose (*Microdochium panattonianum*), and powdery mildew

(*Erysiphe cichoracearum* f. sp. *lactucae*) are foliar diseases that can affect developing lettuce. Favored by the wet, cool conditions of spring, bacterial leaf spot can be only partially controlled by copper fungicides; other control options are not yet available. Because the varnish spot bacterium is found in reservoir water, avoiding sprinkler irrigation usually eliminates this disease. Anthracnose is found only in fields where the resting fungal structure is present in soil during rainy spring weather. Application of protectant fungicides controls this pathogen; avoid planting lettuce in fields with a history of the disease. Powdery mildew is rarely a problem in commercial fields, and control options are not recommended.

Corky root is caused by the soilborne bacterium *Rhizomonas suberifaciens*. Rotate crops so that lettuce is not planted consecutively in the same fields and avoid over-fertilizing with N. However, for infected crops, growers may need to add supplemental fertilizer and water to achieve satisfactory crop yields. Some resistant cultivars are now available.

Fusarium wilt (*Fusarium* sp.) of lettuce is found only in the Central Valley. Because it is a new disease of lettuce, control options are limited. Growers should take precautions so that infested soil is not moved to clean fields.

Other pests and disorders. Freezing injury on mature lettuce is expressed as blistering and peeling of the epidermis followed by browning of the tissues. Normally freezing injury is confined to the cap and wrapper leaves. Tipburn is a physiological disorder caused by the lack of mobility of calcium in the heads during warm weather and rapid growing conditions. There is presently no control for lettuce tipburn.

HARVEST AND HANDLING

Iceberg lettuce is field-packed into cartons. About 60 percent of lettuce is harvested by ground packing (naked packed, as opposed to wrapped). In ground packing, crews of approximately 20 to 30 are split into units (trios) that consist of two cutters and a packer. Trio members often rotate jobs and are normally paid by the number of cartons packed. The solid lettuce heads are cut, trimmed to 4 to 5 wrapper leaves, and packed 24 per carton. A carton has a minimum gross weight of 50 pounds (22.7 kg). About 40 percent of lettuce is wrapped at harvest. Cut and trimmed heads (wrapper leaves removed) are stacked on a table, and workers then wrap and seal each head in film or a plastic bag. The wrapped heads are packed with either 24 or 30 heads per carton. Lettuce in cartons is vacuum cooled prior to storage in a cold room. Vacuum cooling removes field heat in roughly 15 minutes.

Some companies contract, grow, and handle bulk lettuce as their primary product. At harvest, all wrapper leaves are removed in the field. Heads are packed in bins approximately 1 cubic yard in volume for precooling and transport. At the processing plant, heads can be further trimmed, cored, cooled, washed, and precut into various types of retail packages for the food-service industry. The entire processing plant is maintained at 35° to 40°F (1.7° to 4.5°C) to help maintain crispness and freshness.

POSTHARVEST HANDLING

Lettuce is highly perishable and should be cooled as soon as possible after harvesting. Vacuum cooling reduces product temperature to 34°F (1°C); it should then be stored just above freezing at 98 percent relative humidity. Lettuce harvested at prime maturity with no major defects may be held for 2 to 3 weeks at 34°F. At 37°F (3°C), shelf life is reduced to 1 to 2 weeks. Russet spotting is a disorder caused by storing lettuce in containers or cold rooms where ethylene gas, which can be generated by ripening fruits and gasoline engines, is present. Brown stain is a storage disorder caused by high carbon dioxide levels in the cold room.

Iceberg lettuce is sold in many types of packages. Fifty-pound (22.7-kg) cartons containing 24 or 30 wrapped or naked-packed heads are common. Processed iceberg lettuce (chopped, cleaned, or cored) is shipped in 1,000-pound (454-kg) bins. Food-service packs include one 20-pound (9-kg), four 5-pound (2.25-kg), or two 10-pound (4.5-kg) cartons. There are also packages containing 6 heads that are cleaned and trimmed or cored and trimmed.

MARKETING

California produces iceberg lettuce year-round. Supplies peak in May and June and are lowest in December, January, and February. California's lower volume during the winter is due to large supplies coming from western Arizona; the overall national supply is nearly static. Most of California's iceberg lettuce is shipped by refrigerated truck to markets throughout the United States and Canada. Limited quantities are shipped by air, mostly to export markets in Europe. Iceberg lettuce products are used by fast-food outlets, restaurants, institutions, airlines, and schools.

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VEGETABLE RESEARCH AND INFORMATION CENTER

Vegetable Production Series

LEAF LETTUCE PRODUCTION IN CALIFORNIA

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PRODUCTION AREAS AND SEASONS

The major production areas for leaf lettuce *(Lactuca sativa)* in California are the central coast (Monterey, San Luis Obispo, San Benito, Contra Costa, and Santa Clara Counties), the southern coast (Santa Barbara and Ventura Counties), the Central Valley (Fresno, Kings, and Kern Counties), and the southern deserts (Imperial and Riverside Counties). Production is highest in Monterey County.

Planting to harvest takes 70 to 80 days for midsummer plantings and as long as 130 days for late-fall plantings. In the southern deserts, leaf lettuce is planted from mid-September to mid-November for harvest from early December to January and February. In the lettuce-growing areas of the central coast, where temperatures are fairly uniform year-round, lettuce is planted from late December to mid-August for harvest from early April to November. Southern coastal plantings are made from November to August for harvest from April to December. In the Central Valley, leaf lettuce is planted from early August to early September for harvest from late October to mid-November. Spring plantings are made from early November to late December for harvest in April.

LEAF (NON-ROMAINE) LETTUCE ACREAGE AND VALUE

Year	Acreage	Average yield (*tons/acre*)	Gross value/acre
1994	32,500	8.5	$4,750
1993	35,000	10.3	$5,679
1992	32,000	10.7	$4,816

Source: California Agricultural Statistics 1994 (Sacramento: California Department of Food and Agriculture, 1995).

ROMAINE LETTUCE ACREAGE AND VALUE

Year	Acreage	Average yield (*tons/acre*)	Gross value/acre
1994	18,500	12.5	$5,025
1993	19,000	14.0	$5,208
1992	15,500	15.0	$5,430

Source: California Agricultural Statistics 1994 (Sacramento: California Department of Food and Agriculture, 1995).

CLIMATIC REQUIREMENTS

Lettuce is a cool-season crop with distinct temperature requirements. The optimal growing temperatures are 73°F (23°C) during the day and 45°F (7°C) at night. Most California growing regions have daytime temperatures from 63° to 83°F (17° to 28°C) and night temperatures from 37° to 53°F (3° to 12°C). At the high end of the temperature range, lettuce may bolt, causing bitterness and loose, fluffy heads, and tipburn is also common. At temperatures near freezing, young plants are not damaged, but growth is slow. Freezing can damage the outer leaves of mature lettuce, leading to decay in handling and storage.

VARIETIES AND PLANTING TECHNIQUES

The standard greenleaf lettuce varieties in California are Royal Green, Genecorp Green, Waldman's Green, Glossy Green, Pybas Green, and Two Star; redleaf varieties are Prizehead, Deep Red, Big Red, Vulcan, and Western Red; butterhead varieties are Dark Green Boston, Varian, and Encore; romaine varieties are Paris Island Cos, Pic Bos, Darkland Cos, Capri, Pybas 714, and Green Towers.

Most leaf lettuce is planted using pelleted seed and a precision planter; very little lettuce is transplanted in

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California. Seed are planted 2 to 3 inches (5–7.5 cm) apart in rows on 42-inch (105-cm) beds. At a 2-inch (5-cm) spacing there will be 157,000 seed per acre (388,000 seed/ha). The cost of seed varies with variety, coating, spacing, seed enhancement and priming (osmoconditioning) treatments. Nonprimed, natural lettuce seed may be susceptible to thermodormancy when ambient temperatures are above 90°F (32°C) for an extended period. Priming allows the seed to overcome thermodormancy and germinate at higher temperatures. Thermodormancy can also be broken by starting the initial irrigation in the late afternoon so the seed can imbibe water and germinate during the cooler hours of the night.

SOILS

Leaf lettuce grows best in silt loams and sandy soils in the southern deserts. Lighter-textured soils provide better drainage during cold weather and warm up more readily. In the central coast and Central Valley, lettuce can be grown on heavy clay soils as long as there is good soil structure and adequate drainage. Lettuce has a moderately low degree of salt tolerance: excess salinity results in poor seed germination and small heads.

IRRIGATION

In the southern deserts, most growers use sprinklers for the first 5 to 7 days or until the seedlings emerge. The field is then furrow-irrigated for the remainder of the season. In the southern deserts 3 acre-feet (3,700 cu. m) of water per acre is typically used to grow a lettuce crop. The majority of the water is applied in the last 30 days before harvest. Care must be taken not to oversaturate the beds when growing early-season lettuce—excess moisture favors the development of bottom rot. Gated pipe is also used to deliver water, especially near harvest. Gated pipe allows uniform application of water down furrows and maintains a dry head basin so that harvest equipment can turn around on dry soil.

In the central coast, most fields are pre-irrigated with about 2 inches (5 cm) of water to soften the soil for seedbed preparation. Both seeded and transplanted lettuce are sprinkle-irrigated frequently until seedlings emerge or are established (usually 6 to 10 days). For direct-seeded lettuce, another sprinkler irrigation is applied about 2 to 3 weeks later to prepare the field for thinning. (Proper soil moisture makes it easier to thin the closely spaced seedlings.) After thinning, about two-thirds of the acreage is furrow-irrigated using gated pipe until harvest. Depending on soil type and terrain, some fields are sprinkled to maturity with hand-move, linear-move, or permanently buried sprinkler systems. In late summer or fall when corky root disease can be a problem, sprinkler irrigation is often used because the plants' root systems are degraded. Water application is typically 1.0 to 1.5 acre-feet (1,233–1,850 cu. m) per acre for a lettuce crop in the central coast. As the crop approaches maturity, excess water and fertilizer causes heads to become large and puffy, reducing their value.

A small but growing acreage of lettuce is drip-irrigated in the central coast. Both buried and surface drip tape are used. Water is applied with drip irrigation after the post-thinning cultivation. With buried drip systems, the tape is placed 7 to 12 inches (17.5–30 cm) deep in the center of the bed. Most growers use a manifold system so lines can be fed from either end of the field. This allows easy flushing of the system and prevents drought if there is a leak or blowout in the center of a row. Arizona/Sundance-style cultivation and field renovation equipment are used with buried drip systems. High iron content in water in some areas of the central coast creates major plugging problems for subsurface drip users. Plugging by other precipitates, gopher damage, blowout, and cultivation and harvesting equipment damage are other common problems. Some microirrigation users prefer to lay surface drip tape down the center of the bed immediately after the post-thinning cultivation. The tape may be laid on the surface or buried 2 to 3 inches (5–7.5 cm) deep. Surface fabric pipe is used to deliver water to the tape. Lay-flat tape is often reeled in just before harvest; shallow-buried tape is reeled in after harvest has been completed.

FERTILIZATION

In the southern deserts, 500 pounds per acre (560 kg/ha) of 11-52-0 is usually broadcast prior to listing. Nitrogen (N) is sidedressed just after thinning and during later growth. Early, warm-season lettuce requires less N than a crop grown in January and February. About 150 pounds of N per acre (168 kg/ha) is used for early-season crops, while 200 to 250 pounds per acre (224–280 kg/ha) is applied during cold weather.

In the central coast, fertilization begins with applying 50 to 70 gallons per acre (468–655 l/ha) of 6-16-6, 3-10-10, or 9-9-9 into the bed at listing. An alternate practice is to apply about 300 pounds per acre (336 kg/ha) of 6-20-20 in the bed at listing. There are usually two to four sidedressings applied at and after thinning. At thinning, 300 pounds per acre (336 kg/ha) of 15-8-4 is sidedressed into the beds, or 35 to 40 gallons per acre (327–374 l/ha) of UAN-32 (urea–ammonium nitrate, 32-0-0) or 500 pounds per acre (560 kg/ha) of 16-20-0 is sidedressed. Two to three weeks later, 35 gallons per acre (327 l/ha) of UAN-32 or CAN-17 (calcium–ammonium nitrate, 17-0-0), or 40 to 45 gallons per acre (374–421 l/ha) of

AN-20 (ammonium nitrate, 20-0-0) is applied to finish out the crop. A final application of 10 to 15 gallons per acre (94–140 l/ha) of AN-20 may be water-run if the grower feels the crop will run short of N prior to harvest. Typically, 200 to 220 pounds of N per acre (224–246 kg/ha) is applied to the early crops when the soil is cool, and 170 to 180 pounds per acre (190–202 kg/ha) of N is applied to the summer or fall crops. When corky root disease is high, growers increase application of N to compensate for the shallow, degraded root system. In some soils, lettuce will respond to applications of zinc.

Lettuce is very sensitive to overdoses of ammoniacal fertilizers. Seedling injury will be expressed by root burn, yellowing of the leaves, and dead plants. Fertilizer injury later in the season is expressed by wilting of the outer leaves and a rusty reddish discoloration in the middle of the plant root.

Manures and composts are rarely used in production of lettuce in the southern deserts. About two-thirds of the growers in the Salinas Valley, however, apply at least some manure to their lettuce. Manure is commonly applied at a rate of 4 tons per acre (9 t/ha) and is primarily applied to maintain good soil structure. In the Salinas Valley there is growing interest in using compost, which is applied at about the same rate as manure.

INTEGRATED PEST MANAGEMENT

Contact the UC Davis IPM World Wide Web site at http://www.ipm.ucdavis.edu or your local county Farm Advisor for current pest management information (*UC IPM Pest Management Guidelines*, DANR Communication Services Publication 3339).

Weed management. Several herbicides are used for lettuce weed control. Some herbicides have greater activity on specific weed problems. Consult your weed control Farm Advisor for more details as to the best ones to use. Herbicides used on lettuce may be disked into the soil before bedding or applied preplant, postplant, or by air, depending on the product.

Insect identification and control. The most important insect pests of lettuce in California are worms, aphids, leafminers, and whiteflies. These pests cause problems according to the geographical region and time of year. In coastal areas, the pea leafminer (*Liriomyza huidobrensis*) is the most important pest. This insect removes plant tissue and can contaminate the harvested crop. Control strategies should be aimed at the larvae, not the more mobile, insecticide-resistant adults.

In Southern California, the silverleaf whitefly (*Bemisia argentifolii*) has caused slow growth and delayed maturity of the crop. Although this pest can be controlled with registered materials, it may become resistant if one chemical is used too heavily.

In all production areas, various worms, green peach aphids, and lettuce root aphids are always potential problems at various times of year and weather conditions. These should be managed by using selective materials to avoid making other problems more severe. Crops should be rotated to slow insecticide resistance.

Disease identification and management. In the southern deserts, the most serious diseases affecting leaf lettuce are lettuce big vein virus, bottom rot, and lettuce drop. In coastal areas, young lettuce seedlings are rarely seriously affected by diseases, with the exception of downy mildew, which can cause damage during all phases of growth. Lettuce mosaic virus, corky root disease, and bacterial leaf spot can also be a problem in coastal areas. In the Central Valley, lettuce can be affected by *Fusarium* wilt and lettuce drop.

Lettuce mosaic (LMV), big vein (LBVa), beet western yellows (BWY), and turnip mosaic (TuMV) are viral diseases that affect lettuce. With the exception of LMV, these viruses are of moderate concern and control measures are rarely needed. LMV can be controlled by using mosaic-free seed (i.e., no virus in 30,000 seed). Other management steps include selecting resistant cultivars, controlling aphid vectors, removing weed hosts, and plowing down harvested fields that can harbor viruses. A lettuce-free period, which creates a break in the virus cycle during the winter, is mandated by county ordinance in some coastal areas.

Lettuce drop (*Sclerotinia minor* and *S. sclerotiorum*) is a serious soilborne fungal disease that can affect crops from rosette stage until harvest. Rotate crops and use protectant fungicides after thinning and before leaves get too large to provide some protection. Lettuce drop caused by *S. sclerotiorum*, rarely found in coastal areas, is common in the southern deserts.

Bottom rot (*Rhizoctonia solani*) can cause serious losses in the Central Valley and the southern desert areas; it is rarely seen elsewhere in the state. The disease is most prevalent on early-season lettuce that matures between the end of November and mid-January. Use fungicidal sprays to control this disease.

Downy mildew (*Bremia lactucae*) is managed by planting resistant cultivars and applying protectant fungicides. However, the genetic variability of this pathogen results in some strains that are not controlled by fungicides or resistant cultivars.

Bacterial leaf spot (*Xanthomonas campestris* pv. *vitians*), varnish spot (*Pseudomonas cichorii*), anthracnose

(*Microdochium panattonianum*), and powdery mildew (*Erysiphe cichoracearum* f. sp. *lactucae*) are foliar diseases that can affect developing lettuce. Favored by the wet, cool conditions of spring, bacterial leaf spot can be only partially controlled by copper fungicides; other control options are not yet available. Because the varnish spot bacterium is found in reservoir water, avoiding sprinkler irrigation usually eliminates this disease. Anthracnose is found only in fields where the resting fungal structure is present in soil during rainy spring weather. Application of protectant fungicides controls this pathogen; avoid planting lettuce in fields with a history of the disease. Powdery mildew is rarely a problem in commercial fields, and control options are not recommended.

Corky root is caused by the soilborne bacterium *Rhizomonas suberifaciens*. Rotate crops so that lettuce is not planted consecutively in the same fields and avoid over-fertilizing with N. However, for infected crops, growers may need to add supplemental fertilizer and water to achieve satisfactory crop yields. Some resistant cultivars are now available.

Fusarium wilt (*Fusarium* sp.) of lettuce is found only in the Central Valley. Because it is a new disease of lettuce, control options are limited. Growers should take precautions so that infested soil is not moved to clean fields.

Other pests and disorders. Freezing injury on mature lettuce is expressed as blistering and peeling of the epidermis followed by browning of the tissues. Normally freezing injury is confined to the cap and wrapper leaves. Tipburn is a physiological disorder caused by the lack of mobility of calcium in the heads during warm weather and rapid growing conditions. There is presently no control for lettuce tipburn.

HARVEST AND HANDLING

Leaf lettuce is field-packed into cartons. All leaf lettuce is harvested by ground packing (naked packed, as opposed to wrapped). In ground packing, crews of approximately 20 to 30 are split into units (trios) that consist of two cutters and a packer. Trio members often rotate jobs and are normally paid by the number of cartons packed. Leaf lettuce is packed 24 plants to a carton and is vacuum-cooled prior to storage in a cold room. Vacuum cooling removes field heat in roughly 15 minutes.

POSTHARVEST HANDLING

Lettuce is highly perishable and should be cooled as soon as possible after harvesting. Vacuum cooling reduces product temperature to 34°F (1°C); it should then be stored just above freezing at 98 percent relative humidity. Lettuce harvested at prime maturity with no major defects may be held for 2 to 3 weeks at 34°F. At 37°F (2°C) , shelf life is reduced to 1 to 2 weeks. Russet spotting is a disorder caused by storing lettuce in containers or cold rooms where ethylene gas, which can be generated by ripening fruits and gasoline engines, is present. Brown stain is a storage disorder caused by high carbon dioxide levels in the cold room.

MARKETING

California produces leaf lettuce year-round. Supplies peak in May and June and are lowest in December, January, and February. California's lower volume during the winter is due to large supplies coming from western Arizona; the overall national supply is nearly static. Most of California's leaf lettuce is shipped by refrigerated truck to markets throughout the United States and Canada.

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U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

SUGAR BEETS

IMPERIAL COUNTY – 2004

Prepared by:
Herman S Meister Farm Advisor, U.C. Cooperative Extension, Imperial County

For an explanation of calculations used for the study refer to the attached General Assumptions or call the author, Herman Meister, at the Imperial County Cooperative Extension office, (760)352-9474 or e-mail at hmeister@ucdavis.edu.

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University of California and the United States Department of Agriculture cooperating.

FOREWORD

We wish to thank growers, pest control advisors, chemical applicators and chemical dealers, custom farm operators, fertilizer dealers, seed companies, contract harvesters, equipment companies, and the Imperial County Agricultural Commissioner's office for providing us with the data necessary to compile this circular. Without their cooperation we could not have achieved the accuracy needed for evaluating the cost of production for the field crop industry in Imperial County.

The information presented herein allows one to get a "ballpark" idea of field crop production costs and practices in the Imperial County. Most of the information was collected through verbal communications via office visits and personal phone calls. The information does not reflect the exact values or practices of any one grower, but are rather an average of countywide prevailing costs and practices. Exact costs incurred by individual growers depend upon many variables such as weather, land rent, seed, choice of agrichemicals, location, time of planting, etc. No exact comparison with individual grower practice is possible or intended. The budgets do reflect, however, the prevailing industry trends within the region.

Overhead usually includes secretarial and office expenses, general farm supplies, communications, utilities, farm shop, transportation, moving farm equipment, accountants, insurance, safety training, permits, etc. Eleven to 13% of the total of land preparation, growing costs and land rent was used to estimate overhead. Hourly rates vary with each crop depending on the workman's compensation percentages.

Since all of the inputs used to figure production costs are impossible to document in a single page, we have included extra expense in man-hours or overhead to account for such items as pipe setting, motor grader, water truck, shovel work, bird and rodent control, etc. Whenever possible we have given the costs of these operations per hour listed on the cultural operations page. Some custom operators have indicated that they are instituting a "fuel surcharge" to reflect "spikes" in fuel cost.

Not included in these production costs are expenses resulting from management fees, loans, providing supervision, or return on investments. The crop budgets also do not contain expenses encumbered for road and ditch maintenance, and perimeter weed control. If all the above items were taken into account, the budget may need to be increased by 7-15%.

Where applicable we have used terminology that is commonly used in the agricultural industry. These terms are compiled in a glossary at the end of the circular. We feel that an understanding of these terms will be useful to entry-level growers, bankers, students and visitors.

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Senior Editor

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2004-2005 Tillage & Harvest Rates
IMPERIAL COUNTY

HEAVY TRACTOR WORK & LAND PREPARATION

OPERATION	$/ACRE
Plow	32.00
Subsoil 2nd gear	45.00
Subsoil 3rd gear	38.00
Landplane	14.00
Triplane	12.00
Chisel 15”	26.00
Wil-Rich chisel	17.00
Big Ox	25.00
Slip plow	43.00
Mark/disc borders	10.50
Make cross checks (taps)	6.75
Break border	6.50
Stubble disc/with cultipack	22.50/24.50
Regular disc/with cultipack	13.00/15.00
List 30”-12 row/40” 8 row	16.50
Float	11.50
Dump (scraper) borders	18.25
Corrugate	14.00

LIGHT TRACTOR WORK

Power mulch dry	27.50
Power mulch with herbicide	31.00
Shape 30” 6-row / 40” 4-row	12.75/12.75
Plant sugar beets & cotton 30”/40”	17.00/15.00
Plant vegetables	20.00
Mulch plant wheat	20.25
Plant alfalfa (corrugated)	18.50
Plant alfalfa (beds)	19.00
Plant bermudagrass	13.75
Plant with drill (sudangrass, wheat)	14.75
Plant corn slope	17.00
Cultivate 30”/40” beds 4-row	16.00/14.00
Spike 30”/40” beds 4-row	13.00/11.00
Spike and furrow out 30”/40” 4-row	14.00/12.00
Furrow out 30”/40” beds 4-row	13.00/11.00
Lilliston 30” 6-row / 40” 4-row	14.00/14.00
Lilliston 30” 6 row/ 40” 4-row/ herb	15.50/15.50
Inj fert & fur out 30”/ 40” beds 4-row	16.50/14.50
Fertilize dry & fur out 30”/ 40” 4-row	17.00/15.00
Inject fertilizer flat	15.00
Broadcast dry fertilizer	8.00
Ground spray 30”/40” 8-row	12.00
Chop cotton stalks 30”/40”beds	16.00/14.00
List 80” melon beds	20.00
Plant 80” melon slope beds	22.00
Back fill furrow (melons)	9.5
Cultivate 80” melon slope beds	18.00
Center 80” melon beds	17.00
Re-run 80” melon beds	11.00
Inject fertilizer & furrow out 80” melon beds	18.00
Bust out 80” melon beds	12.00

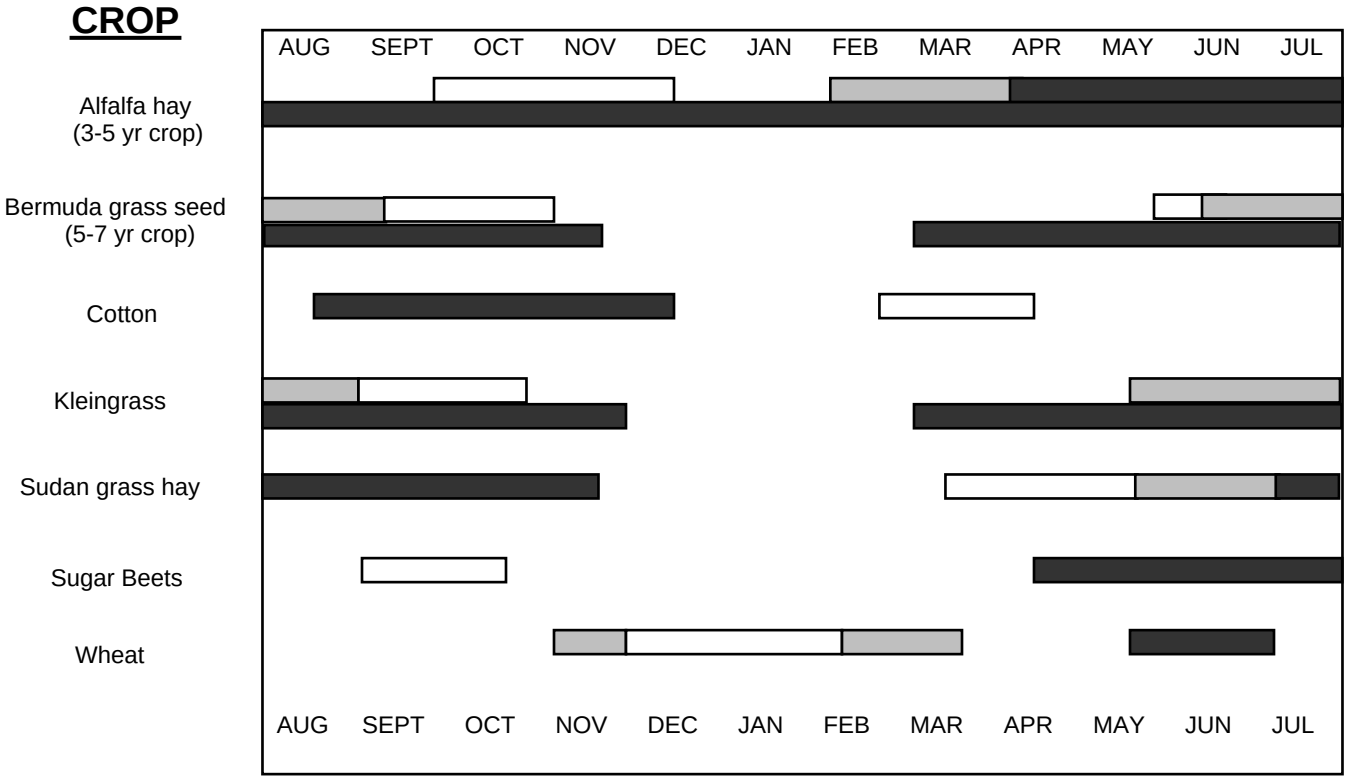
HARVEST COSTS-FIELD CROPS

	BY UNIT
Windrow alfalfa seed	17.50/acre
Combine alfalfa seed	41.00/acre
Swath bermudagrass	13.75/acre
Rake bermudagrass	5.50/acre
Swath sudangrass	11.25/acre
Rake sudangrass	6.00/acre
Swath alfalfa	8.75/acre
Rake alfalfa	5.00/acre
Bale (all types of hay- small bale)	0.70/bale
Haul & stack hay – small bale	0.27/bale
Bale (large bale 4X4)	7.50/bale
Haul & stack big bale	3.50/bale
Load with hay squeeze	62.50 / load
Dig sugar beets	2.65/clean ton
Haul sugar beets	2.50/clean ton
Combine wheat	16.00 per acre + 0.60 /cwt. over 1 ton
Haul wheat	5.00/ton
Combine bermudagrass seed 1st time	42.50/acre
Combine bermudagrass seed 2nd time	26.50/acre
Haul bermudagrass seed (local)	175/load
Pick Cotton 1st/2nd	03cts/lb/35.00/acre

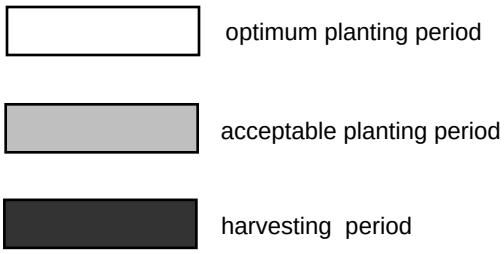
MISCELLANEOUS RATES BY THE HOUR

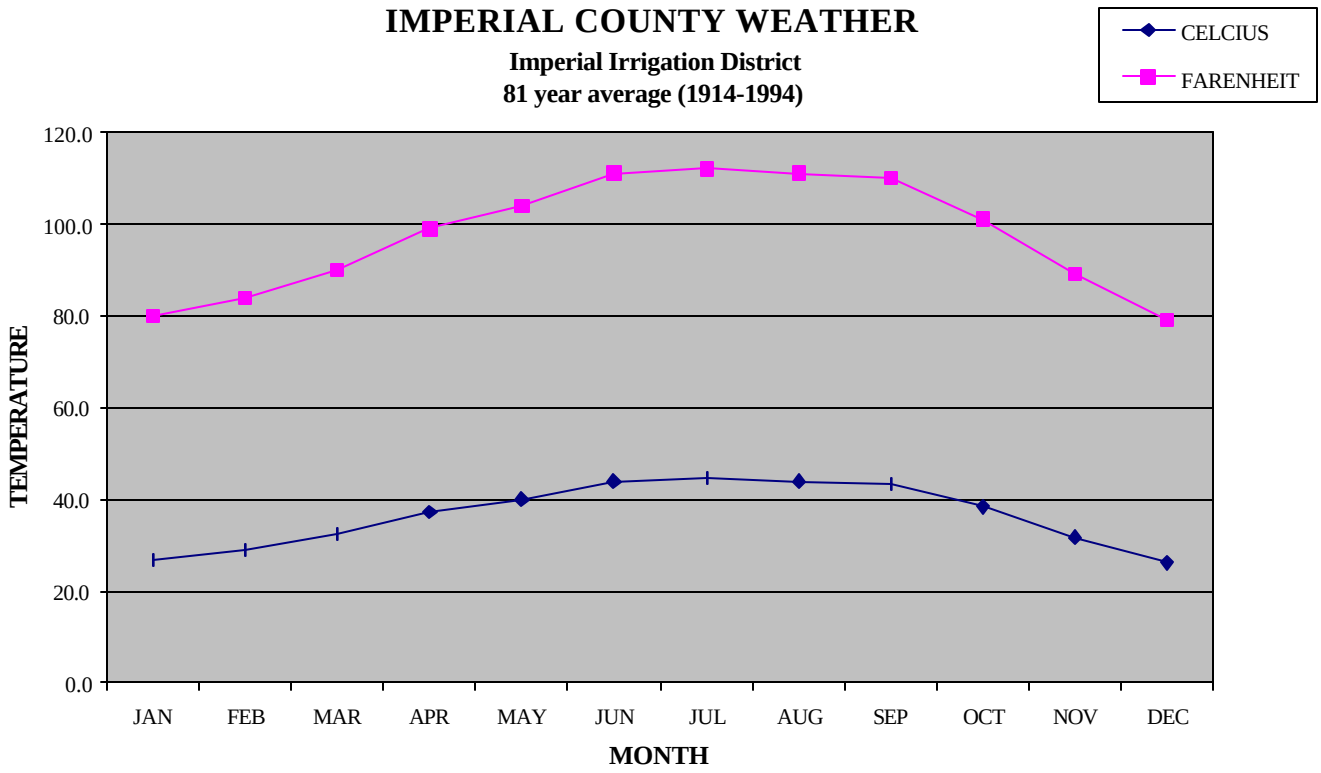
	$/HR
Motor grader	55.00
Backhoe	50.00
Water truck	40.00
Wheel tractor	35.00
Scraper	36.00
Versatile	60.00
D-6	56.00
D-8	73.00
Buck ends of field	35.00
Pipe setting (2 men)	38.00
Laser level	90.00
Work ends (disc out rotobucks)	40.00

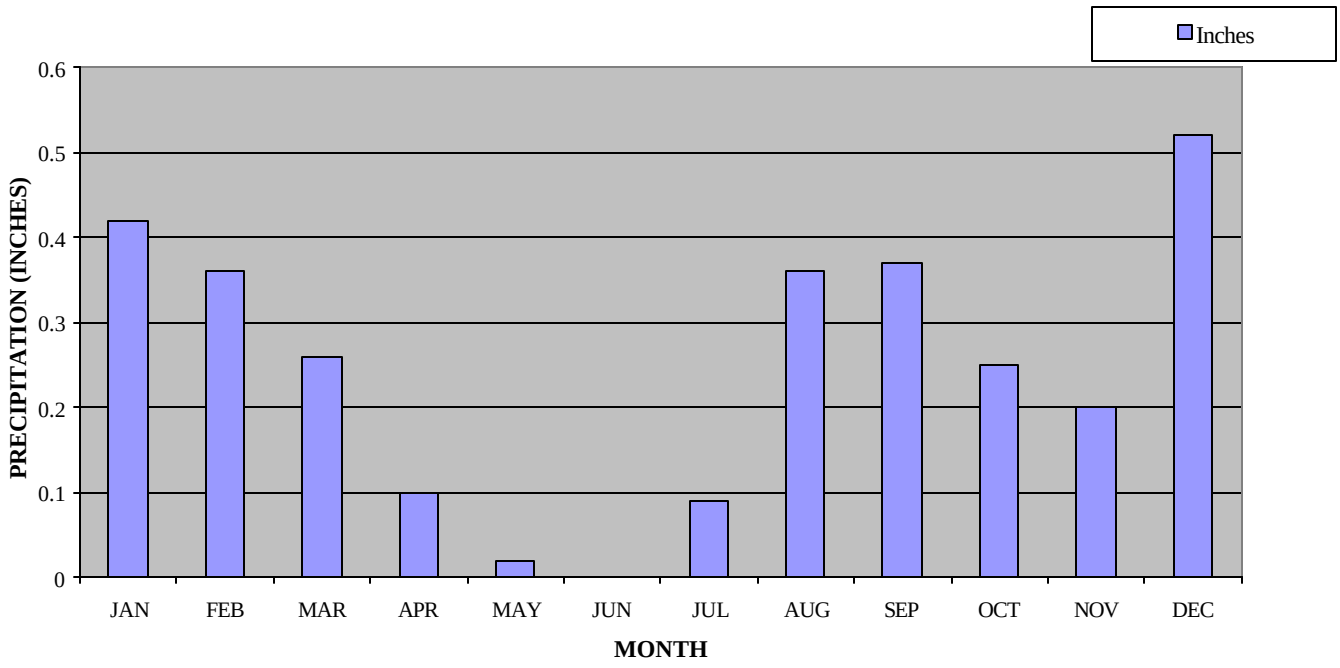
FIELD CROPS
PLANTING & HARVESTING CALENDAR
IMPERIAL VALLEY, CALIFORNIA



MONTH




IMPERIAL COUNTY WEATHER
Imperial Irrigation District
81 year average (1914-1994)
CELCIUS
FARENHEIT
TEMPERATURE
120.0
100.0
80.0
60.0
40.0
20.0
0.0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH


Inches
PRECIPITATION (INCHES)
0.6
0.5
0.4
0.3
0.2
0.1
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Mechanical operations at prevailing rates. Labor at $8.60 /hr ($6.75 plus SS, unemployment, workman's compensation and fringe benefits)

Yield--42.0 tons per acre. 30-inch beds **80 Acre Field**

OPERATION	Prevailing Rate	MATERIALS Type/Amount	MATERIALS Cost	HAND LABOR Hours	HAND LABOR Dollars	COST Per Acre
LAND PREPARATION						
Stubble disc	22.50					22.50
Subsoil 2nd gear	45.00					45.00
Disc 2x / ring roller	15.00					30.00
corruguate	14.00					14.00
Flood		Water 1.0 ac-ft	16.00	1	8.60	24.60
Disc 2x	13.00					26.00
Fertilize	8.00	250 lb 11-52-0	37.50			45.50
Triplane	12.00					12.00
List	16.50					16.50
Pre-irrigate beds		Water .5 ac-ft	8.00	1	8.60	16.60
Lilliston beds	14.00					14.00
TOTAL LAND PREPARATION COSTS						**266.70**
GROWING PERIOD						
Plant and	17.00	Seed 3.0" spacing	52.00			69.00
inject insecticide	2.00	Admire/Lorsban	22.00			24.00
Herbicide 3x ground	12.50	Herbicide	75.00			112.50
Cultivate 2x	16.00					32.00
Fertilize(dry) 2X	17.00	160 lb N(am-nitrate)	68.80			102.80
Insecticide 6x(4air,2 grd)	8.50	Insecticide	80.00			114.00
Disease control 2x grd	12.50	Fungicide(sulfur)	8.00			33.00
Irrigate 17X		Water 5.5 ac-ft	88.00	5	43.00	131.00
Work ends 2x	6.50					13.00
TOTAL GROWING PERIOD COSTS						**631.30**
GROWING PERIOD & LAND PREPARATION COSTS						**898.00**
Land rent (net acres)						175.00
Cash overhead	13 % of growing period, land prep & land rent					139.49
TOTAL PREHARVEST COSTS						**1,212.49**
HARVEST COSTS						
Digging	2.65 per clean ton	Yield -	42 tons/acre			111.30
Hauling	2.50 per clean ton					105.00
TOTAL HARVEST COSTS						**216.30**
TOTAL ALL COSTS						**1,428.79**

In order to determine the value of a ton of sugar beets, several variables must be known:
1) percent sugar 2) sugar price to grower (varies with % sugar) 3)contracted harvest date (premium price for early dig; price reduction for late dig), 4) variable trucking charges due to distance, and 5) grower agreements on digging pools

IMPERIAL COUNTY SUGAR BEET CULTURE 2004-2005

Annual acreage, yields, and value of sugar beets in Imperial County, CA for five consecutive years

Year	Acres	Yield/Acre (tons)	Value/Acre
2003	25,617	42.4	$1,816
2002	24,714	40.8	$1,659
2001	26,300	41.6	$1,443
2000	31,475	38.6	$1,432
1999	33,386	40.7	$1,774

(Source: I.C. Agricultural Commissioner's Reports).

YIELD: Sugar beet yields and sugar levels are increasing due to better varieties and management practices. Craig Elmore of Desert Sky Farms holds the current sugar beet yield record in the Imperial Valley with 21,095 lbs. sugar per acre on 69.85 tons of beets per acre at 15.10 % sugar.

BED PREPARATION: Fields are generally pre-irrigated twice; once flat and once after the beds are listed. This process aids in leaching salts and removing weed populations. Lillisting the bed before planting assures a crumbly seed bed necessary for adequate seed germination. A concerted effort to assure a healthy, uniform stand is imperative to obtain maximum yields.

SEEDING RATE: Sugar beets are grown single line on 30-inch rows. Some early season fields are planted at a 2-3-inch spacing; later fields are precision planted with seed spaced 4-5 inches apart. Seed is now sold in units of 100,000 seed. Seed prices depend upon fungicide and insecticide treatments, seed size, seed quality, variety and quick prime treatment. Precision planting improves the overall stand by reducing the need for thinning and increases overall plant uniformity and population. Field observations indicate that yield is reduced more by too few plants than too many plants per acre. Planting depth is normally ¼ to ½ inch. Many kinds of planters are used including vacuum planters.

Early plantings during extremely hot weather will require a higher seeding rate to achieve the proper stand. Planting when soil temperatures are high greatly increases the incidence of seed rot, damping-off and insect injury. However, new seed treatments have reduced the problem significantly.

PLANTING / HARVEST DATE: The planting season begins in September and continues until mid-October. Harvest starts roughly April 15 and ideally ends by the 1st of August. Late-planted fields tend to be more expensive due to additional costs for irrigation, additional pest control, and for losses due to root rots and sugar beet cyst nematode. However, sometimes the greater expenses on late fields are often offset by higher beet yields.

VARIETIES: There are several sugar beet varieties approved by a seed evaluation committee for use in Imperial Valley. "Phoenix" performs well for early plantings and "Beta 4430" is commonly planted for the remainder of the season. Varieties should be tolerant to *rhizomania*, a destructive viral disease. The California Sugar Beet Association will soon release sugar beet cyst nematode tolerant varieties upon approval.

FERTILIZATION: All phosphate fertilizer should be applied before listing the beds. Apply 1/3 of the required nitrogen fertilizer with phosphate in a pre-plant application, 1/3 at thinning and the final 1/3 before December 1st. Some growers split the nitrogen into two applications on the early-planted fields. Late applications of nitrogen will reduce sugar percentage and purity. Many types of nitrogen fertilizer are used for sugar beet production.

With vegetable rotations, sugar content and purity are generally lower. Land formerly in vegetable crops tends to have high residual nitrogen. This needs to be accounted for in planning the fertilization program.

IRRIGATION: The crop is normally furrow irrigated up initially and may require watering back within 4 to 5 days to get a stand. Never allow the crop to wilt or suffer from shortage of water. Fifteen to 17 irrigations may be required during the season depending on soil type. Beets should not be irrigated so frequently that prolonged periods of soil saturation occur, as this practice will encourage root rot organisms. The last irrigation should be applied at least 30 days prior to harvest in April, 25 days in May, 20 days in June, and 15 days in July. In late June and July on quarter-mile irrigation runs, early evening irrigations on a 7-9 day schedule is suggested.

PEST CONTROL: Pest populations vary from year to year and pest control costs varies accordingly. A number of insects and diseases may be a problem during the growing season. Growers planting early should exercise all caution against insect damage by inspecting fields frequently and carefully. Crickets, flea beetles, cutworms and armyworms occur as seedling pests and are especially damaging in early plantings. From January to March the green peach aphid is a primary pest. Spider mites and leafhoppers occur as late-season pests. Armyworms can increase the incidence of *Rhizopus* root rot (*Rhizopus stolonifer*) by creating points of entry for the fungus.

Sugar beet cyst nematode (SBCN) (*Heterodera schachtii*) is a serious pest that threatens the Imperial Valley sugar beet industry. Until recently, a crop rotation program consisting of growing sugar beets 4 out of 10 years has been successful in reducing the SBCN. The industry is now encouraging growers not to plant beets "back to back" due to a higher incidence of fields showing SBCN infestations. Nematode-infested fields must be rotated to non-host crops. Host crops such as broccoli, cabbage or cauliflower should not be rotated with sugarbeets for a minimum of 3 years. Other potential weed host such as wild beets should be controlled in other crops. Growers should carefully clean all nematode-infested machinery when moving between beet fields.

Rhizomania is a viral disease caused by Beet Necrotic Yellow Vein Virus (BNYVV) and vectored by a soilborne fungus (*Polymyxa betae*). The disease reduces sugar production significantly. The only control is to use partially resistant varieties and to meticulously clean all equipment coming into fields.

Rhizomania-resistant varieties are available, but plant resistant breaking strains of BVYVV have been detected in the Imperial Valley.

Various types of fungal root rots (*Phythopthora drechsleri*, *Pythium aphanidermatum* and *P. ultimum*) are prevalent on sugar beets. Bacterial vascular necrosis and rot (*Erwinia carotovora*) is also very common. Root rots are extremely prevalent in late season beets and as much as 10 percent of the beet roots may be affected. Varieties with higher rot tolerance should be planted for late July harvest. Proper water management is extremely important in combating root rots. *Rhizoctonia solani* causes damping-off, as well as root and crown rot. Powdery mildew (*Erisiphe polygoni*) is a common foliar disease that can be effectively controlled with fungicides.

WEED CONTROL: UpBeet is used by ground for the first weed control operation. UpBeet in combinations with other herbicides like Betamix or Stinger are used depending on the weed problem for the second application. The expense of hand weeding is almost prohibitive. Pre-irrigation, cultivation and herbicides are relied on for weed control.

HARVEST: Pinch-wheel beet harvesting machines recover 1-2 tons of beets more per acre than spike-wheel harvesters due to the method of root extraction. Also, pinch-wheel harvesters can be used to harvest fields a few days earlier after the last irrigation than spike wheel harvesters can.

Pasturing sugar beet tops with cattle was once common practice, however, with new harvesting techniques only the leaves remain. The sugar beet crowns are taken with the sugar crop. As a result, pasturing is a no longer profitable.

GLOSSARY

10% Bloom stage of growth in alfalfa when 10% of the stems are flowering.

Bale or Baling Compacting dried alfalfa or grass into a compact package usually weighing 100-120 lbs.

Bed Mounded soil that is shaped and used for planting; beds are separated by furrows.

Berry see *kernel*

Big Ox® A chisel with 7 shanks used to rip soil 18-24 inches deep.

Blacken the beds To thoroughly wet/darken a bed with irrigation water applied in furrows.

Black point Darkened, sometimes shriveled embryo end of wheat seed; caused by several fungi including *Alternaria*, *Fusarium*, and *Helminthosporium*; also called kernel smudge.

Bleach Loss of green color in hay due to sun exposure.

Boot stage Stage of wheat development when the sheath surrounding the inflorescence expands.

Break borders To tear down flat flood borders or flat crop borders.

Broadcast To spread seed on the soil surface.

Buck ends of field The remaking of beds at the end of a field in order to channel when beds at the end of a field are destroyed due to insufficient turn around space for farm equipment.

Chisel A tractor-mounted, knifelike implement used to rip soil 15-20 inches deep.

Corrugation Ridges made in soil to control the flow of water down a field (mini-beds). Name stems from the resemblance to corrugated sheet metal.

Crimping Mechanical operation used to crush stems of hay for better curing.

Cross checks Small dikes at perpendicular angles to borders used for water diversion into a field; also called taps.

Cultipacker A farm implement used to break up clods of soil; consists of groups of knobbed metal rings stacked together; also called a ringroller.

Cultivate To work beds after planting in order to control weeds, loosen soil, and allow for application of fertilizer

Custom rate The value assigned to a cultural operation by farmers or contractors for cost accounting; normally includes the cost of the operator.

Cwt of CWT One hundred pounds

Damping-off A fungal disease of seedlings

Dough stage Stage of wheat kernel development, when kernels are mature, but not hardened.

Dormant varieties Alfalfa varieties which do not produce much growth in cold weather.

Drill Type of planter used for cereals.

Dump borders See *scraper borders*

Eagle beak Type of planter shoe shaped like an eagle's beak used in mulch planting crops such as wheat.

Float A large, wooden frame pulled with a tractor for rough leveling of the soil surface.

Flood irrigation A method of irrigation where water is applied a field by gravity; the water is channeled by earth borders that are usually 70-200 feet apart.

Full bloom Alfalfa blooming at maximum potential.

Furrow irrigation A method of irrigation where water is applied to fields by gravity flow, down furrows; the water enters the bed by capillary action.

Furrow out The movement of soil from furrows to beds by tractor-mounted shovels; removes impediments to irrigation water.

Grated pipe Large diameter pipes used to deliver low pressure water to each furrow; used to keep head end of field dry for cultivation or harvesting.

Green chop Alfalfa that is cut green and dehydrated for making alfalfa pellets.

Ground spray The application of an agrichemical by a tractor-mounted sprayer.

Inject fertilizer The application of liquid of liquid fertilizer in the top or sides of a bed.

Irrigate up To irrigate a crop to emergence.

Kernel smudge See *black point*.

Landplane A large, tractor-pulled land leveling machine.

Laser level A land surface leveler that uses a laser guiding device to maintain an accurate grade.

Layby To apply an herbicide or other agrichemical at the last opportunity to enter a field with a tractor prior to harvest.

Lilliston A rolling cultivator with curved tines which uses ground speed to assist in working up the soil surface in order to destroy weeds.

Listing Throwing soil into a mound to make beds.

Lodge Cereals falling over due to the weight of the seed and lack of stem strength.

Motor grader A large grader normally used to cut tail ditches for draining off excess surface water.

Mulch plant Planting seed into moist soil; no additional irrigation needed to germinate crop.

Noncruciferous Any crop other than members of the cabbage family (e.g., broccoli, brussell sprouts, cauliflower, etc.)

Nondeterminant Describes a plant's growth habit; plant size is not determined and may increase (within limits) as long as proper growth conditions exist.

Off types Plant types whose characteristics differ from those of the true variety.

Pipe setting Installing 2-inch plastic tubes through a soil berm with a hydraulic ram; the pipes are used to control the flow of irrigation water.

Pinch wheel Type of sugar beet harvester which grasps the beet leaves by pinching.

Planting to stand Planting the same number of seeds as the desired number of plants in a field.

Plow To mix soil by inversion.

Power mulch A tractor-mounted, power rototiller.

Pull borders To make flood berms used to channel the flow of surface applied water.

Punching pipe see *pipe setting*.

Raking Rolling hay to a windrow in order to dry, or combining windrows.

Random flow planter A non-precision planter; seed drop is regulated by agitating the seed in a hopper over a hole; planting rate depends upon hole size and tractor speed.

Rank growth Excessive growth.

Roll beds To roll a large, metal roller over the tops of beds in order to firm them prior to thinning.

Rototill To mechanically mix soil.

Row A line of plants or a bed with a single line of plants.

Scald Death of plants due to excessive soil moisture during period of high temperature causing lack of oxygen to the plant roots; e.g., alfalfa, bermuda grass, and sudan grass.

Scraper borders Method of making borders without leaving low spots in soil within the area to be planted; helps to prevent water puddling thus preventing scald and root diseases.

Seed line A line down a bed in which seeds are planted.

Semolina flour Flour made from Durum wheat and used to make pasta.

Shatter Loss of grain from the seed heads prior to harvest, often caused by wind or moisture.

Sidedress To place pesticides or fertilizers in a band next to a row of plants.

Slip plow An implement pulled by a caterpillar and used to make deep cuts into the soil whereby soil from below is carried upward into the cut; used to improve drainage.

Solitary bees Type of bee used for pollination which lives alone, not in colonies.

Spike The running of tractor-mounted shanks into the soil or beds to improve aeration and drainage.

Spike wheel Type of sugar beet harvester using long metal spikes to penetrate the beets and hold them while lifting them out of the ground.

Stand The density of plants in a field after emergence.

Stubble disc An implement used to chop crop residue and incorporate it into the soil; the blades are scalloped unlike a standard disc..

Subbing Irrigation method where water is applied to a field in furrows and allowed to travel across beds by capillary action.

Subsoil The pulling of large, hard-faced shanks through the soil up to 42 inches deep; used to shatter soil layers and improve drainage, and leach salts.

Top crop Cotton bolls set at the top of the plant; the late crop.

Triplane A smaller, three-wheeled version of a *landplane*.

Versatile A large 4-wheel drive tractor used to pull discs and other implements.

Water back Irrigate again, often after sprinkling.

Water fun An application of an agrichemical in irrigation water (i.e., furrow irrigation).

Wil-rich chisel plow An implement used to work wet or moist soils prior to making beds.

Windrow Forage cut from the plants and raked into a single line for curing and baling.

Work ends Miscellaneous field operations including use of a motor grader to cut a tail ditch for irrigation drain water; or bucking ends and pipe punching.

Yellowberry wheat kernels that are yellow rather than the normal opaque; usually the result of insufficient, nitrogen fertilization.

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2002

SAMPLE COSTS TO PRODUCE
PROCESSING
TOMATOES

SAN JOAQUIN VALLEY-South
Fresno County

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UC COOPERATIVE EXTENSION

SAMPLE COSTS to PRODUCE PROCESSING TOMATOES
San Joaquin Valley South - Fresno County 2002

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INTRODUCTION

Sample costs to produce processing tomatoes in the San Joaquin Valley – Fresno County are presented in this study. This study is intended as a guide only, and can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Practices described are based on those 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. Some costs and practices presented in this study may not be applicable to your situation. A blank column, "*Your Costs*", is provided in Tables 1 and 2 to enter your costs.

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 call the Department of Agricultural and Resource Economics, University of California, Davis, (530) 752-3589.

Sample Cost of Production studies for many commodities are available and can be requested through the Department of Agricultural Economics, UC Davis, (530) 752-3589. Current studies, those produced during the last five years, can be obtained from selected county UC Cooperative Extension offices or downloaded from the department website http//coststudies.ucdavis.edu.

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ASSUMPTIONS

The following assumptions refer to Tables 1 to 6 and pertain to sample costs to produce processing tomatoes in the southern San Joaquin Valley – Fresno County. Practices described are not recommendations by the University of California, but represent production procedures considered typical for this crop and area. Some practices listed may not be needed nor used during every production year. Additional ones not indicated may be needed. Cultural practices and costs for the production of processing tomatoes vary by grower and region. Differences can be significant. In this study, growers planting a larger percentage of double rows will increase seed, weeding/thinning and some fertilizer and chemical costs. Also, depending on the water district, water costs can increase significantly. The practices and inputs used in this cost study serve as a guide, only. **The use of trade names 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**.

Farm. The hypothetical field and row-crop farm consists of 4,000 non-contiguous acres of rented land. Processing tomatoes, which are rotated with other crops, are planted on 1,200 acres and 2,800 acres are planted to cotton, cantaloupes, lettuce, onions, garlic, melons, sugarbeets, broccoli, small grains, and/or alfalfa.

Production Operating Costs

Land Preparation. Fields are disced once followed by subsoiling 18 to 22-inches deep, and two discings. The ground is smoothed in two passes with a triplane. Beds on five-foot centers are made and fertilizer applied with a six-row lister. Beds are then mulched and shaped, and fertilizer incorporated with a bed-shaper cultivator. All operations are done in November and December of the preceding year.

Planting. Planting begins in late January and is spread over a four-month period so the grower can meet the delivery contracts at harvest. In this report 33% (400) of the acres are planted in February and represent the January and February plantings and 67% (800) are planted in April and represent March and April plantings. Hybrid varieties are seeded two rows per bed – 85,000 seed per acre - in January and February, and one row per bed – 65,000 seed per acre - in March and April. Seeding rates per acre range from 70,000 to 85,000 on double rows and 55,000 to 65,000 on single rows. Double rows are a common practice early in the season in order to obtain a large plant population. Beginning in March, due to warmer weather and better stand establishment, growers will plant single rows on a bed. Planting patterns vary, some growers' plant single rows during the early season as well as double rows during the late season. Many growers also transplant tomato seedlings on a portion of their acres, but this cost is addressed in a separate study. Plants are thinned to stand by a hand thinning crew 30 to 45 days after planting for the early season and 20 to 30 days beginning with the mid-season planting.

Fertilization. A liquid preplant fertilizer, 10-34-0 at 180 pounds (15 gallons) of material per acre, is applied during bed listing. The bulk of applied nitrogen is sidedressed during the season at 153 pounds of N per acre as UN-32 (44 gallons or 478 pounds of material). At planting, a "popup" fertilizer 7-21-0 at 4 gallons per acre per seed line is placed with the seed. Also, an anti-crustant 2-0-0-12Ca at 7 gallons per acre per seed line is sprayed on a 7-inch band.

Irrigation. Water costs in the San Joaquin Valley vary by water district and costs the grower from $30 to $200 per acre-foot. In this study the Westland Irrigation District supplies the priority one water with no supplemental water included for $50.16 per acre-foot ($4.18/acin). Six-acre inches are sprinkled in two to three irrigations to germinate the seed and establish a stand. In this study, the crop receives two sprinkler irrigations and the third irrigation is applied 50% sprinkled and 50% furrow irrigated. This is followed by subsequent alternate row furrow irrigations (irrigate alternate furrows, the next irrigation in alternate furrows not previously irrigated) at 7 to 14 day intervals. A total of 3.5 acre-feet (42-acre inches) is applied to the crop in this study – 10-acres inches preplant and 32-acres inches during the growing season. Water cost at different rates is shown in Table A.

Table A. Per-acre Water Cost for 3.5 acre-feet.

$/acre-foot	$/acre	$/acre-foot	$/acre
30	105	120	420
40	140	130	455
50	175	140	490
60	210	150	525
70	245	160	560
80	280	170	595
90	315	180	630
100	350	190	665
110	385	200	700

Pest Management. The pesticides and rates mentioned in this cost study are listed in *UC IPM Pest Management Guidelines: Tomato*. For more information on pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu. For information and pesticide use permits, contact the local county agricultural commissioner's office.

Pest Control Advisor (PCA). Written recommendations are required for many pesticides and are made by licensed pest control advisors. In addition the PCA will monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCA's or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study the PCA works for a chemical and fertilizer company.

Insects and Diseases. During the second cultivation, Dithane at 2 pounds per acre and Kocide at 2 pounds per acre are applied to control bacterial speck. Sulfur dust is applied by air to control russet mites. An air application of Avaunt or Dipel is applied to the mid and late season plantings (67% of the acres) to control armyworms. Traps for monitoring pinworm are place in the field by the PCA at no cost. No-Mate flowable is applied to 12.5% of the acres (outside edges of field) to control pinworm in the mid-season/late harvest tomatoes. Bravo or Quadris for Black Mold control is also applied to 67% acres (March/April planting) or mid to late season harvest. Another worm spray with Success is applied to the late season harvest (April planting).

Weeds. Hand weeding, herbicides, and mechanical cultivation are used for weed control. Vapam is bladed on six-inch bands into the bed preplant on 33% of the acres. Matrix at two ounces per treated acre on a six-inch band is applied post plant on the remaining 67% and sprinkled in during the first irrigation. The crop is cultivated two times during the season. Seedling tomatoes are hand thinned and weeded by a contract labor crew. Hand weeding is repeated two times and the cost per acre decreases with each weeding. Double row weeding costs are higher than single row.

Crop Protectant. Snow or Sunshield is applied to 25% of the acres to protect the late harvested fruit from sunburn.

Harvest. Over 30% of the growers custom harvest their crop. A custom operator mechanically harvests the tomatoes in this study. Hauling from the field to the cannery is arranged and paid by the canner.

Growers with this acreage that do not custom harvest will likely have two tomato harvesters -- a primary harvester and a second harvester for special harvest situations and as a backup to the primary harvester. The grower will also need tractors, trailer dollies, generators, lights, harvest support equipment, and each harvester will require four manual sorters, a harvester driver, and two bulk-trailer tractor operators. On average, he will harvest 2.0 loads at 25 tons per load per hour with two (one day and one night) shifts of 10 hours each. Growers in this case will subtract the custom harvest charges from the appropriate tables and add in their costs for labor and equipment.

Table B. Average Yield & Price - Fresno County

Year	Ton/ac	$/ton
2000	40.20	51.00
1999	41.50	57.00
1998	35.77	53.00
1997	39.15	51.00
1996	39.80	52.00
1995	38.67	54.00
1994	41.59	51.00
1993	35.79	47.00
1992	35.21	46.00
1991	30.78	52.30
Avg.	37.85	51.43

Ag Commissioner Annual Crop Report 1991-

Yields. Average annual crop yields in Fresno County over the past ten years ranged from 30.78 to 41.59 tons per acre. The average county yields from 1991 to 2000 are shown in Table B. In this study, 40 tons per acre are used.

Returns. Growers produce tomatoes under contract from various food processing companies. Average prices ranged from $46.00 to $57.00 per ton over the last ten years and are shown in Table A. Based on current market estimates, $51.50 per ton is used in this study.

Assessments. Under a state marketing order, a mandatory assessment fee is collected and administered by the Processing Tomato Advisory Board (PTAB). This assessment pays for inspection and grading of fruit, and varies between inspection stations. Inspection fees range from $6.36 to $8.90 per load with an average of $6.75. Both growers and processors are charged for half of the fee; growers pay $3.72 per load in this study. A truckload is assumed to be 25 tons. Tomato growers are also assessed a fee for the Curly Top Virus Control Program (CTVCP) administered by the California Department of Food and Agriculture (CDFA). Growers in District 2 (San Joaquin Valley) are charged $0.106 per ton by CDFA for program costs.

Additionally, several voluntary organizations assess member growers to fund their activities. California Tomato Growers Association (CTGA) represents growers' interest in negotiating contract prices with processors. CTGA membership charges are $0.17 per ton. The California Tomato Research Institute (CTRI) fund projects for crop improvement. CTRI membership charges are $0.07 per ton.

Labor. Basic hourly wages for workers are $10.00 and $6.75 per hour for machine operators and non-machine (irrigators and manual laborers) workers, respectively. Adding 34% for employer's share of federal and state payroll taxes, insurance, and other benefits raises the total labor costs to $13.40 per hour for machine operators and $9.05 per hour for non-machine labor. For growers doing their own harvest, 50% or more of the tractor drivers are contracted at the $7.25 labor cost plus overhead. The labor for operations involving machinery is 20% higher than the operation time to account for the additional time involved in equipment set up, moving, maintenance and repair.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by ASAE. Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower, and fuel type. Prices for on-farm delivery of diesel and gasoline are $1.26 and $1.51 per gallon, respectively. The fuel, lube, and repair cost per acre for each operation in Table 2 is determined by multiplying the total hourly operating cost in Table 6 for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time.

Interest On Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 7.40% 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.

Risk. Risks associated with processing tomato production are not assigned a production cost. All acres are contracted prior to harvest and it is assumed all tonnage-time delivery contracts are met. No excess acres are grown to fulfill contracts. While this study makes an effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks that affect the crop profitability and economic viability.

Cash Overhead

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, land rent, field sanitation, crop insurance, and investment repairs.

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 property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% 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 on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.660% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $1,380 for the entire farm or $0.345 per acre.

Office Expense. Office and business expenses are estimated at $30 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, road maintenance, etc. Cash overhead costs are found in Tables 1, 2, 3 and 4.

Land Rent. Land is valued at $2,000 to $3,500 per acre and is rented at a flat rate or as a percentage of gross income. Tomato land in this study is rented on a per acre basis with the landowner receiving $175 per acre with priority 1 water rights. Rents in the area depend upon water available to that land. Land in the area may have priority 1 rights (2.6-acre feet) or priority 2 rights (1.3-acre feet). The land rented includes developed wells and irrigation system. The landowner is responsible for the maintenance of the irrigation system.

Field Sanitation. Sanitation services provide double portable toilet and washing facilities for the ranch during the crop season. The cost includes delivery and 7 months of weekly service. Costs will vary depending upon the crops and number of portable units required.

Managers Salary. Per acre costs for manager's salaries will vary, depending on farm size and overhead allocations. Manager salaries are estimated at $100,000 plus 34% for benefits or $134,000 annually. In addition there may be area managers or specific crop managers on the ranch. Managerial costs in this study are estimated to be $15.50 per acre and represents an average costs over various size farms as determined by participating growers.

Crop Insurance. The insurance protects the grower from crop losses due to adverse weather conditions, fire, unusual diseases and/or insects, wildlife, earthquake, volcanic eruption, and failure of the irrigation system. The grower can choose the protection level at 50% to 75% of production history or county yields. In this study, the premium is $26.44 per acre for a 65% guarantee level.

Non-Cash Overhead

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments. Although farm equipment used for processing tomatoes may be purchased new or used, this study shows the current purchase price for new equipment.

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 formula for the calculation of the annual capital recovery costs is ((Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 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 Engineers (ASAE) based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASAE 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 equipment.

Interest Rate. The interest rate of 6.41% used to calculate capital recovery cost is the United States Department of Agriculture-Economic Reporting Service's (USDA-ERS) ten-year average of California's agricultural sector long run rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can only be used effectively in the agricultural sector. In other words, the next best alternative use for these resources is in another agricultural enterprise.

Pipe. The irrigation system owned by the grower consists of 86 10-inch X 40 foot sections of 30-inch mainline, 774 2-inch X 30-foot sprinkler pipe sections, and 47 10-inch X 40-foot sections of gated pipe with 30-inch gate spacing. The grower also owns 10 pipe trailers with hydraulic lifts.

Truck. A two-ton truck containing equipment and materials to repair and service equipment in the field is designated as a service truck.

Equipment. Farm equipment is purchased new or used, but the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs for equipment and other investments are shown in Tables 3 and 8. 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

Table 1. COSTS PER ACRE TO PRODUCE TOMATOES

SAN JOAQUIN VALLEY - Fresno County 2002

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Land Prep-Disc 3X	0.32	5	11	0	0	16	
Land Prep-Subsoil 2X	0.61	10	27	0	0	36	
Land Prep-Triplane 2X	0.24	4	7	0	0	11	
Land Prep/Fertilize-List 6 Bed	0.05	1	1	22	0	24	
Land Prep-Shape/Mulch Bed	0.20	3	4	0	0	7	
Irrigate-Preplant	2.40	65	12	42	0	119	
Weed-Mulch Bare Beds	0.20	3	4	0	0	7	
Weed-Vapam 33% acre	0.07	1	1	15	0	17	
Weed-Vapam Caps Removed 33% acre	0.04	1	1	0	0	1	
Plant/Fertilize	0.30	5	5	215	0	225	
Irrigate-Sprinkle for Plant Establishment	3.20	81	16	39	0	137	
Weed-Cultivate	0.20	3	4	0	0	7	
Weed-Hoe/Thin	0.00	0	0	0	60	60	
Weed/Fertilize-Cultivate/Sidedress	0.20	3	4	40	0	47	
Weed-Mulch/Layby	0.20	3	4	4	0	11	
Weed-Hoe	0.00	0	0	0	38	38	
Weed/Insect-Cultivate/Spray	0.20	3	4	12	0	19	
Weed-Herbicide (Matrix)	0.10	2	2	17	0	20	
Irrigate-Furrow Plant Establishment	0.36	3	0	11	0	14	
Irrigate-Furrow	2.62	24	0	84	0	107	
Disease-Powdery Mildew	0.00	0	0	6	6	13	
Insect-Worms	0.00	0	0	16	4	19	
Insect-Pinworm 17% acre (late)	0.00	0	0	7	1	8	
Disease-Black Mold 67% acres (late)	0.00	0	0	12	4	16	
Insect-Worms 25% acres (late)	0.00	0	0	10	1	11	
Irrigate-Open Ditch	0.00	0	0	0	0	0	
Irrigate-Close Ditch	0.00	0	0	0	0	0	
Train Vines	0.21	3	4	0	0	8	
Whitewash 25% acres (late)	0.00	0	0	5	2	7	
Pickup Truck Use (2 pickups)	0.22	7	3	0	0	10	
TOTAL CULTURAL COSTS	11.94	230	114	557	115	1,017	
Harvest:							
Harvest Jan/Feb plant 33% ac	0.00	0	0	0	125	125	
Harvest Mar/Apr plant 40% ac	0.00	0	0	0	152	152	
Harvest Apr/May plant 27% ac	0.00	0	0	0	103	103	
TOTAL HARVEST COSTS	0.00	0	0	0	380	380	
Assessment:							
Assessments/Fees	0.00	0	0	16	0	16	
TOTAL ASSESSMENT COSTS	0.00	0	0	16	0	16	
Postharvest:							
Disc Crop Residue 2X	0.20	3	7	0	0	10	
TOTAL POSTHARVEST COSTS	0.20	3	7	0	0	10	
Interest on operating capital @ 7.40%						48	
TOTAL OPERATING COSTS/ACRE		233	121	573	495	1,470	

UC COOPERATIVE EXTENSION

Table 1. Continued

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre: Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cash Overhead:							
Office Expense						30	
Land Rent						175	
Liability Insurance						0	
Field Sanitation						0	
Crop Insurance 65%						26	
Manager Salary						16	
Property Taxes						2	
Property Insurance						2	
Investment Repairs						2	
TOTAL CASH OVERHEAD COSTS						253	
TOTAL CASH COSTS/ACRE						1,723	
Non-Cash Overhead:	Per producing Acre			-- Annual Cost -- Capital Recovery			
Shop Building		16		1		1	
Storage Building		7		1		1	
Fuel Tanks & Pumps		5		0		0	
Shop Tools		3		0		0	
Pipe - Gated		3		0		0	
Pipe-Sprinkler774		8		1		1	
PipeMnLine10" 86pi		4		1		1	
Truck-Service 2Ton		31		6		6	
Pipe Trailer (10)		9		1		1	
Equipment		284		41		41	
TOTAL NON-CASH OVERHEAD COSTS		370		54		54	
TOTAL COSTS/ACRE						1,777	

UC COOPERATIVE EXTENSION

Table 2. COSTS AND RETURNS PER ACRE TO PRODUCE TOMATOES

SAN JOAQUIN VALLEY - Fresno County 2002

	Rate/Acre	Quantity /Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS						
Tomatoes		40.00	ton	51.50	2,060	
OPERATING COSTS						
Fertilizer:						
10-34-0	180 lb (15 gal)	180.00	lb	0.12	22	
7-21-0 (Popup)	4 gal/seedline	5.37	gal	3.00	16	
N-Cal Anticrustant	1 gal/treated acin	9.32	gal	1.00	9	
UN-32	153 lb N (40 gal)	153.00	lb n	0.26	40	
Fumigant:						
Vapam	10 gal/acre 6” band	3.30	gal	4.50	15	
Herbicide:						
Treflan HP	1.20 pint	1.20	pint	3.48	4	
Matrix DF	2 oz/6” band	1.34	oz	12.68	17	
Fungicide:						
Dithane DF	2 lb	2.00	lb	3.49	7	
Kocide 101	2 lb	2.00	lb	2.55	5	
Sulfur, Dust 98%	35 lb	35.00	lb	0.18	6	
Insecticide:						
Avaunt	3.5 oz	2.35	oz	6.69	16	
Bravo Weatherstik	2.5 pt	1.68	pint	7.43	12	
Success	6 floz	1.50	floz	6.60	10	
NoMate TPW MEC	2.5 oz	0.42	floz	16.25	7	
Crop Protectant:						
Snow	80 lb	20.00	lb	0.26	5	
Irrigation:						
Water- Preplant		10.00	acin	4.18	42	
Water-Growing Season		32.00	acin	4.18	134	
Seed:						
Tomato Seed	85,000 dbl/65,000 sgl	71.60	thou	2.65	190	
Contract:						
Contract Labor double row thin/weed		5.30	hour	8.38	44	
Contract Labor single row thin/weed		6.40	hour	8.38	54	
Custom:						
Air Application Dust		35.00	lb	0.18	6	
Air Application Spray 10 gal		1.76	acre	5.25	9	
Air Application Spray 20 gal		0.25	acre	7.50	2	
Harvest		40.00	ton	9.50	380	
Assessment:						
CDFA-CTVP		40.00	ton	0.02	1	
CTGA		40.00	ton	0.17	7	
CTRI		40.00	ton	0.07	3	
CPTAB		40.00	ton	0.14	5	
Labor (machine)		11.26	hrs	13.40	151	
Labor (non-machine)		9.12	hrs	9.05	83	
Fuel - Gas		1.29	gal	1.51	2	
Fuel - Diesel		48.30	gal	1.26	61	
Lube					9	
Machinery repair					48	
Interest on operating capital @ 7.40%					48	
TOTAL OPERATING COSTS/ACRE					1,470	
NET RETURNS ABOVE OPERATING COSTS					590	

UC COOPERATIVE EXTENSION
Table 2. continued

	Quantity /Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS:					
Office Expense				30	
Land Rent				175	
Liability Insurance				0	
Field Sanitation				0	
Crop Insurance 65%				26	
Manager Salary				16	
Property Taxes				2	
Property Insurance				2	
Investment Repairs				2	
TOTAL CASH OVERHEAD COSTS/ACRE				253	
TOTAL CASH COSTS/ACRE				1,723	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Shop Building				1	
Storage Building				1	
Fuel Tanks & Pumps				0	
Shop Tools				0	
Pipe - Gated				0	
Pipe-Sprinkler				1	
Pipe-Main Line				1	
Truck-Service 2-Ton				6	
PipeTrailer (10)				1	
Equipment				41	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				54	
TOTAL COSTS/ACRE				1,777	
NET RETURNS ABOVE TOTAL COSTS				283	

UC COOPERATIVE EXTENSION

Table 3. MONTHLY CASH COSTS PER ACRE TO PRODUCE TOMATOES

SAN JOAQUIN VALLEY - Fresno County 2002

Beginning NOV 01 Ending OCT 02	NOV 01	DEC 01	JAN 02	FEB 02	MAR 02	APR 02	MAY 02	JUN 02	JUL 02	AUG 02	SEP 02	OCT 02	TOTAL
Cultural:													
Land Prep-Disc 3X	16												16
Land Prep-Subsoil 2X	36												36
Land Prep-Triplane 2X	11												11
Land Prep/Fertilize-List		24											24
Land Prep-Shape/Mulch Bed		7											7
Irrigate-Preplant		119											119
Weed-Mulch Bare Beds		7											7
Weed-Vapam 33% ac		17											17
Weed-Vapam Caps Removed 33% ac			1										1
Plant/Fertilize				91		134							225
Irrigate-Sprinkle Plant Establishment				41	26	69							137
Irrigate-Furrow Plant Establishment							14						14
Irrigate-Furrow					4	12	48	27	16				107
Weed-Cultivate					2		5						7
Weed-Hoe/Thin					26		34						60
Weed/Fertilize-Cultivate/Sidedress					16		32						47
Weed-Mulch/Layby					4		8						11
Weed-Hoe							31	7					38
Weed/Insect-Cultivate/Spray							19						19
Weed-Matrix						20							20
Disease-Powdery Mildew								13					13
Insect-Worms									19				19
Insect-Pinworm 17% ac (late)										8			8
Disease-Black Mold 67% ac (late)										16			16
Insect-Worms 25% ac (late)										11			11
Irrigate-Open Ditch						0	0						0
Irrigate-Close Ditch								0		0			0
Train Vines								2	5				8
Whitewash 25% acres(late)										7			7
Pickup Truck Use (2 pickup)	1	1	1	1	1	1	1	1	1	1	1		10
TOTAL CULTURAL COSTS	64	175	2	133	79	237	192	49	41	43	1		1,017
Harvest:													
Harvest Jan/Feb plant 33%									125				125
Harvest Mar/Apr plant 40%										152			152
Harvest Apr/May plant 27%											103		103
TOTAL HARVEST COSTS									125	152	103		380
Assessment:													
Assessments/Fees										16			16
TOTAL ASSESSMENT COSTS										16			16
Postharvest:													
Disc Crop Residue 2X											10		10
TOTAL POSTHARVEST COSTS											10		10
Interest on operating capital	0	1	1	2	3	4	5	6	7	8	9		48
TOTAL OPERATING COSTS/ACRE	64	177	4	135	82	242	197	55	173	219	122		1,470

UC COOPERATIVE EXTENSION
Table 3. continued

Beginning NOV 01 Ending OCT 02	NOV 01	DEC 01	JAN 02	FEB 02	MAR 02	APR 02	MAY 02	JUN 02	JUL 02	AUG 02	SEP 02	OCT 02	TOTAL
OVERHEAD:													
Office Expense	3	3	3	3	3	3	3	3	3	3	3	3	30
Land Rent												175	175
Liability Insurance			0										0
Field Sanitation	0	0	0	0	0	0	0	0	0	0	0		0
Crop Insurance 65%				26									26
Manager Salary	1	1	1	1	1	1	1	1	1	1	1	1	16
Property Taxes				1					1				2
Property Insurance				1					1				2
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL CASH OVERHEAD COSTS	4	4	4	32	4	4	4	4	6	4	4	179	253
TOTAL CASH COSTS/ACRE	68	181	8	167	86	246	201	59	179	223	126	179	1,723

UC COOPERATIVE EXTENSION

Table 4. ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY - Fresno County 2002

ANNUAL INVESTMENT COSTS

						Cash Overhead		
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
02	110HP 7410 2WD Tractor	60,044	6	24,757	8,851	280	424	9,555
02	125HP2000gal Booster Pump 2	18,000	5	5,863	3,288	79	119	3,486
02	125HP2000gal Booster Pump 1	18,000	5	5,863	3,288	79	119	3,486
02	150HP 7810 4WD Tractor 1	102,012	8	35,601	13,143	454	688	14,285
02	150HP 7810 4WDTractor 2	102,012	8	35,601	13,143	454	688	14,285
02	225HP 8400T Track Tractor	160,000	10	47,261	18,634	684	1,036	20,354
02	340HP 75E Track	171,600	10	50,688	19,985	734	1,111	21,830
02	Cultivator - 3 Row 1	10,725	5	3,494	1,959	47	71	2,077
02	Cultivator -3 Row 2	10,725	5	3,494	1,959	47	71	2,077
02	Disc - Stubble 18'	45,045	5	14,673	8,228	197	299	8,724
02	Ditcher - V	7,800	12	1,080	888	29	44	962
02	Injector - 15'	4,834	5	1,575	883	21	32	936
02	Lister - 6 Row	18,232	5	5,939	3,330	80	121	3,531
02	Mulcher - 15' 1	20,507	5	6,680	3,746	90	136	3,971
02	Mulcher - 15' 2	20,507	5	6,680	3,746	90	136	3,971
02	Pickup Truck - 1/2	17,655	7	1,766	3,000	64	97	3,161
02	Pickup Truck - 3/4	17,655	7	1,766	3,000	64	97	3,161
02	Planter - 3 Row	8,919	10	1,577	1,117	35	52	1,205
02	Planter - 6 Row	15,015	6	4,328	2,478	64	97	2,638
02	Rear Blade 15'	4,500	15	432	458	16	25	498
02	Saddle Tank 2-200 Gal	4,575	5	1,490	836	20	30	886
02	SaddleTank 2-200 Gal 2	4,575	5	1,490	836	20	30	886
02	Scraper - Drag 10'	2,581	18	172	240	9	14	263
02	Spray Boom - 20'	482	5	157	88	2	3	93
02	Subsoiler1 6' 9-shank	32,175	5	10,481	5,877	141	213	6,231
02	Triplane - 16'	20,109	10	3,556	2,519	78	118	2,716
02	Vine trainer	4,800	10	480	629	17	26	673
TOTAL		903,084		276,944	126,148	3,894	5,900	135,942
	60% of New Cost *	541,850		166,166	75,689	2,336	3,540	81,565

*Used to reflect a mix of new and used equipment

UC COOPERATIVE EXTENSION
Table 4. continued

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead Insur-ance	Taxes	Repairs	Total
INVESTMENT								
Fuel Tanks & Pumps	19,835	20	1,984	1,734	72	109	397	2,312
Pipe - Gated	10,850	10		1,502	36	54	217	1,809
Pipe-Sprinkler 774 sections	33,865	10		4,689	112	169	677	5,647
PipeMain Line 10" 86 sections	17,286	10		2,393	57	86	346	2,883
PipeTrailer (10)	35,000	10	700	4,794	118	179	700	5,790
Shop Building	65,216	25	6,522	5,185	237	359	652	6,432
Shop Tools	13,072	20	1,307	1,143	47	72	131	1,393
Storage Building	26,308	20	2,631	2,300	96	145	526	3,066
Truck-Service 2-Ton	125,000	5	25,000	25,599	495	750	2,500	29,344
TOTAL INVESTMENT	346,432		38,144	49,339	1,269	1,923	6,146	58,677

ANNUAL BUSINESS OVERHEAD

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Crop Insurance 65%	1,200	acre	26.44	31,728
Field Sanitation	4,000	acre	0.48	1,920
Land Rent	1,200	acre	175.00	210,000
Liability Insurance	4,000	acre	0.34	1,360
Manager Salary	4,000	acre	15.50	62,000
Office Expense	4,000	acre	30.00	120,000

UC COOPERATIVE EXTENSION

Table 5. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY - Fresno County 2002

			COSTS PER HOUR						
		Actual		Cash Overhead		Operating			
Yr	Description	Hours Used	Capital Recovery	Insurance	Taxes	Repairs	Fuel & Lube	Total Operating	Total Costs/Hr.
02	110HP 7410 2WD Tractor	1,993.40	2.66	0.08	0.13	2.84	9.25	12.09	14.97
02	125HP2000g Booster Pump 2	4,224.00	0.47	0.01	0.02	3.24	1.45	4.69	5.19
02	125HP2000g Boost Pump 1	3,168.00	0.62	0.01	0.02	3.24	1.45	4.69	5.35
02	150HP 7810 4WD Tractor 1	1,989.70	3.96	0.14	0.21	2.70	12.61	15.31	19.62
02	150HP 7810 4WDTractor 2	1,987.40	3.97	0.14	0.21	2.70	12.61	15.31	19.62
02	225HP 8400T Track Tractor	1,599.70	6.99	0.26	0.39	4.14	18.92	23.06	30.69
02	340HP 75E Track	1,599.90	7.49	0.28	0.42	4.44	28.59	33.03	41.22
02	Cultivator - 3 Row 1	398.00	2.95	0.07	0.11	2.38	0.00	2.38	5.51
02	Cultivator -3 Row 2	400.00	2.94	0.07	0.11	2.38	0.00	2.38	5.49
02	Disc - Stubble 18'	629.60	7.84	0.19	0.28	7.60	0.00	7.60	15.91
02	Ditcher - V	152.10	3.51	0.12	0.18	2.11	0.00	2.11	5.90
02	Injector - 15'	240.00	2.21	0.05	0.08	1.89	0.00	1.89	4.23
02	Lister – 6 Row	400.20	4.99	0.12	0.18	3.80	0.00	3.80	9.09
02	Mulcher - 15' 1	400.20	5.62	0.13	0.20	2.38	0.00	2.38	8.33
02	Mulcher - 15' 2	400.00	5.62	0.13	0.20	2.38	0.00	2.38	8.33
02	Pickup Truck - 1/2	266.00	6.77	0.14	0.22	1.26	5.06	6.32	13.45
02	Pickup Truck - 3/4	266.00	6.77	0.14	0.22	1.26	5.06	6.32	13.45
02	Planter - 3 Row	226.80	2.96	0.09	0.14	2.39	0.00	2.39	5.57
02	Planter - 6 Row	135.20	11.00	0.28	0.43	4.22	0.00	4.22	15.93
02	Rear Blade 15'	133.00	2.06	0.07	0.11	0.89	0.00	0.89	3.14
02	Saddle Tank 2-200 Gal 1	893.20	0.56	0.01	0.02	1.25	0.00	1.25	1.84
02	SaddleTank 2-200 Gal 2	438.00	1.14	0.03	0.04	1.25	0.00	1.25	2.46
02	Scraper - Drag 10'	154.10	0.94	0.04	0.05	0.38	0.00	0.38	1.40
02	Spray Boom - 20'	358.00	0.15	0.00	0.01	0.13	0.00	0.13	0.29
02	Subsoiler1 6' 9-shank	727.20	4.85	0.12	0.18	7.45	0.00	7.45	12.59
02	Triplane - 16'	290.40	5.21	0.16	0.24	3.06	0.00	3.06	8.67
02	Vine trainer	252.00	1.50	0.04	0.06	2.88	0.00	2.88	4.48

UC COOPERATIVE EXTENSION

Table 6. RANGING ANALYSIS

SAN JOAQUIN VALLEY - Fresno County 2002

	YIELD (ton/acre)						
	28.00	32.00	36.00	40.00	44.00	48.00	52.00
OPERATING COSTS/ACRE:							
Cultural Cost	1,017	1,017	1,017	1,017	1,017	1,017	1,017
Harvest Cost	266	304	342	380	418	456	494
Assessment	13	14	15	16	17	18	19
Postharvest Cost	10	10	10	10	10	10	10
Interest on operating capital	46	47	47	48	49	49	50
TOTAL OPERATING COSTS/ACRE	1,352	1,392	1,431	1,471	1,511	1,550	1,590
TOTAL OPERATING COSTS/TON	**48.29**	**43.50**	**39.75**	**36.78**	**34.34**	**32.29**	**30.58**
CASH OVERHEAD COSTS/ACRE	253	253	253	253	253	253	253
TOTAL CASH COSTS/ACRE	1,605	1,645	1,684	1,724	1,764	1,803	1,843
TOTAL CASH COSTS/TON	**57.32**	**51.41**	**46.78**	**43.10**	**40.09**	**37.56**	**35.44**
NON-CASH OVERHEAD COSTS/ACRE	54	54	54	54	54	54	54
TOTAL COSTS/ACRE	1,659	1,699	1,738	1,778	1,818	1,857	1,897
TOTAL COSTS/TON	**59.25**	**53.09**	**48.28**	**44.45**	**41.32**	**38.69**	**36.48**

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE	YIELD (ton/acre)						
$/ton	28.00	32.00	36.00	40.00	44.00	48.00	52.00
42.50	-162	-32	99	229	359	490	620
45.50	-78	64	207	349	491	634	776
48.50	6	160	315	469	623	778	932
51.50	90	256	423	589	755	922	1,088
54.50	174	352	531	709	887	1,066	1,244
57.50	258	448	639	829	1,019	1,210	1,400
60.50	342	544	747	949	1,151	1,354	1,556

NET RETURNS PER ACRE **ABOVE CASH** COSTS

PRICE	YIELD (ton/acre)						
$/ton	28.00	32.00	36.00	40.00	44.00	48.00	52.00
42.50	-415	-285	-154	-24	106	237	367
45.50	-331	-189	-46	96	238	381	523
48.50	-247	-93	62	216	370	525	679
51.50	-163	3	170	336	502	669	835
54.50	-79	99	278	456	634	813	991
57.50	5	195	386	576	766	957	1,147
60.50	89	291	494	696	898	1,101	1,303

NET RETURNS PER ACRE **ABOVE TOTAL** COSTS

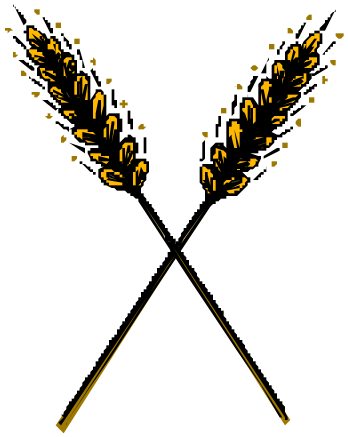
PRICE	YIELD (ton/acre)						
$/ton	28.00	32.00	36.00	40.00	44.00	48.00	52.00
42.50	-469	-339	-208	-78	52	183	313
45.50	-385	-243	-100	42	184	327	469
48.50	-301	-147	8	162	316	471	625
51.50	-217	-51	116	282	448	615	781
54.50	-133	45	224	402	580	759	937
57.50	-49	141	332	522	712	903	1,093
60.50	35	237	440	642	844	1,047	1,249

1999

UNIVERSITY OF CALIFORNIA - COOPERATIVE EXTENSION

SAMPLE COSTS TO PRODUCE

~ *WHEAT*~



SAN JOAQUIN VALLEY
Double Cropped

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

1999
SAMPLE COSTS TO PRODUCE WHEAT
San Joaquin Valley
Double Cropped

INTRODUCTION

The detailed costs to produce double cropped wheat in the San Joaquin Valley of California are presented in this study. The hypothetical farm used in this report consists of 1,200 acres of which 300 acres are in double cropped winter wheat production.

This study consists of Assumptions for producing double cropped winter wheat and seven tables. It is intended as a guide only. It can be used to make production decisions, determine potential returns, prepare budgets and evaluate production loans. Sample costs given for labor, materials, equipment and contract services are based on current figures. Some costs and practices detailed in this study may not be applicable to every situation. A blank *Your Cost* column is also provided to enter your actual costs on Table 1. Costs Per Acre To Produce Wheat and Table 2. Costs And Returns Per Acre To Produce Wheat.

This study consists of General Assumptions for Producing Wheat and seven tables.

Table 1. Costs Per Acre To Produce Wheat
Table 2. Costs And Returns Per Acre To Produce Wheat
Table 3. Monthly Cash Costs Per Acre To Produce Wheat
Table 4. Annual Equipment, Investment And Business Overhead
Table 5. Hourly Equipment Costs
Table 6. Ranging Analysis
Table 7. Cost And Returns/Breakeven Analysis

For an explanation of calculations used for the study refer to the attached General Assumptions, call the Department of Agricultural and Resource Economics, Cooperative Extension, University of California, Davis, California, (530) 752-3589 or call the farm advisor in your county.

Other small grain and forage crop cost studies are available for commodities grown in the San Joaquin Valley. For those interested in this and other studies, they can be requested through the Department of Agricultural Economics, U.C. Davis, (530) 752-3589 or (530) 752-1515, or from selected county Cooperative Extension offices. There is a nominal charge.

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UNIVERSITY OF CALIFORNIA - COOPERATIVE EXTENSION

1999
SAMPLE COSTS TO PRODUCE WHEAT
San Joaquin Valley
Double Cropped

ASSUMPTIONS

The following is a description of some general assumptions pertaining to sample costs to produce double cropped wheat in San Joaquin Valley. Practices described are not recommendations by the University of California, but rather represent production procedures considered typical of a well managed farm for the San Joaquin Valley. Costs and practices detailed in this study may not be applicable to all situations. Cultural practices for the production of wheat vary by grower and region; variations can be significant. The practices and inputs used in this cost study serve only as a sample or guide. These costs are represented on an annual, per acre basis. *The use of trade names 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.*

Land and Share Rent. This report is based on a 1,200 acre field and row crop farm of which 300 acres are producing double cropped wheat and 900 acres are planted to alfalfa hay, cotton, processing tomatoes, corn, sugar beets, beans, and other small grains.

Land in this study is leased on a cash-rent basis with the land owner receiving $100 per acre. The land rented includes developed wells and irrigation system. The grower owns a shop and an equipment yard to fix and store equipment. Land Rent appears as a cash overhead cost in Tables 1-4.

Irrigation System. An irrigation district supplies water, though growers may supplement this with well water in some areas. The amount of water used to irrigate wheat will vary in the San Joaquin Valley. Irrigation districts in the Valley were surveyed for water pricing and the cost of pumping well water was calculated. District and well water costs were combined to obtain an average cost for water. The cost of irrigation water for this cost study is $2.20 per acre-inch or $26.40 per acre-foot.

The permanent irrigation system is already in place when the land is rented. The cost of the irrigation system is included in the land rent which is cash overhead cost in Table 1-4.

Labor. Basic hourly wages for workers are $8.21 and $5.75 per hour for machine operators and non-machine (irrigators) workers respectively. Adding 34% for SDI, FICA, insurance and other benefits raises the total labor costs to $11.00 per hour for machine operators and $7.71 per hour for non-machine labor. The labor for operations involving machinery are 20% higher than the operation time to account for the additional time involved in equipment set up, moving, maintenance and repair. Any returns above total costs are considered returns to investment.

Cultural Practices and Material Inputs

Land Preparation. Primary tillage and planting groundwork operations which includes chiseling, disking, pulling borders, and preplant fertilization are performed in November and December. All operations requiring equipment are performed with either a 200 hp crawler, 130, or 92 hp wheel tractors. Operations that are done on only a percentage of the acreage are noted; all other operations are done on 100% of the acreage.

In November, all of the acreage is chiseled once to open the soil structure to a depth of 18 inches. The ground is disced twice to prepare the seedbed and irrigation borders are pulled. Fertilizer is applied preplant at a rate of 100 pounds of nitrogen per acre.

Stand Establishment. In December, wheat is drilled into the fields at 130 pounds of seed per acre. If testing indicate a need, phosphorus is applied at planting usually in the range of 40 to 60 pounds of P_2O_5.

Irrigation. The cost of irrigations shown in Tables 1, 2, and 3 are for the cost of the water and labor to apply it. The amount of water applied will vary depending on soil moisture from winter rains. After planting, wheat is flood irrigated three time from March through May. Nitrogen fertilizer is injected once into the March irrigation. A total of 18 acre-inches is applied to the crop in this study.

Fertilization. One hundred pounds per acre of UN-32 is sprayed on to the flat fields and incorporated in with a disc prior to planting. In February the wheat receives 40 pounds of nitrogen per acre in the form of urea. During March a liquid fertilizer is injected with the irrigation putting on another 40 pounds of N per acre.

Weed Management. A single treatment of a herbicide (MCPA) is made in February and is applied by aircraft.

The pesticides and rates, and cultural practices mentioned in this cost study are only a few of those that are listed in the UC IPM Pest Management Guidelines, Wheat and Integrated Pest Management For Small Grains. Written recommendations are required for many pesticides and are made by licensed pest control advisors. For information and pesticide use permits, contact the local county Agricultural Commissioner's office.

Equipment Costs. Equipment costs are composed of three parts; capital recovery, cash overhead, and operating costs. Both capital recovery and cash overhead factors are discussed in later sections. The operating costs consist of repairs, fuel, and lubrication.

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 Engineers (ASAE). Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO hp, and type of fuel used. The fuel and repair cost per acre for each operation in Table 1 is determined by multiplying the total hourly operating cost in Table 5 for each piece of equipment used for the cultural practice by the number of hours per acre for that operation. Tractor time is 10% higher than implement time for a given operation to account for setup, travel and down time. Prices for on-farm delivery of diesel and gasoline are $0.62 and $1.02 per gallon, respectively.

Harvest. Wheat is combined and hauled from the field in bankout wagons to waiting trucks for transportation to storage. Harvest costs $29 per ton by a custom harvest company.

Growers may choose to own harvesting equipment, purchased either new or used, or hire a custom harvester to perform the harvest. Many factors are important in deciding which harvesting option a grower uses. These considerations and appropriate method of analysis are discussed in *"Acquiring alfalfa hay harvest equipment: A financial analysis of alternatives"*.

Yields. The crop yield used in this study is 2.5 ton per acre at 9 to 10% moisture. Yields have varied over the years in the San Joaquin Valley and are shown in Table A.

Table A. Average annual wheat yields for selected counties in the San Joaquin Valley

County	1993	1994	1995	1996	1997
	tons/acre				
San Joaquin	2.63	3.01	2.21	2.39	2.89
Stanislaus	2.50	1.40	2.00	2.10	2.75
Merced	2.63	2.72	1.80	1.79	2.38
Madera	2.70	2.70	2.31	2.60	2.40
Fresno	3.06	3.13	2.26	2.52	2.67
Tulare	2.55	2.43	2.53	2.26	2.59
Kings	2.75	2.76	2.58	2.42	2.68
Kern	2.38	2.76	2.56	2.69	2.66

Source: selected County Crop Reports, 1993-1997.

Returns. A selling price of a $100 per ton of grain is used to estimate income from the sale of wheat. Selling prices may range from $80 to $140 per ton; the $100 used in the cost study is, at best, an estimate taking into consideration current situations. Table 6 indicates the effects on grower returns based on varying yields and returns. Breakeven points based on estimated costs are calculated for both yields and return prices in Table 7.

This study also includes income received from the Production Flexibility Contract (PFC) program administered by the USDA Farm Service Agency. The PFC income is calculated by taking 85% of the program payment yield and multiplying it times the payment rate. In this study the California program payment yield of 2.03 tons per acre and the payment rate is $21 per ton. Program support is calculated as 2.03 tons/acre X .85 X $21/ton = $36.24 per acre. In this study, every wheat acre is assumed to be covered by program payments. In reality, however, maximum payment limitations may leave some acres uncovered effectively reducing the per cwt income. Maximum contract payments are limited to $50,000 per person. Payments to growers were increased in 1998 by 50% because of a one time supplement by congress to the program.

The PFC payment rate is set by a number of factors at harvest time. Because the actual rate is not determined until the end of each growing season the USDA sets future PFC payment rates in a range. PFC payment rates change annually. Contact the local Farm Service Agency office for further information about the support program.

Assessments. Under a state marketing order a mandatory assessment fee is collected and administered by the California Wheat Commission. This assessment of $0.03 per hundredweight (cwt) pays for wheat research in California and is collected at the first point of sale.

Risk. Risks associated with wheat production are not assigned a production cost. While this study makes an effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks which affect the profitability and economic viability of wheat production.

Overhead and Capital Recovery Costs

Cash Overhead. Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. These costs include property taxes, interest on operating capital, office expense, liability and property insurance, and investment repairs. Cash overhead costs are found in Tables 1, 2, 3 and 4.

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 property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1% of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

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 9.69% per year. A nominal interest rate is the going market cost of borrowed funds.

Insurance. Insurance for farm investments vary depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.713% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs $1,049 for the entire farm or $0.87 per acre.

Office Expense: Office and business expenses are estimated at $25 per acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, road maintenance, etc.

Capital Recovery Costs. Capital recovery cost is calculated for equipment and other farm investments. Although farm equipment used on farms in this region might be purchased new or used, this study shows the current purchase price for new equipment. The new purchase price is adjusted to 60% to indicate a mix of new and used equipment. Annual ownership costs (Equipment and Investments) are shown in Tables 1-4.

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). Put another way, it is equivalent to the annual payment on a loan for the investment with the downpayment 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 as follows:

$$\left[\left(\text{Purchase Price} - \text{Salvage Value}\right) \times \left(\text{Capital Recovery Factor}\right)\right] + \left[\text{Salvage Value} \times \text{Interest Rate}\right]$$

Salvage Value. Salvage value is an estimate of the remaining market value of an investment at the end of its useful life. It is calculated differently for different investments. For farm machinery (e.g., tractors and implements) the remaining value is a percentage of the new cost of the investment. Salvage value is calculated as

$$\text{New Price} \times \%\,\text{Remaining Value}$$

Salvage value for other investments including irrigation systems, buildings, and miscellaneous equipment is zero. The salvage value for land is equal to the purchase price because land does not depreciate. Salvage value for investments can vary. The purchase price and salvage value for certain equipment and investments are shown in Table 4.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. It is the function of the interest rate and years of life of the equipment.

Interest Rate. The interest rate of 7.40% used to calculate capital recovery cost is the United States Department of Agriculture-Economic Reporting Service's (USDA-ERS) ten year average of California's agricultural sector long-run real rate of return to production assets from current income. It is used to reflect the long-term realized rate of return to these specialized resources that can only be used effectively in the agricultural sector, not including inflation. In other words, the next best alternative use for these resources is in another agricultural enterprise.

Acknowledgment. Appreciation is expressed to Dr. Dan Sumner and other cooperators who provided support and information for this study.

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For information concerning the above mentioned University of California publications contact UC DANR Communications Services (1-800-994-8849) or your local county Cooperative Extension office.

Table 1.

U.C. COOPERATIVE EXTENSION
COSTS PER ACRE TO PRODUCE WHEAT
SAN JOAQUIN VALLEY - 1999

Labor Rate: $11.00/hr. machine labor
$7.71/hr. non-machine labor

Interest Rate: 9.69%
Yield per Acre: 2.5 Ton

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre: Labor Cost	Fuel,Lube & Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:							
Chisel 2X	0.50	7	7	0	0	14	
Finish Disc 2X	0.25	3	5	0	0	8	
Pull Borders	0.04	1	0	0	0	1	
Fertilize - Preplant 100 Lbs N/Acre	0.17	2	3	35	0	40	
Plant	0.20	3	2	17	0	22	
Fertilize - 40 Lbs N/Acre	0.00	0	0	5	0	5	
Weed Control - Post-emergent	0.00	0	0	5	8	13	
Pull Tail Ditch	0.04	1	0	0	0	1	
Irrigate & Fertilize 1X	0.25	2	0	27	0	29	
Irrigate 2X	0.00	0	0	26	0	26	
Close Ditch	0.04	1	0	0	0	1	
Pickup Truck Use	0.24	3	1	0	0	4	
TOTAL CULTURAL COSTS	1.73	22	19	115	8	164	
Harvest:							
Harvest - Combine	0.00	0	0	0	73	73	
California Wheat Commission	0.00	0	0	2	0	2	
TOTAL HARVEST COSTS	0.00	0	0	2	73	74	
Postharvest:							
Disc Stubble 2X	0.25	3	5	0	0	8	
TOTAL POSTHARVEST COSTS	0.25	3	5	0	0	8	
Interest on operating capital @ 9.69%						8	
TOTAL OPERATING COSTS/ACRE		25	24	117	81	254	
TOTAL OPERATING COSTS/TON						101.65	

Table 1. Continued

CASH OVERHEAD:			
Liability Insurance			1
Office Expense			25
Rent			50
Property Taxes			2
Property Insurance			1
Investment Repairs			1
TOTAL CASH OVERHEAD COSTS			79
TOTAL CASH COSTS/ACRE			333
TOTAL CASH COSTS/TON			133.36
CAPITAL RECOVERY COSTS (7.40% Interest Rate):			
Investment	Per producing Acre	-- Annual Cost -- Capital Recovery	
Fuel Tanks	9	1	1
Fuel Wagon	2	0	0
Shop Building	69	6	6
Shop Tools	11	1	1
Siphon Tubes	2	0	0
Equipment	193	24	24
TOTAL CAPITAL RECOVERY COSTS	285	33	33
TOTAL COSTS/ACRE			366
TOTAL COSTS/TON			146.50

Table 2.

U.C. COOPERATIVE EXTENSION
COSTS AND RETURNS PER ACRE TO PRODUCE WHEAT
SAN JOAQUIN VALLEY - 1999

Labor Rate: $11.00/hr. machine labor Interest Rate: 9.69%
$7.71/hr. non-machine labor

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Wheat	2.50	Ton	100.00	250	
Support Payment	1.73	Ton	21.00	36	
TOTAL GROSS RETURNS FOR WHEAT				286	
OPERATING COSTS					
Fertilizer:					
UN-32	140.00	Lb N	0.351	49	
46-0-0	40.00	Lb N	0.13	5	
Seed:					
Wheat Seed	130.00	Lb	0.13	17	
Herbicide:					
MCPA	2.00	Pint	2.25	5	
Custom:					
Air Application	1.00	Acre	8.00	8	
Harvest - Per Ton	2.50	Ton	29.00	73	
Irrigation:					
Water	18.00	AcIn	2.20	40	
Assessment:					
Assessment Fee	50.00	Cwt	0.03	2	
Labor (machine)	2.08	hrs	11.00	23	
Labor (non-machine)	0.25	hrs	7.71	2	
Fuel - Gas	0.60	gal	1.02	1	
Fuel - Diesel	16.23	gal	0.62	10	
Lube				2	
Machinery repair				12	
Interest on operating capital @ 9.69%				8	
TOTAL OPERATING COSTS/ACRE				254	
TOTAL OPERATING COSTS/TON				102	
NET RETURNS ABOVE OPERATING COSTS				32	

Table 2. Continued

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS:					
Liability Insurance				1	
Office Expense				25	
Rent				50	
Property Taxes				2	
Property Insurance				1	
Investment Repairs				1	
TOTAL CASH OVERHEAD COSTS/ACRE				79	
TOTAL CASH COSTS/ACRE				333	
TOTAL CASH COSTS/TON				133	
CAPITAL RECOVERY COSTS (7.40% Interest Rate):					
Fuel Tanks				1	
Fuel Wagon				0	
Shop Building				6	
Shop Tools				1	
Siphon Tubes				0	
Equipment				24	
TOTAL CAPITAL RECOVERY COSTS/ACRE				33	
TOTAL COSTS/ACRE				366	
TOTAL COSTS/TON				146	
NET RETURNS ABOVE TOTAL COSTS				-80	

Table 3.

U.C. COOPERATIVE EXTENSION
MONTHLY CASH COSTS PER ACRE TO PRODUCE WHEAT
SAN JOAQUIN VALLEY - 1999

Beginning NOV 98 Ending OCT 99	NOV 98	DEC 98	JAN 99	FEB 99	MAR 99	APR 99	MAY 99	JUN 99	JUL 99	AUG 99	SEP 99	OCT 99	TOTAL
Cultural:													
Chisel 2X	14												14
Finish Disc 2X	8												8
Pull Borders		1											1
Fertilize - Preplant 100		40											40
Plant		22											22
Fertilize - 40 Lbs N/Acre				5									5
Weed Control - Post-emergent				13									13
Pull Tail Ditch					1								1
Irrigate & Fertilize 1X					29								29
Irrigate 2X						13	13						26
Close Ditch								1					1
Pickup Truck Use	0	0	0	0	0	0	0	0	0	0	0	0	4
TOTAL CULTURAL COSTS	22	63	0	18	30	14	14	1	0	0	0	0	164
Harvest:													
Harvest - Combine								73					73
California Wheat Commission								2					2
TOTAL HARVEST COSTS								74					74
Postharvest:													
Disc Stubble 2X								8					8
TOTAL POSTHARVEST COSTS								8					8
Interest on oper. capital	0	1	1	1	1	1	1	2	-0	-0	-0	-0	8
TOTAL OPERATING COSTS/ACRE	23	64	1	19	32	15	15	85	0	0	0	0	254
TOTAL OPERATING COSTS/TON	9.00	25.50	0.42	7.55	12.63	5.90	5.94	34.16	0.14	0.14	0.14	0.13	101.65
OVERHEAD:													
Liability Insurance			1										1
Office Expense	2	2	2	2	2	2	2	2	2	2	2	2	25
Rent								50					50
Property Taxes				1					1				2
Property Insurance				1									1
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL CASH OVERHEAD COSTS	2	2	3	4	2	2	2	52	3	2	2	2	79
TOTAL CASH COSTS/ACRE	25	66	4	23	34	17	17	138	3	2	2	2	333
TOTAL CASH COSTS/TON	9.85	26.35	1.61	9.22	13.48	6.75	6.79	55.01	1.33	0.99	0.99	0.98	133.36

U.C. COOPERATIVE EXTENSION

Table 4. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

SAN JOAQUIN VALLEY - 1999

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	- Cash Overhead - Insur-ance	Taxes	Total
98	130 HP 2WD Tractor	90841	10	26833	11268	420	588	12276
98	200 HP Crawler	163020	10	48154	20221	753	1056	22030
98	90 HP 2WD Tractor	52546	10	15521	6518	243	340	7101
98	Chisel - Heavy 11'	5427	10	960	719	23	32	774
98	Disc - Border	1398	12	194	169	6	8	183
98	Disc - Finish 18'	26459	12	3665	3202	107	151	3461
98	Disc - Stubble 14'	36036	12	4991	4362	146	205	4713
98	Ditcher - V	4070	12	564	493	17	23	532
98	Grain Drill - 20'	22733	10	4020	3011	95	134	3240
98	Pickup - 1/2 Ton	19305	5	8652	3266	100	140	3506
98	Rear Blade - 8'	2504	18	167	251	10	13	274
98	Saddle Tank - 300 Gal	2407	10	426	319	10	14	343
TOTAL		426746		114147	53800	1928	2704	58433
60% of New Cost *		256048		68488	32280	1157	1623	35060

* Used to reflect a mix of new and used equipment.

ANNUAL INVESTMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	------ Cash Overhead ------ Insur-ance	Taxes	Repairs	Total
INVESTMENT									
	Fuel Tanks	10930	20	1093	1038	43	60	60	1201
	Fuel Wagon	1995	10	200	275	8	11	11	305
	Shop Building	82500	25	8250	7213	324	454	454	8444
	Shop Tools	13354	15	1335	1452	52	73	73	1651
	Siphon Tubes	2155	20	216	205	8	12	12	237
TOTAL INVESTMENT		110934		11094	10183	435	610	610	11839

U.C. COOPERATIVE EXTENSION

Table 4. Continued

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	1200.00	Acre	0.87	1044
Office Expense	1200.00	Acre	25.00	30000
Rent	300.00	Acre	100.00	30000

U.C. COOPERATIVE EXTENSION

Table 5. HOURLY EQUIPMENT COSTS

SAN JOAQUIN VALLEY - 1999

		COSTS PER HOUR						
			- Cash Overhead -		-------- Operating --------			
Yr Description	Actual Hours Used	Capital Recovery	Insur-ance	Taxes	Repairs	Fuel & Lube	Total Oper.	Total Costs/Hr.
98 130 HP 2WD Tractor	1199.6	5.64	0.21	0.29	4.04	5.38	9.42	15.56
98 200 HP Crawler	1599.6	7.58	0.28	0.40	4.15	8.28	12.43	20.69
98 90 HP 2WD Tractor	1200.0	3.26	0.12	0.17	2.34	3.15	5.49	9.04
98 Chisel - Heavy 11'	199.2	2.17	0.07	0.10	1.13	0.00	1.13	3.46
98 Disc - Border	166.0	0.61	0.02	0.03	0.22	0.00	0.22	0.88
98 Disc - Finish 18'	166.2	11.56	0.39	0.54	4.12	0.00	4.12	16.61
98 Disc - Stubble 14'	166.0	15.77	0.53	0.74	5.61	0.00	5.61	22.65
98 Ditcher - V	166.0	1.78	0.06	0.08	1.08	0.00	1.08	3.00
98 Grain Drill - 20'	150.0	12.05	0.38	0.54	5.97	0.00	5.97	18.93
98 Pickup - 1/2 Ton	284.7	6.88	0.21	0.29	1.24	2.93	4.17	11.56
98 Rear Blade - 8'	166.0	0.91	0.03	0.05	0.36	0.00	0.36	1.35
98 Saddle Tank - 300 Gal	150.0	1.28	0.04	0.06	0.64	0.00	0.64	2.01

Table 6.

U.C. COOPERATIVE EXTENSION
RANGING ANALYSIS
SAN JOAQUIN VALLEY - 1999

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE WHEAT

	YIELD (TON/ACRE)						
	1.75	2.00	2.25	2.50	2.75	3.00	3.25
OPERATING COSTS/ACRE:							
Cultural Cost	164	164	164	164	164	164	164
Harvest Cost	52	59	67	74	81	89	96
Postharvest Cost	8	8	8	8	8	8	8
Interest on operating capital	8	8	8	8	8	8	8
TOTAL OPERATING COSTS/ACRE	232	239	247	254	262	269	276
TOTAL OPERATING COSTS/TON	132	120	110	102	95	90	85
CASH OVERHEAD COSTS/ACRE	79	79	79	79	79	79	79
TOTAL CASH COSTS/ACRE	311	318	326	333	341	348	356
TOTAL CASH COSTS/TON	178	159	145	133	124	116	109
CAPITAL RECOVERY COSTS/ACRE	33	33	33	33	33	33	33
TOTAL COSTS/ACRE	344	351	359	366	374	381	389
TOTAL COSTS/TON	196	176	159	146	136	127	120

NET RETURNS PER ACRE ABOVE OPERATING COSTS FOR WHEAT

PRICE (DOLLARS/TON)		YIELD (TON/ACRE)						
Wheat		1.75	2.00	2.25	2.50	2.75	3.00	3.25
Support Payment		1.73	1.73	1.73	1.73	1.73	1.73	1.73
70.00	21.00	-73	-63	-53	-43	-33	-23	-13
80.00	21.00	-55	-43	-30	-18	-5	7	20
90.00	21.00	-38	-23	-8	7	22	37	52
100.00	21.00	-20	-3	15	32	50	67	85
110.00	21.00	-3	17	37	57	77	97	117
120.00	21.00	15	37	60	82	105	127	150
130.00	21.00	32	57	82	107	132	157	182

Table 6 continued

NET RETURNS PER ACRE ABOVE CASH COSTS FOR WHEAT

PRICE (DOLLARS/TON)		YIELD (TON/ACRE)						
Wheat		1.75	2.00	2.25	2.50	2.75	3.00	3.25
Support Payment		1.73	1.73	1.73	1.73	1.73	1.73	1.73
70.00	21.00	-152	-142	-132	-122	-112	-102	-92
80.00	21.00	-135	-122	-110	-97	-85	-72	-59
90.00	21.00	-117	-102	-87	-72	-57	-42	-27
100.00	21.00	-100	-82	-65	-47	-30	-12	6
110.00	21.00	-82	-62	-42	-22	-2	18	38
120.00	21.00	-65	-42	-20	3	25	48	71
130.00	21.00	-47	-22	3	28	53	78	103

NET RETURNS PER ACRE ABOVE TOTAL COSTS FOR WHEAT

PRICE (DOLLARS/TON)		YIELD (TON/ACRE)						
Wheat		1.75	2.00	2.25	2.50	2.75	3.00	3.25
Support Payment		1.73	1.73	1.73	1.73	1.73	1.73	1.73
70.00	21.00	-185	-175	-165	-155	-145	-135	-125
80.00	21.00	-168	-155	-142	-130	-117	-105	-92
90.00	21.00	-150	-135	-120	-105	-90	-75	-60
100.00	21.00	-133	-115	-97	-80	-62	-45	-27
110.00	21.00	-115	-95	-75	-55	-35	-15	5
120.00	21.00	-98	-75	-52	-30	-7	15	38
130.00	21.00	-80	-55	-30	-5	20	45	70

Table 7.

U.C. COOPERATIVE EXTENSION
COSTS AND RETURNS / BREAKEVEN ANALYSIS
SAN JOAQUIN VALLEY - 1999

COSTS AND RETURNS - PER ACRE BASIS

Crop	1. Gross Returns	2. Operating Costs	3. Net Returns Above Oper. Costs (1-2)	4. Cash Costs	5. Net Returns Above Cash Costs (1-4)	6. Total Costs	7. Net Returns Above Total Costs (1-6)
Wheat	286	254	32	333	-47	366	-80

COSTS AND RETURNS - TOTAL ACREAGE

Crop	1. Gross Returns	2. Operating Costs	3. Net Returns Above Oper. Costs (1-2)	4. Cash Costs	5. Net Returns Above Cash Costs (1-4)	6. Total Costs	7. Net Returns Above Total Costs (1-6)
Wheat	85899	76234	9665	100016	-14117	109873	-23974

BREAKEVEN PRICES PER YIELD UNIT

CROP	Base Yield (Units/Acre)	Yield Units	Breakeven Price To Cover: Operating Costs	Cash Costs	Total Costs
			$ per Yield Unit		
Wheat	2.5	Ton	88.75	116.43	127.91

BREAKEVEN YIELDS PER ACRE

CROP	Yield Units	Base Price ($/Unit)	Breakeven Yield To Cover: Operating Costs	Cash Costs	Total Costs
			Yield Units / Acre		
Wheat	Ton	100.00	2.2	2.9	3.2