
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

2009

**SAMPLE COSTS TO PRODUCE
SUDAN SILAGE**



SAN JOAQUIN VALLEY - South

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San Joaquin Valley – South 2009

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INTRODUCTION

Sample costs to produce sudan silage in the southern 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. A “*Your Costs*” column in Tables 1 and 2 is provided to enter your costs.

The hypothetical farm operations, production practices, overhead, and calculations are described under the assumptions. For additional information or an explanation of 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) 752-1517. Current studies and several archived 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 refer to Tables 1 to 7 and pertain to sample costs to produce sudan silage in the southern San Joaquin Valley. Practices described represent production practices and materials considered typical of a well-managed farm 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.**

Farm. The hypothetical farm consists of 300 non-contiguous acres of which 150 acres are rented and 150 owned by the grower. Sudan for silage is planted on 140 acres of the 150 acres of rented land. The remaining 10 acres are roads and field edges. The grower-owned 150 acres includes 10 acres occupied by buildings and homestead, and 140 acres planted to other crops.

Production Cultural Practices and Material Inputs

Tables 1-3 show the costs associated with ground preparation, planting, growing, and harvesting sudan silage.

Land Preparation. Land preparations begin in the spring (April/May). The fields are disced to incorporate the previous crop residue. Borders are pulled to make irrigation basins for the preirrigation and are left in place for the season. After irrigation, fertilizer is injected and one pass is made with a finish or offset disc to prepare the seedbed.

Planting. Sudan is planted from May to July. In June, the sudan seed is planted (drilled) on flat ground at 100 pounds per acre. A custom planter does the planting for \$19 per acre.

Fertilization. Growers should apply fertilizer or soil amendments after soil tests to determine nutrient and pH levels. Nitrogen (N) as anhydrous ammonia (80-0-0) is injected at 100 pounds N per acre prior to planting and 40 pounds of N per acre is water run after the first cutting.

Irrigation. The grower uses both well and surface water at an average cost of \$4.58 per acre-inch or \$54.96 per acre-foot. A preplant irrigation of eight acre-inches is made in early June. The amount of water applied preplant will vary depending on soil type and moisture remaining from winter rains and the previous crop. Effective rainfall is not accounted for in this study. After planting, four irrigations (two each in July and August) totaling 20 acre-inches of water are applied.

Pest Management. For more information on other pesticides available, pest identification, monitoring, and management visit the UC IPM website at www.ipm.ucdavis.edu or contact your local UCCE farm advisor. For information and pesticide use permits, contact the local county agricultural commissioner's office. Adjuvants or surfactants may be recommended for use with some pesticides, but are not included in this study. Pesticide costs vary by location and grower volume. Pesticide and fertilizer costs are taken from a single dealer and are shown as full retail.

Pest Control Adviser (PCA). Written recommendations are required for many pesticides and are made by licensed pest control advisers. In addition the PCA will monitor the field for agronomic problems including pests and nutrition. Growers may hire private PCAs or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study, the PCA is provided by the ag chemical dealer.

Weeds. In late June or early July prior to the first irrigation, Clarity and Prowl herbicides are ground applied for broadleaf and grass control.

Insects. None applied

Harvest. Normally, non-dairy growers sell the crop standing and the buyer or dairy pays the harvesting costs. Therefore, no costs are shown in the tables. The crop is harvested twice for silage production. In July and late August, the sudan is harvested for silage (green chop), processed, hauled, and packed into a silage pit.

Yields. The crop is assumed to yield 14 tons per acre at 70% moisture. Yields can range from 10 to 18 tons per acre in this region.

Returns. Based on the 2008 market, a price of \$34 per ton is used to calculate returns. Table 4 shows a range of grower returns over a range of yields.

Labor, Equipment and Interest Costs

Labor. Labor rates of \$13.94 per hour for machine operators and \$10.88 for general labor includes payroll overhead of 36%. The basic hourly wages are \$10.25 for machine operators and \$8.00 for general labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for field crops (code 0071), 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, 2009 (California Department of Insurance, unreferenced). Labor for operations involving machinery are 20% higher than the operation time given in Table 1 to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

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 power take off (PTO) horsepower and fuel type. Prices for **on-farm delivery** of diesel and gasoline are \$3.70 (excludes excise taxes) and \$3.36 per gallon, respectively. The fuel prices are the average costs from July through December 2008 derived from American Automobile Association (AAA) and Energy Information Administration monthly data. The cost includes a 2.25% sales tax for diesel fuel, and federal and excise taxes plus an 8% sales tax on gasoline. The federal and state excise tax on gasoline used on the farm 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 5.75% per year. A nominal interest rate is the typical market cost of borrowed funds. The interest cost of post harvest operations is discounted back to the last harvest month using a negative interest charge. The rate will vary depending upon various factors, but the rate in this study is considered a typical lending rate by a farm lending agency as of January 2009.

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.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the farm and not to a particular operation.

Property Taxes. Counties charge a base property tax at the rate of 1% on the assessed value of the property including land, equipment, buildings, and improvements. In some counties special assessment districts exist and charge additional taxes on property. 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. Land value is assumed to remain unchanged.

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 0.82% of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$983 for the entire farm or \$3.51 per producing acre.

Office Expense. Office and business expenses are estimated at \$40 per producing acre. These expenses include office supplies, telephones, bookkeeping, accounting, legal fees, and miscellaneous overhead expenses

Land Rent. The cash rent for the land is \$175 per acre or \$187.50 per production acre (140 acres) for a single crop. The land rented includes developed wells and irrigation system. Land rent appears as a Cash Overhead cost.

Investment Repairs. Annual repairs are calculated as 2% of the purchase price.

Non-Cash Overhead

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 prices 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 $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$.

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery 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 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. The purchase price and salvage value for equipment and investments are shown in Table 5.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. The amortization factor is a table value that corresponds to the interest rate and equipment life.

Interest Rate. The interest rate of 4.75% is used to calculate capital recovery. The rate will vary depending upon size of loan and other lending agency conditions, but is a suggested rate by a farm lending agency in January 2009.

Land. Land values for row crop land in the region range from \$3,500 per acre to \$12,000 per acre. Prices are affected by location, soil type, and water availability. In this study the silage is grown on rented land (see Land Rent).

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 sudan will vary in the San Joaquin Valley. District and well water costs were combined to obtain an average cost for water. The permanent irrigation system consists of buried mainline. This part of the system is already in place when the land is purchased/rented; therefore, no costs are shown.

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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UC COOPERATIVE EXTENSION
Table 1 COSTS PER ACRE to PRODUCE SUDAN SILAGE
 SAN JOAQUIN VALLEY - South 2009

Operation	Operation	Cash and Labor Cost per acre					Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel, Lube & Repairs	Material Cost	Custom/ Rent			
Cultural:								
Land Prep: Disc Stubble	0.17	3	11	0	0	14		
Land Prep: Pull Borders	0.04	1	2	0	0	2		
Irrigate: Preirrigate	0.10	1	0	37	0	38		
Fertilize: Inject (80-0-0)	0.00	0	0	45	14	59		
Land Prep: Finish Disc	0.13	2	8	0	0	10		
Plant: Seed	0.00	0	0	150	19	169		
Weed: Postplant (Clarity, Prowl)	0.13	2	3	40	0	45		
Irrigate 4X	0.40	4	0	92	0	96		
Fertilize: Water Run (80-0-0)	0.00	0	0	18	0	18		
Pickup Truck Use	0.38	6	4	0	0	11		
TOTAL CULTURAL COSTS	1.35	20	29	381	33	462		
Harvest:								
Harvest - Cut, Haul & Pack (Paid by Buyer)*	0.00	0	0	0	0	0		
TOTAL HARVEST COSTS	0.00	0	0	0	0	0		
Interest on operating capital @ 5.75%						6		
TOTAL OPERATING COSTS/ACRE		20	29	381	33	468		
Cash Overhead:								
Liability Insurance						4		
Office Expense						40		
Land Rent (per producing acre)						188		
Property Taxes						3		
Property Insurance						2		
Investment Repairs						7		
TOTAL CASH OVERHEAD COSTS						244		
TOTAL CASH COSTS/ACRE						711		
Non-Cash Overhead (Capital Recovery):								
	Per producing Acre		-- Annual Cost --					
			<u>Capital Recovery</u>					
Fuel Tanks/Aboveground	23		2			2		
Fuel Wagon	10		1			1		
Buildings	286		18			18		
Shop/Field Tools	54		4			4		
Equipment	120		11			11		
TOTAL NON-CASH OVERHEAD COSTS	493		37			37		
TOTAL COSTS/ACRE						748		

Note: X=times as 2X=2 times or passes.

*See "Harvest" on page 4 in text.

UC COOPERATIVE EXTENSION
Table 2. COSTS and RETURNS PER ACRE to PRODUCE SUDAN SILAGE
 SAN JOAQUIN VALLEY - South 2009

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Sudan Silage	14.00	ton	34.00	476	
OPERATING COSTS					
Irrigation:					
Water	28.00	acin	4.58	128	
Herbicide:					
Clarity	1.00	pint	18.98	19	
Prowl H20	3.00	pint	6.87	21	
Seed:					
Sudan Seed (conventional, treated)	100.00	lb	1.50	150	
Fertilizer:					
80-0-0 (NH3)	140.00	lb N	0.45	63	
Custom:					
Plant (Drill)	1.00	acre	19.00	19	
Injection-Sidedress NH3	1.00	acre	14.00	14	
Labor (machine)	1.02	hrs	13.94	14	
Labor (non-machine)	0.50	hrs	10.88	5	
Fuel - Gas	0.95	gal	3.36	3	
Fuel - Diesel	4.79	gal	3.70	18	
Lube				3	
Machinery repair				4	
Interest on operating capital @ 5.75%				6	
TOTAL OPERATING COSTS/ACRE				468	
NET RETURNS ABOVE OPERATING COSTS				8	
Cash Overhead:					
Liability Insurance				4	
Office Expense				40	
Land Rent (per producing acre)				188	
Property Taxes				3	
Property Insurance				2	
Investment Repairs				7	
TOTAL CASH OVERHEAD COSTS				244	
TOTAL CASH COSTS/ACRE				711	
Non-Cash Overhead (Capital Recovery):					
Fuel Tanks/Aboveground				2	
Fuel Wagon				1	
Buildings				18	
Shop/Field Tools				4	
Equipment				11	
TOTAL NON-CASH OVERHEAD COSTS				37	
TOTAL COSTS/ACRE				748	
NET RETURNS ABOVE TOTAL COSTS				-272	

UC COOPERATIVE EXTENSION
Table 3. MONTHLY CASH COSTS PER ACRE to PRODUCE SUDAN SILAGE
 SAN JOAQUIN VALLEY - South 2009

Beginning JAN 09	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Ending DEC 09	09	09	09	09	09	09	09	09	09	09	09	09	
Cultural:													
Land Prep: Disc Stubble					14								14
Land Prep: Pull Borders					2								2
Irrigate: Preirrigate						38							38
Fertilize: Inject (80-0-0)						59							59
Land Prep: Finish Disc						10							10
Plant: Seed						169							169
Weed: Postplant (Clarity, Prowl)							45						45
Irrigate 4X							48	48					96
Fertilize: Water Run (80-0-0)								18					18
Pickup Truck Use					3	3	3	3					11
TOTAL CULTURAL COSTS					19	279	95	69					462
Harvest:													
Harvest - Cut, Haul & Pack (Paid by Buyer)*							0	0					0
TOTAL HARVEST COSTS							0	0					0
Interest on operating capital @ 5.75%					0	1	2	2					6
TOTAL OPERATING COSTS/ACRE					19	280	97	71					468
Cash Overhead:													
Liability Insurance					4								4
Office Expense					8	8	8	8	8				40
Land Rent (per producing acre)									188				188
Property Taxes							3						3
Property Insurance					2								2
Investment Repairs	1	1	1	1	1	1	1	1	1	1	1	1	7
TOTAL CASH OVERHEAD COSTS	1	1	1	1	15	9	11	9	196	1	1	1	244
TOTAL CASH COSTS/ACRE	1	1	1	1	34	289	108	79	196	1	1	1	711

*See "Harvest" on page 4 in text.

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Table 4. RANGING ANALYSIS
 SAN JOAQUIN VALLEY – South 2009

COSTS PER ACRE AT VARYING YIELDS TO PRODUCE SUDAN SILAGE

	YIELD (ton/acre)						
	9.50	11.00	12.50	14.00	15.50	17.00	18.50
OPERATING COSTS:							
Cultural Cost	462	462	462	462	462	462	462
Interest on operating capital @ 5.75%	6	6	6	6	6	6	6
TOTAL OPERATING COSTS/acre	468	468	468	468	468	468	468
Total Operating Cost/ton	49	43	37	33	30	28	25
CASH OVERHEAD COSTS							
TOTAL CASH COSTS/acre	712	712	712	712	712	712	712
Total Cash Costs/ton	75	65	57	51	46	42	38
NON-CASH OVERHEAD COSTS/acre							
TOTAL COSTS/ACRE	749	749	749	749	749	749	749
Total Cost/ton	79	68	60	53	48	44	40

NET RETURNS PER ACRE ABOVE OPERATING COSTS

PRICE \$/ton	YIELD (ton/acre)						
	9.50	11.00	12.50	14.00	15.50	17.00	18.50
25.00	-230	-193	-155	-118	-80	-43	-5
28.00	-202	-160	-118	-76	-34	8	50
31.00	-173	-127	-80	-34	13	59	106
34.00	-145	-94	-43	8	59	110	161
37.00	-116	-61	-5	50	106	161	217
40.00	-88	-28	32	92	152	212	272
43.00	-59	5	70	134	199	263	328

NET RETURNS PER ACRE ABOVE CASH COSTS

PRICE \$/ton	YIELD (ton/acre)						
	9.50	11.00	12.50	14.00	15.50	17.00	18.50
25.00	-474	-437	-399	-362	-324	-287	-249
28.00	-446	-404	-362	-320	-278	-236	-194
31.00	-417	-371	-324	-278	-231	-185	-138
34.00	-389	-338	-287	-236	-185	-134	-83
37.00	-360	-305	-249	-194	-138	-83	-27
40.00	-332	-272	-212	-152	-92	-32	28
43.00	-303	-239	-174	-110	-45	19	84

NET RETURNS PER ACRE ABOVE TOTAL COSTS

PRICE \$/ton	YIELD (ton/acre)						
	9.50	11.00	12.50	14.00	15.50	17.00	18.50
25.00	-511	-474	-436	-399	-361	-324	-286
28.00	-483	-441	-399	-357	-315	-273	-231
31.00	-454	-408	-361	-315	-268	-222	-175
34.00	-426	-375	-324	-273	-222	-171	-120
37.00	-397	-342	-286	-231	-175	-120	-64
40.00	-369	-309	-249	-189	-129	-69	-9
43.00	-340	-276	-211	-147	-82	-18	47

UC COOPERATIVE EXTENSION
**Table 5. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT,
and BUSINESS OVERHEAD COSTS**
SAN JOAQUIN VALLEY - South 2009

ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insur- ance	Taxes	
09	130 HP 2WD Tractor	87,060	20	11,171	6,492	403	491	7,386
09	200 HP Trac Tractor	194,000	20	57,305	20,210	1,030	1,257	22,497
09	92 HP 2WD Tractor	51,094	20	6,556	3,810	236	288	4,335
09	Disc - Border	2,150	20	112	165	9	11	186
09	Disc - Finish 18'	31,734	20	1,654	2,441	137	167	2,745
09	Disc - Stubble 14'	36,036	20	1,878	2,772	155	190	3,117
09	Pickup 1/2 Ton	28,000	5	12,549	4,140	166	203	4,509
09	Saddle Tank 300Gal	3,218	15	176	297	14	17	327
09	Spray Boom - 20'	1,850	15	309	161	9	11	180
TOTAL		435,142	0	91,710	40,488	2,160	2,634	45,283
60% of New Cost *		261,085	0	55,026	24,293	1,296	1,581	27,170

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes	Repairs	
Fuel Wagon	2,850	10	285	342	13	16	57	427
Fuel Tanks/Aboveground	6,514	20	250	504	28	34	130	695
Buildings 2,400 sqft	80,000	30		5,057	328	400	1,600	7,385
Shop/Field Tools	15,000	20	600	1,160	64	78	300	1,602
TOTAL INVESTMENT	104,364		1,135	7,062	433	527	2,087	10,109

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	280	acre	3.51	983
Office Expense	280	acre	40.00	11,200
Rent: Silage acres (140 acres planted)	150	acre	175.00	26,250

Farm size = 300 acres, Planted acres = 280.

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Table 6. HOURLY EQUIPMENT COSTS
 SAN JOAQUIN VALLEY -South 2009

Yr	Description	COSTS PER HOUR							Total Costs/Hr.
		Actual Hours Used	Cash Overhead			Operating			
			Capital Recovery	Insur- ance	Taxes	Repairs	Fuel & Lube	Total Oper.	
09	130 HP 2WD Tractor	600	6.49	0.44	0.49	3.72	32.10	35.82	43.24
09	200 HP Trac Tractor	1,600	7.58	0.39	0.47	5.16	49.39	54.55	62.99
09	92 HP 2WD Tractor	600	3.81	0.24	0.29	0.94	19.22	20.16	24.50
09	Disc - Border	100	1.00	0.06	0.07	0.33	0.00	0.33	1.46
09	Disc - Finish 18'	100	14.68	0.82	1.00	4.90	0.00	4.90	21.40
09	Disc - Stubble 14'	100	16.60	0.93	1.13	5.57	0.00	5.57	24.23
09	Pickup 1/2 Ton	285	8.71	0.35	0.43	1.82	9.66	11.48	20.97
09	Saddle Tank 300Gal	100	1.79	0.09	0.10	0.85	0.00	0.85	2.83
09	Spray Boom - 20'	100	0.97	0.05	0.07	0.49	0.00	0.49	1.58

UC COOPERATIVE EXTENSION
Table 7. OPERATIONS WITH EQUIPMENT & MATERIAL INPUTS
 San Joaquin Valley - South 2009

Operation	Operation Month	Equipment Tractor	Implement	Non-Mach Labor hrs/acre	Material	Broadcast Rate/acre	Unit
Cultural:							
Land Prep: Disc Stubble	May	200HP Trac	Stubble Disc				
Land Prep: Pull Borders	May	130HP	Border Disc				
Irrigate: Preirrigate	June			0.10	Water	8.00	acin
Fertilize: Inject	June	Custom			80-0-0	100.00	lb N
Land Prep: Finish Disc	June	200HP Trac	Finish Disc				
Plant: Seed.	June	Custom			Seed	100.00	lb
Weed: Post Plant	July	92HP	Saddle Tank & Spray Boom		Clarity	1.00	pint
					Prowl	3.00	pint
Irrigate:	July			0.20	Water	10.00	acin
Irrigate	August			0.20	Water	10.00	acin
Fertilize: Water Run	August				80-0-0	40.00	lb N
Harvest	July	Buyer					
	August	Buyer					