
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION**2004****SAMPLE COSTS TO PRODUCE
SMALL GRAIN SILAGE****SAN JOAQUIN VALLEY - SOUTH**

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UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

**SAMPLE COSTS TO
PRODUCE SMALL GRAIN SILAGE**

San Joaquin Valley 2004

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INTRODUCTION

Sample costs to produce small grain 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. “Your Costs” columns in Tables 1 and 2 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 from the Department of Agricultural and Resource Economics’ website <http://coststudies.ucdavis.edu> or by calling, UC Davis, (530) 752-4424. The studies can also be obtained from the local county UC Cooperative Extension offices.

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ASSUMPTIONS

The assumptions refer to Tables 1 through 7 and pertain to sample costs to produce small grain silage in the southern San Joaquin Valley. Practices described represent production practices and materials considered typical of well-managed small grain silage crop. Costs, materials, and practices in this study will not be applicable to all situations. 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 300 non-contiguous acres of which 150 acres are rented and 150 owned by the grower. The 150 acres of rented land is double cropped beginning with small grain silage followed by corn. Some annual costs are allocated to the small grain silage (25%) and the corn (75%). The grower owned 150 acres includes 10 acres occupied by buildings and homestead, and 140 acres planted to other crops.

Production Operating Costs

Land Preparation. In the fall five tons of manure are broadcast on the field. The fields are disked twice to incorporate the manure and to prepare the seedbed. Borders or levees are pulled at planned intervals creating checks for irrigation.

Planting. Wheat seed is drilled (planted) at a rate of 120 pounds per acre on flat ground. Planting normally occurs in the fall and in this study a custom operator drills the seed in November. Wheat is the predominant cultivar planted for small grain silage; other cultivars planted are triticale or oats.

Fertilization. In November prior to land preparation, manure at five tons per acre is hauled and applied by a custom operator. Some dairies sell their manure, but a number of dairies in the region give their manure away if the grower pays to haul it. In this study, we assume the dairy charges a minimum of \$3 per ton for the manure and a custom operator charges \$2.50 per ton for spreading and hauling. Hauling and spreading charges may vary by location, also additional charges may apply for hauling distances over one-mile. In February nitrogen (N) as urea is applied top dress at a rate of 50 pounds per acre. In some areas, phosphorous may be required for cereal forages at planting. Growers should apply fertilizer or soil amendments only after soil tests determine nutrient and pH levels.

Irrigation. The irrigation costs includes the water (\$2.50 per acre-inch) and labor expense (0.15 hours per acre per irrigation). The crop is irrigated in January, March, and April at four acre-inches per irrigation. The water is supplied by an irrigation district, although some growers may use or supplement with well water. Water prices vary among irrigations districts. The authors agreed that \$30 per acre-foot (\$2.50 per acre-inch) is a fair value for this study, based upon information from their respective counties.

Pest Management. The pesticides, rates, and application practices mentioned in this cost study are listed in the *UC IPM Pest Management Guidelines, Small Grains*. **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. Pesticide cost will vary by grower location and the grower's purchasing volume or use. Material costs are shown as full retail from a single chemical dealer.

Pest Control Adviser (PCA). Written recommendations are required for many commercially applied 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. PCA costs are not shown in this study.

Weeds. Shark, Buctril, MCPA, or Clarity are post-emergent herbicides to control broadleaf weeds. They are generally applied in January or when weeds are very small. In this study, Shark is applied at 1.24 ounces per acre to control all weeds listed on the label. The herbicides are applied commercially by ground rig.

Harvest. The small grain crop is harvested for silage in May. The grower incurs no harvest costs. The buyer swaths, chops, hauls, and packs the silage. The grain crop is wilted to about 70% moisture before the harvester chops, and packs the forage into a silage pit. A typical custom harvest rate is \$7 per ton for swathing, chopping, and packing in a silage pile. Delivery up to 15 miles cost \$0.15 per mile per ton or for this study \$2.25 per ton. Silage packed in bags cost an additional \$5.00 per ton.

Yields. The crop is assumed to yield 17 tons per acre at 30% dry matter (DM). Yields are an average high yield based on grower inputs. Grower yields will vary depending on the forage type and/or mixture, and growing conditions.

Returns. A price of a \$22 per ton for silage is used to calculate returns above several cost levels. The returns used in this study are from the March 2004 USDA prices for green chopped wheat forage. Table 4 indicates the effects on grower returns based on varying yields and returns.

Pickup/ATV. The pickup and the all terrain vehicle (ATV) each travel 7.12 miles per acre for small grain silage 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 \$13.05 per hour for machine operators and \$9.79 for general labor includes payroll overhead of 45%. 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, 2004 (California Department of Insurance). 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 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 \$1.45 and \$1.88 per gallon, respectively. The fuel prices are averaged based on four California delivery locations plus \$0.24 per gallon, which is one-half the difference between the high and low price for regular gasoline in 2003 from the California State Automobile

Association Monthly Survey. 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 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 6.89% 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 small grain silage 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. Overhead costs are allocated 25% to the forage crop and 75% to the second 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 \$816 for the entire farm or \$2.81 per producing acre. Twenty-five percent of the cost or \$0.70 per acre is allocated to the small grain silage.

Office. Costs are estimated at \$35 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. Twenty-five percent of the office expenses are allocated to the small grain silage.

Land Rent. Rent for a single crop ranges from \$180 to \$225 per acre. Being the field is being double cropped, \$215 per acre is used in this study with 25% or \$53.75 being charged to the small grain silage crop.

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. Overhead costs where applicable are applied 25% to the forage crop and 75% to the second 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 $((\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor}) + (\text{Salvage Value} \times \text{Interest Rate})$.

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 6.23% 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 permanent irrigation system consists of wells, pumps and motors, and buried mainline with alfalfa valves. The maintenance costs are included in the land rental price.

Land. Cropland with district water suitable for small grain silage production typically ranges in value among counties from \$1,000 to \$5,500 per acre. The land in this study that is owned by the grower cost \$2,500 per acre. Being the small grain silage is on rented land, land ownership costs are not shown.

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 PRODUCE SMALL GRAIN SILAGE
 SAN JOAQUIN VALLEY 2004

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:								
Fertilize: Manure	0.00	0	0	28	0	28		
Land Prep: Disk 2X	0.22	3	7	0	0	10		
Land Prep: Make Borders	0.04	1	1	0	0	1		
Plant	0.00	0	0	26	10	36		
Weed: Post-Emergent (Shark)	0.00	0	0	10	9	19		
Irrigate 3X	0.45	4	0	30	0	34		
Fertilize: N Topdress (Urea)	0.00	0	0	19	7	25		
Pickup Truck Use	0.24	4	2	0	0	5		
TOTAL CULTURAL COSTS	0.95	12	9	113	25	160		
Harvest: (harvested by buyer)								
Harvest: Swath, Chop, Pack, Haul	0.00	0	0	0	0	0		
TOTAL HARVEST COSTS	0.00	0	0	0	0	0		
Interest on operating capital @ 6.89%						5		
TOTAL OPERATING COSTS/ACRE		12	9	113	25	165		
CASH OVERHEAD: *								
Liability Insurance						1		
Office Expense						8		
Land Rent						54		
Property Taxes						1		
Property Insurance						1		
Investment Repairs						2		
TOTAL CASH OVERHEAD COSTS						66		
TOTAL CASH COSTS/ACRE						231		
NON-CASH OVERHEAD: *								
		Per producing acre		-- Annual Cost --				
				Capital Recovery				
Building		87		7		7		
Shop Tools		16		1		1		
Fuel tanks		5		0		0		
Equipment		55		7		7		
TOTAL NON-CASH OVERHEAD COSTS		162		16		16		
TOTAL COSTS/ACRE						247		

*25% of total costs allocated to small grain silage

UC COOPERATIVE EXTENSION
Table 2. COSTS AND RETURNS PER ACRE to PRODUCE SMALL GRAIN SILAGE
 SAN JOAQUIN VALLEY 2004

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Small Grain Silage	17.00	ton	22.00	374	
TOTAL GROSS RETURNS				374	
OPERATING COSTS					
Fertilizer:					
Manure/Spread	5.00	ton	5.50	28	
Urea (46-0-0)	50.00	lb N	0.38	19	
Irrigation:					
Water	12.00	acin	2.50	30	
Seed:					
Small Grain Mix	120.00	lb	0.22	26	
Custom:					
Plant	1.00	acre	10.00	10	
Ground Application: Urea	1.00	acre	6.50	7	
Ground Application: Herbicide	1.00	acre	9.00	9	
Herbicide:					
Shark	1.24	oz	8.43	10	
Labor (machine)	0.60	hrs	13.05	8	
Labor (non-machine)	0.45	hrs	9.79	4	
Fuel - Gas	0.60	gal	1.88	1	
Fuel - Diesel	3.31	gal	1.45	5	
Lube				1	
Machinery repair				2	
Interest on operating capital @ 6.89%				5	
TOTAL OPERATING COSTS/ACRE				165	
NET RETURNS ABOVE OPERATING COSTS				209	
CASH OVERHEAD COSTS: *					
Liability Insurance				1	
Office Expense				8	
Land Rent				54	
Property Taxes				1	
Property Insurance				1	
Investment Repairs				2	
TOTAL CASH OVERHEAD COSTS/ACRE				66	
TOTAL CASH COSTS/ACRE				231	
NON-CASH OVERHEAD COSTS (Capital Recovery)*					
Building				7	
Shop Tools				1	
Fuel Tanks				0	
Equipment				7	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				16	
TOTAL COSTS/ACRE				247	
NET RETURNS ABOVE TOTAL COSTS				127	

*25% of total costs allocated to small grain silage

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Table 3. MONTHLY CASH COSTS PER ACRE to PRODUCE SMALL GRAIN SILAGE
 SAN JOAQUIN VALLEY 2004

Beginning OCT 03	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Ending SEP 04	03	03	04	04	04	04	04	04	04	04	04	04	
Fertilize: Manure		28											28
Land Prep: Disk 2X		10											10
Land Prep: Make Borders		1											1
Plant		36											36
Weed: Post-Emergent (Shark)				19									19
Irrigate 3X				11		11	11						34
Fertilize: N Topdress (Urea)					25								25
Pickup Truck Use (<\$1/month)	0	0	0	0	0	0	0	0	0	0	0	0	5
TOTAL CULTURAL COSTS	0	76	0	31	26	12	12	0	0	0	0	0	160
Harvest: (harvested by buyer)													
Harvest: Swath, Chop, Pack, Haul								0					0
TOTAL HARVEST COSTS to grower								0					0
Interest on operating capital	0	0	0	1	1	1	1	1	0	0	0	0	5
TOTAL OPERATING COSTS/ACRE	0	76	1	32	27	13	13	1	0	0	0	0	165
OVERHEAD:*													
Liability Insurance							1						1
Office Expense		1	1	1	1	1	1	1					8
Land Rent								54					54
Property Taxes						0				0			1
Property Insurance						1							1
Investment Repairs	0	0	0	0	0	0	0	0	0	0	0	0	2
TOTAL CASH OVERHEAD COSTS	0	1	1	1	2	1	2	55	0	1	0	0	66
TOTAL CASH COSTS/ACRE	0	78	2	33	29	14	15	56	1	1	1	1	231

*25% of cost allocated to small grain silage

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Table 4. RANGING ANALYSIS

SAN JOAQUIN VALLEY 2004

COSTS PER ACRE TO PRODUCE SMALL GRAIN SILAGE AT VARYING YIELDS

Total Yield:	YIELD (ton/acre)						
	13	14	15	16	17	18	19
OPERATING COSTS:							
Cultural Cost	160	160	160	160	160	160	160
Harvest Cost (harvested by buyer)	0	0	0	0	0	0	0
Interest on operating capital	5	5	5	5	5	5	5
TOTAL OPERATING COSTS/acre	165	165	165	165	165	165	165
Operating Cost/ton	12.68	11.78	10.99	10.31	9.70	9.16	8.68
CASH OVERHEAD COSTS							
TOTAL CASH COSTS/acre	231	231	231	231	231	231	231
Cash Costs/ton	17.75	16.48	15.38	14.42	13.57	12.82	12.15
NON-CASH OVERHEAD COSTS							
TOTAL COSTS/acre	247	247	247	247	247	247	281
Total Costs/ton	18.98	17.62	16.45	15.42	14.51	13.71	12.98

NET RETURNS PER ACRE ABOVE OPERATING COSTS

\$/ton	YIELD (ton/acre)						
	13	14	15	16	17	18	19
14.00	17	31	45	59	73	87	101
16.00	43	59	75	91	107	123	139
18.00	69	87	105	123	141	159	177
20.00	95	115	135	155	175	195	215
22.00	121	143	165	187	209	231	253
24.00	147	171	195	219	243	267	291
26.00	173	199	225	251	277	303	329

NET RETURN PER ACRE ABOVE CASH COST

\$/ton	YIELD (ton/acre)						
	13	14	15	16	17	18	19
14.00	-49	-35	-21	-7	7	21	35
16.00	-23	-7	9	25	41	57	73
18.00	3	21	39	57	75	93	111
20.00	29	49	69	89	109	129	149
22.00	55	77	99	121	143	165	187
24.00	81	105	129	153	177	201	225
26.00	107	133	159	185	211	237	263

NET RETURNS PER ACRE ABOVE TOTAL COST

\$/ton	YIELD (ton/acre)						
	13	14	15	16	17	18	19
14.00	-65	-51	-37	-23	-9	5	19
16.00	-39	-23	-7	9	25	41	57
18.00	-13	5	23	41	59	77	95
20.00	13	33	53	73	93	113	133
22.00	39	61	83	105	127	149	171
24.00	65	89	113	137	161	185	209
26.00	91	117	143	169	195	221	247

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**Table 5. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT,
and BUSINESS OVERHEAD COSTS**
SAN JOAQUIN VALLEY 2004

ANNUAL EQUIPMENT COSTS

Yr Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes		
04 125 HP MFWD Tractor	82,819	10	24,463	9,539	363	536	10,438	
04 215 HP Trac Tractor	156,780	10	46,310	18,058	686	1,015	19,760	
04 Disk – Border	1,500	12	208	169	6	9	183	
04 Disk – Finish 21’	22,900	12	3,172	2,580	88	130	2,799	
04 Pickup 1/2 Ton	28,000	5	12,549	4,473	137	203	4,813	
TOTAL	291,999		82,702	34,820	1,280	1,874	37,997	
60% of New Cost*	175,199		52,021	20,892	768	1,136	22,796	

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insur- ance	Taxes	Repairs	
Building 2,400 sqft	65,000	25		5,196	220	325	1,200	6,941
Fuel Tanks 2-300 gal	3,500	20		311	12	18	70	411
Shop Tools	12,000	20	1,200	1,034	45	66	240	1,385
TOTAL INVESTMENT	80,500		1,200	6,541	276	408	1,510	8,736

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Price/ Unit	Total Cost
Liability Insurance	290.00	acre 2.81	815
Office Expense	290.00	acre 35.00	10,150
Rent @ 25% of \$215	150.00	acre 53.75	8,063

UC COOPERATIVE EXTENSION
Table 6. HOURLY EQUIPMENT COSTS
SAN JOAQUIN VALLEY 2004

Yr Description	COSTS PER HOUR							
	Actual Hours Used	Cash Overhead			Operating			Total Costs/Hr.
		Capital Recovery	Insur- ance	Taxes	Repairs	Fuel & Lube	Total Oper.	
04 125 HP MFWD Tractor	1199.6	4.77	0.18	0.27	3.76	12.10	15.86	21.08
04 215 HP Trac Tractor	1599.0	6.78	0.26	0.38	4.07	20.81	24.88	32.29
04 Disk – Border	166.0	0.61	0.02	0.03	0.24	0.00	0.24	0.90
04 Disk – Finish 21’	165.7	9.34	0.32	0.47	3.63	0.00	3.63	13.77
04 Pickup 1/2 Ton	184.9	14.52	0.44	0.66	1.81	5.40	7.21	22.83

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Table 7. OPERATIONS WITH EQUIPMENT
 SAN JOAQUIN VALLEY 2004

Operation	Operation Month	Equipment		Material	Rate/acre	Unit
		Tractor	Implement			
Apply Manure	November	Custom		Manure	5.00	ton
Disc 2X	November	215 HP Trac	Finish Disc			
Make Borders	November	215 HP Trac	Border Disc			
Plant	November	Custom		Small Grains	120.00	lb
Fertilize: Topdress N	February	Custom		46-0-0	50.00	lb N
Weed: Post Emergent	January	Custom		Shark	1.24	oz
Irrigate	January			Water	4.00	acin
Irrigate	March			Water	4.00	acin
Irrigate	April			Water	4.00	acin
Harvest: Swath, Haul, Pack	May	Buyer				