



Enterprise Budgets

Guayule, Flood Irrigated, Southern Arizona

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This series of enterprise budgets estimate the typical economic costs and returns to establish, grow, and harvest guayule over a six-year period, using flood irrigation in southern Arizona. It should be used as a guide to estimate actual costs and returns and is not representative of any farm. The assumptions used in constructing these budgets are discussed below. Assistance provided by area producers and agribusinesses is much appreciated.

The results of this study are based on our current understanding of guayule production, market, and yields. As research advances, we expect these assumptions to change.

Cropping Pattern

This budget is based on a 1,500-tillable acre farm. As Arizona is experiencing irrigation water shortages, approximately 40 percent (597 acres) of the total farm tillable acres are fallowed. This fallowed land will allow adequate water to irrigate the following crops: 271 acres in cotton, 45 acres in silage corn, 90 acres in guayule, 181 acres in durum wheat, and 316 acres of alfalfa hay. The costs to fallow land are allocated to each crop based on its water use. All crops are grown using flood irrigation.

The six-year sequence for guayule production is to establish the crop in year 1, harvest in years 2, 4, and 6, and grow the crop between harvests in years 3 and 5. Crop removal occurs in year 6 after harvest.

Labor

Tractor driver labor cost is \$17.89 per hour and general labor \$14.55 per hour; both rates include social security, workers' compensation, unemployment insurance, and other labor overhead expenses. For this study, owner labor is valued at the same rate as tractor driver rates, and all labor is assumed to be a cash cost. Tractor labor

hours are calculated based on machinery hours, plus ten percent.

Capital

Interest on operating capital for harvest and production inputs (6 percent) is treated as a cash expense, borrowed for 6-months. An interest rate of six percent is charged as an opportunity to the owner for machinery ownership.

Operations

The cultural operations are listed approximately in the order in which they are performed. A 175-hp tractor is used to pull the v-ripper, heavy offset disk, moldboard plow, landplane, lister, and planter. A 125-hp tractor is used to pull the shredder/root puller, drill, cultivator, fertilizer spreader, and boom sprayer. A charge for miscellaneous and other expenses is five percent of production costs, including additional labor, machinery repairs and maintenance, supplies and materials, tax preparation, memberships in professional organizations, and educational workshops not included in field operations.

A detailed breakdown of machinery values is shown in Table 7. Estimated labor, variable, and fixed costs for machinery are shown in Table 8, based on an hour and per acre basis. The machinery costs are calculated based on the total farm use of the machinery. Off-road diesel is \$4.00 per gallon. Table 8 shows the machine operations by year during guayule production.

Six-Year Sensitivity Analysis of Net Returns

Adding together the six years of costs and three years of guayule production results in a break-even price of \$0.0347 per pound to cover all variable costs and \$0.0624 per pound

to cover total variable and fixed costs. Table 1 shows the total net returns over six-years of guayule production at various yields, prices, and a 20 percent increase and decrease in total costs. The \$0.08 cents per pound or mid-point on the sensitivity analysis (Table1) was derived from the breakeven cost of production. This was used as there is no established market for guayule.

Annual Budgets

Table 2 represents the net cost and returns per year for the six-year production cycle of guayule. More detailed cost of establishing guayule is \$1,189 per acre (Table 3) and \$619 per acre in the growing years between harvests (Table 5). The gross income in the harvest years is \$1,760 per acre;

guayule price at \$0.08 per pound, with an average yield of 22,000 pounds at 15 percent moisture content (Table 4). Variable costs are \$282 per acre, giving a net return above variable cash costs of \$1,478 per acre. Total fixed costs are \$1,373 per acre, which includes an amortization charge of \$809 is included as an opportunity cost to establish and grow guayule in years 1, 3, and 5 during the six-year rotation. The gross income minus total costs results in a \$387 per acre return.

NOTE: Not included in these budgets are family living withdrawals for unpaid labor, returns to management, depreciation and opportunity costs for vehicles, buildings and improvements, inflation, property and crop insurance, and local, state, and federal income and property taxes.

Table 1. Estimated Total Net Returns from Six Years of Guayule Production at Varying Price, Yields, and Percentage of Production Costs, \$/acre.

% Change in Total Costs	Yield, Lbs/Acre	Guayule Price per Pound of Biomass				
		\$0.06	\$0.07	\$0.08	\$0.09	\$0.10
0%	19,000	(\$698)	(\$128)	\$442	\$1,012	\$1,582
	20,000	(\$518)	\$82	\$682	\$1,282	\$1,882
	21,000	(\$338)	\$292	\$922	\$1,552	\$2,182
	22,000	(\$158)	\$502	\$1,162	\$1,822	\$2,482
	23,000	\$22	\$712	\$1,402	\$2,092	\$2,782
	24,000	\$202	\$922	\$1,642	\$2,362	\$3,082
	25,000	\$382	\$1,132	\$1,882	\$2,632	\$3,382
-20%	19,000	\$126	\$696	\$1,266	\$1,836	\$2,406
	20,000	\$306	\$906	\$1,506	\$2,106	\$2,706
	21,000	\$486	\$1,116	\$1,746	\$2,376	\$3,006
	22,000	\$666	\$1,326	\$1,986	\$2,646	\$3,306
	23,000	\$846	\$1,536	\$2,226	\$2,916	\$3,606
	24,000	\$1,026	\$1,746	\$2,466	\$3,186	\$3,906
	25,000	\$1,206	\$1,956	\$2,706	\$3,456	\$4,206
20%	19,000	(\$1,522)	(\$952)	(\$382)	\$188	\$758
	20,000	(\$1,342)	(\$742)	(\$142)	\$458	\$1,058
	21,000	(\$1,162)	(\$532)	\$98	\$728	\$1,358
	22,000	(\$982)	(\$322)	\$338	\$998	\$1,658
	23,000	(\$802)	(\$112)	\$578	\$1,268	\$1,958
	24,000	(\$622)	\$98	\$818	\$1,538	\$2,258
	25,000	(\$442)	\$308	\$1,058	\$1,808	\$2,558

Table 2. Annual Net Returns of Income and Expenses to Establish and Produce Guayule, \$/acre.¹

	Income	Income		Annual Net Returns
		Cash Costs	Fixed Costs	
Year 1: Establishment	\$0	\$770	\$419	-\$1,189
Year 2: Harvest ²	1,760	282	282	1,196
Year 3: Growing	0	336	283	-619
Year 4: Harvest ²	1,760	282	282	1,196
Year 5: Growing	0	336	283	-619
Year 6: Harvest ²	1,760	282	282	1,196

¹ Guayule yield is estimated to be 22,000 pounds per acre, with 15% moisture content, at a price of \$0.08 per pound.

² Harvest costs are paid by the processor

Table 3. Year 1: Guayule Establishment Year, Economic and Cash Costs, \$/acre.

Variable Cash Costs	Price	Quantity	Unit	Labor	Machinery	Materials	Total
Land Preparation and Maintenance							
V-Ripper		1.00	acre	\$13.53	\$34.33	\$0.00	\$47.86
Offset Disk		2.15	acre	10.14	25.34	0.00	35.48
Landplane		1.00	acre	3.87	9.24	0.00	13.10
Lister		1.00	acre	6.18	14.35	0.00	20.54
Bed Shaper		1.00	acre	3.09	6.90	0.00	9.99
Crop Production							
Row Planter		1.00	acre	4.51	13.42	75.20	93.10
- Seed	\$75.20	1.00	acre				
Fertilizer Spreader		1.00	acre	1.88	3.70	99.60	105.17
- Nitrogen	\$0.46	60.00	pounds				
- Phosphorus	\$0.36	200.00	pounds				
Boom Sprayer		3.00	acre	3.57	5.45	90.25	99.26
- Prowl	\$6.06	9.00	pints				
- Aim	\$5.94	1.80	ounces				
- Fusile	\$1.25	20.00	ounces				
Row Cultivator		2.00	acre	6.01	8.80	0.00	14.81
Irrigation				56.99	0.00	215.42	272.40
- Irrigation Water, Flood	\$55.00	3.92	ac ft				
- Irrigation Labor, Flood	\$14.55	3.92	hour				
Other Charges							
Other Expenses		0.05		0.00	0.00	35.59	35.59
Interest on Operating Capital		0.06		<u>0.00</u>	<u>0.00</u>	<u>22.42</u>	<u>22.42</u>
Total Variable Cash Costs				\$109.77	\$121.52	\$538.47	\$769.76
Total Returns minus Total Variable Cash Costs							-\$769.76
Fixed Cash Costs					Unit	\$/Unit	Value
Fallow Costs				acre	\$110.99	\$110.99	
Annual Cash Rent Payment				acre	170.00	<u>170.00</u>	
Total Fixed Cash Costs						\$280.99	
Fixed Non-Cash Costs					Unit	\$/Unit	Value
Power Units, Machinery & Equipment, depreciation & interest				acre	\$137.79	<u>\$137.79</u>	
Total Fixed Non-Cash Costs						\$137.79	
Total Annual Costs							\$1,188.54
Returns minus Total Annual Costs							-\$1,188.54

Table 4. Year 2, 4 and 6: Guayule Harvest Years, Economic and Cash Costs and Returns, \$/acre.

Returns			Unit	\$/Unit		Quantity	Value
Guayule Biomass			pound	\$0.08		22,000.00	<u>\$1,760.00</u>
Total Returns							\$1,760.00
Variable Cash Costs	Price	Quantity	Unit	Labor	Machinery	Materials	Total
Land Preparation and Maintenance							
Offset Disk		0.10	acre	\$0.47	\$1.180	\$0.00	\$1.65
Crop Production							
Fertilizer Program				0.00	0.00	27.60	27.60
- Nitrogen	\$0.46	60.00	pounds				
Irrigation				48.50	0.00	183.33	231.83
- Irrigation Water, Flood	\$55.00	3.33	ac ft				
- Irrigation Labor, Flood	\$14.55	3.33	hour				
Harvest							
Harvest expenses paid by the processor ¹		1.00	acre	0.00	0.00	0.00	0.00
Other Charges							
Other Expenses		0.05		0.00	0.00	13.05	13.05
Interest on Operating Capital		0.06		<u>0.00</u>	<u>0.00</u>	<u>8.22</u>	<u>8.22</u>
Total Variable Cash Costs				\$48.57	\$1.18	\$232.21	\$282.36
Total Returns minus Total Variable Cash Costs							\$1,477.64
Fixed Cash Costs					Unit	\$/Unit	Value
Fallow Costs					acre	\$110.99	\$110.99
Annual Cash Rent Payment					acre	170.00	<u>170.00</u>
Total Fixed Cash Costs							\$280.99
Fixed Non-Cash Costs					Unit	\$/Unit	Value
Amortized Establishment and Maintenance Costs					acre	\$808.69	\$808.99
Power Units, Machinery & Equipment, depreciation & interest					acre	0.60	<u>0.60</u>
Total Fixed Non-Cash Costs							
Total Annual Costs							\$1,372.64
Returns minus Total Annual Costs							\$387.36

Table 5. Year 3 and 5: Guayule Growing Years, Economic and Cash Costs and Returns, \$/acre.

Returns			Unit	\$/Unit		Quantity	Value
Guayule Biomass			pound	\$0.08		22,000.00	<u>\$1,760.00</u>
Total Returns							\$1,760.00
Variable Cash Costs	Price	Quantity	Unit	Labor	Machinery	Materials	Total
Land Preparation and Maintenance							
Offset Disk		0.05	acre	\$0.24	\$0.59	\$0.00	\$0.83
Crop Production							
Fertilizer Program				0.00	0.00	27.60	27.60
- Nitrogen	\$0.46	60.00	pounds				
Boom Sprayer		1.00	acre	1.19	1.82	47.28	50.29
- Prowl	\$6.06	2.50	pints				
- Aim	\$5.94	1.20	ounces				
- Fusilade	\$1.25	20.00	ounces				
Irrigation				48.50	0.00	183.33	231.83
- Irrigation Water, Flood	\$55.00	3.33	ac ft				
- Irrigation Labor, Flood	\$14.55	3.33	hour				
Harvest							
Harvest expenses paid by the processor ¹							
Other Charges							
Other Expenses		0.05		0.00	0.00	15.535	15.53
Interest on Operating Capital		0.06		<u>0.00</u>	<u>0.00</u>	<u>9.78</u>	<u>9.782</u>
Total Variable Cash Costs				\$49.93	\$2.40	\$283.52	\$335.85
Total Returns minus Total Variable Cash Costs							-\$335.85
Fixed Cash Costs					Unit	\$/Unit	Value
Fallow Costs					acre	\$110.99	\$110.99
Annual Cash Rent Payment					acre	170.00	170.00
Total Fixed Cash Costs							\$280.99
Fixed Non-Cash Costs					Unit	\$/Unit	Value
Amortized Establishment and Maintenance Costs					acre	\$1.93	<u>\$1.93</u>
Power Units, Machinery & Equipment, depreciation & interest							1.93
Total Fixed Non-Cash Costs							
Total Annual Costs							\$618.77
Returns minus Total Annual Costs							-\$618.77

Table 6. Whole Farm Machinery Cost Assumptions.

Machine	Width (feet)	Market Value	Annual Use	Hours of Expected Life (Years)
175 HP Tractor	N/A	\$180,000	1,293	10
125 HP Tractor	N/A	80,000	467	15
V-Ripper	8.0	22,000	408	10
Offset Disk	18.0	30,000	483	15
Moldboard Plow	9.3	35,000	138	15
Landplane	16.0	18,000	81	15
Lister	10.0	6,500	104	15
Cotton Shredder/Root Puller	20.0	12,000	41	15
Row Planter	24.0	40,000	76	15
Row Cultivator	24.0	22,000	108	10
Drill	20.0	25,000	72	15
Fertilizer Spreader	40.0	18,000	101	20
Boom Sprayer	60.0	9,500	144	20

Table 7. Machinery Cost Calculations, on a per hour and per acre basis..

Machine	-Variable Costs-		Fixed Cost		Total Cost
	Fuel & Lube	Repairs & Maint.	Deprec. & Interest		
----- Costs Per Hour -----					
175 HP Tractor	\$36.80	\$6.98	\$18.16		\$61.37
125 HP Tractor	23.00	1.68	19.42		44.10
V-Ripper	0.00	6.16	6.98		13.14
Offset Disk	0.00	5.40	6.94		12.34
Moldboard Plow	0.00	18.20	28.29		46.50
Landplane	0.00	3.24	24.85		28.09
Lister	0.00	1.89	6.99		8.87
Cotton Shredder/Root Puller	0.00	2.76	32.57		35.33
Row Planter	0.00	14.76	61.55		76.31
Row Cultivator	0.00	4.10	25.95		30.05
Drill	0.00	8.71	40.53		49.24
Fertilizer Spreader	0.00	14.02	20.37		34.39
Boom Sprayer	0.00	5.35	7.56		12.91
----- Costs Per Acre -----					
Field Operation	Acre/ Hour	Operator Labor	Variable Costs	Fixed Costs	Total Costs
175 HP Tractor & V-Ripper	1.45	\$13.53	\$34.33	\$17.28	\$65.15
175 HP Tractor & Offset Disk	4.17	4.72	11.79	6.02	22.52
175 HP Tractor & Moldboard Plow	2.55	7.73	24.35	18.25	50.33
175 HP Tractor & Landplane	5.09	3.87	9.24	8.45	21.55
175 HP Tractor & Lister	3.18	6.18	14.35	7.90	28.44
175 HP Tractor & Shredder	6.64	2.97	4.14	7.83	14.93
175 HP Tractor & Planter	4.36	4.51	13.42	18.27	36.19
175 HP Tractor & Cultivator	6.55	3.01	4.40	6.93	14.33
175 HP Tractor & Drill	3.64	5.41	9.18	16.49	31.08
175 HP Tractor & Fertilizer Spreader	10.47	1.88	3.70	3.80	9.37
175 HP Tractor & Boom Sprayer	16.55	1.19	1.82	1.63	4.63

Table 8. Machine Operations by Year in Guayule Production

Machine Operation	Establishment Year	Harvest Years	Growing Years
	X/Acre	X/Acre	X/Acre
175 HP Tractor & V-Ripper	1.00		
175 HP Tractor & Offset Disk	2.15	0.10	0.05
175 HP Tractor & Landplane	1.00		
175 HP Tractor & Lister	1.00		
175 HP Tractor & Bed Shaper	1.00		
175 HP Tractor & Planter	1.00		
125 HP Tractor & Cultivator	2.00		
125 HP Tractor & Fertilizer Spreader	1.00		
125 HP Tractor & Boom Sprayer	3.00		1.00



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