

SUSTAINABLE BIOECONOMY

FOR ARID REGIONS



BENCO OVERVIEW

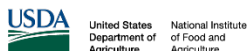
BREAKEVEN FOR NEW CROP OPTIONS

OVERVIEW

BENCO is an interactive tool that allows growers to compare the profitability of adopting alternative crops into an existing cropping system.

Results show per-acre net returns for one or two new crops and as whole-farm analysis. It also provides breakeven price and yields for new and existing crops. This handout provides an overview of the model.

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Breakeven for New Crop Options (BENCO) Model The goal of creating the BENCO model was to allow farmers to evaluate, on paper, the adoption of new crops. Particular attention is paid to helping farmers adjust to emerging water constraints.

One of the main benefits of BENCO is the ability to customize it to an individual farm. All values listed in **Bold Red** can be modified.

Farm inputs can be customized to your farm

Modifications can be made to:

- Acres on the farm available for production.
- Crops grown as a percentage of total acres.
- Prices and crop yields to expectations on your farm. *Unit* can be adjusted based on your preference.

TOTAL ACRES IN FARM		200	% Irrigation Type		
CROP	% of farm	Acres	Flood	Drip-tape	Sprinkler
Guayule	50.0%	100	100%	0%	0%
Guar	0.0%	-	100%	0%	0%
Hemp for CBD Oil	0.0%	-	100%	0%	0%
Hemp for Grain	0.0%	-	100%	0%	0%
Hemp for Fiber	0.0%	-	100%	0%	0%

Price and Crops Yields			
CROP	Unit	Price	Quantity
Guayule Biomass	pound	\$0.08	22,000.0
Guayule Rubber Content	kilogram	\$0.00	0.0
Guar	pound	\$0.25	1,400.0
Hemp for CBD Oil	pound	\$1.00	4,000.0

Irrigation Water Options: The amount of water available and applied can be calculated. Adjustments to irrigation type, including startup costs for systems under consideration. Since this model is developed for arid lands, all croplands are assumed to be irrigated.

Irrigation Water Available, Used, and Saved/Deficit					
	Unit	Total Farm	Quantity Flood	Quantity Drip-tape	Quantity Sprinkler
Total Available Water	ac ft	550			
Total Water Used			843	0	0
Total Water Saved or Deficit	ac ft	(293)			

13	Price of Irrigation Water Applied w/ Pumping Costs	\$/ac ft	\$55.00
14	Irrigation Systems:		
15	Flood	Efficiency	80.0%
16	- Upfront Costs of New System	acre	\$0.00
17	- Years of Use Life	year(s)	0.0
18	- Annual Repairs & Maintenance	acre	\$3.00

Farm Practices can be customized to your farm

Machinery. Machinery size and values can be adjusted. Alternatively, custom harvest and farming operation prices can be used. Land preparation, production, and harvest operations can be customized for each crop.

Machinery	Purchase Price	Budget Life	Fuel Use per	Width	Speed	Efficiency
175 HP Tractor	\$180,000	10	8	N/A		
125 HP Tractor	\$80,000	15	5	N/A		

Field Operations	X/Acre	X/Acre	X/Acre
7 V-Ripper	1.00	-	-
8 Offset Disk	2.15	0.05	0.10
9 Drag	-	-	-



The following case study illustrates how the BENCO could be used in Southern Arizona.

The example below compares the hypothetical results of a 200-acre farm growing 100% cotton and evaluating the adoption of 50% guayule.

Complete Costs of Production Estimated for Each Crop: The BENCO model provides detailed estimates for the cost of production, based on the customized input prices, farm equipment, and farm practices. In addition to the Total Returns for each crop in production (shown below), detailed Variable Costs, Fixed Cash Costs, and Fixed Non-Cash Costs are all provided. Total Annual Costs and the Returns Minus Total Annual Costs are provided. These sheets are formatted to print easily for sharing with all farm managers.

Table 1. Economic and Cash Costs and Returns of Producing				Cotton , \$/acre.			
<i>Returns</i>	Unit	\$/Unit	Quantity	Value			
Cotton Lint	pound	\$1.00	1,500	\$1,500.00			
Cotton Seed	pound	\$0.15	2,250	337.50			
Total Returns				\$1,837.50			
<i>Variable Cash Costs</i>	Price	Quantity	Unit	Labor	Machinery	Materials	Total
Land Preparation and Maintenance							
V Ripper, Custom	\$44.25	0.00	acre	\$0.00	\$0.00	\$0.00	\$0.00

BENCO allows easy side-by-side viewing of results from evaluating different crop scenarios. This includes:

- Changes in Total Farm Net Returns.
- Changes in Irrigation Water Applied.
- Changes in major categories of farm inputs
- (not shown) Changes in the Break Even price needed for each crop grown.

Total Net Returns and Inputs, Before and After Adoption			
Resources and Inputs	Before	After	Change
Total Farm Net Returns (\$)	\$199	\$26,356	\$26,157
Irrigation Water Applied, AF	1,000	843	(157)
Crop Seeds (\$)	\$22,000	\$11,600	(\$10,400)
Fertilizers (\$)	\$35,100	\$33,030	(\$2,070)
Pesticides (\$)	\$14,800	\$21,153	\$6,353
Power Units: Labor (hours)	720	360	(360)
All Other Labor (hours)	1,000	1,559	559
Custom Hire Operations (\$)	\$32,000	\$16,000	(\$16,000)
Machinery Fuel, Maint. & Repairs (\$)	\$27,135	\$23,679	(\$3,456)
Machinery Fixed Costs (\$)	\$57,356	\$95,096	\$37,740

Changes can be evaluated for any change the user is considering.

This could include changes in irrigation technology, crop mixes, input prices, it's almost limitless.

In the change shown above, with 50% of the farm changed to Guayule and under the prices and yields

specified, the farm has increased Net Returns by \$26,157 using 157-acre-feet less water. The BENCO model also reports the change in Whole-Farm Net Returns on a per-acre basis.



Special focus on Guayule

Sensitivity Analysis. With the uncertainty involved in growing a new crop, the BENCO model includes a sensitivity analysis to show Net Returns/Acre for varying prices (ranging from \$0.04/lb - \$0.12/lb in

example below), yields (see second column of table to left) and cash costs (the second part of table image shows estimates for Net Returns/Acre if all cash costs increase by 10%). The adjustments to cash costs can be determined by user.

Sensitivity Analysis: Net Returns, \$/Acre Per Year Average **50%** of the Farm Planted to Guayule, at Varying Prices, Yields, and Cash Costs

% Change in Total Costs	Yield, Per Acre	Guayule Price per Pound of Biomass				
		\$0.04	\$0.06	\$0.08	\$0.10	\$0.12
0%	19,000	(\$259)	(\$69)	\$121	\$311	\$501
	20,000	(239)	(39)	161	361	561
	21,000	(219)	(9)	201	411	621
	22,000	(199)	21	241	461	681
	23,000	(179)	51	281	511	741
	24,000	(159)	81	321	561	801
10%	20,000	(303)	(103)	97	297	497
	21,000	(283)	(73)	137	347	557
	22,000	(263)	(43)	177	397	617



Equitable Lease Analysis. The BENCO model also allows the user to evaluate adjustments to land lease arrangements for farming guayule. Both tenant and landowner returns for a 6-year lease are estimated based on customizable contributions to land and farming expenses. Annual costs and discounted present values for both parties are estimated based on crop returns.

Annual Returns, Costs, Net Returns, and Accumulated Net Returns are calculated for the tenant and landowner based on crop returns and specified contributions.

A	B	C
1		
2	Tenant and Landowner's Contributions to a Lease	
3	Agricultural Value of Land (per acre)	\$5,000
4	Annual Appreciation of Land Values	0.50%
5	Desired Return on Investment (%)	3.00%
6	Landowner's Share: Property Insurance	100.00%
7	Landowner's Share: Property Taxes	
8	Tenant's Share: Seed	
9	Tenant's Share: Fertilizer	

Cash Rent Calculations

Year	Tenant Returns and Costs		Annual Net Returns
	Annual Returns	Annual Costs	
1	\$0	\$1,111	(\$1,111)
2	\$1,760	\$285	\$1,475
3	\$0	\$350	(\$350)

BENCO includes instruction manual and video instructions.