CHAPTER 4

Economics of Cotton Production

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Management is a highly important factor in the success of any farm operation. Profit maximization is traditionally assumed to be the overriding goal in most management decisions. To achieve that goal, producers should understand the probable costs and returns of their farm operations, the profit equation, financial and production risks, as well as potential alternatives. To assist farm managers in this effort, enterprise budgets can be employed for both short- and long-range planning.

An enterprise budget illustrates typical costs and returns, inputs and production, and timing or resource use for a particular farm activity. Among the various uses for budgets are to provide data for whole-farm planning, to estimate potential income for particular farm situations, to estimate the farm size required to earn a specific income objective, to estimate cash flow during the year, and to compare expected returns among alternative agricultural enterprises.

The following enterprise budgets for irrigated (Table 4-1) and dryland (Table 4-2) cotton are provided to assist cotton producers in estimating their costs of production. These budgets are intended to serve as guidelines. The cultural practices and prices used in developing these two situations should be examined in detail to determine if they are representative of the individual's cotton farming operation. The "Your Value" column of the budgets should be used to adjust the costs and returns to a particular operation. Compilations of notes are shown in the corresponding Appendix Sections A4-1 and A4-2 to assist users with the interpretation of this information. If individuals do make modifications, the budgets become more beneficial as planning tools. The budgets were constructed for average soil productivity. Soil characteristics may affect the type and level of inputs such as seeding rates, fertilizer, irrigation, herbicides, and the types of machinery operated. Furrow irrigation was used in these budgets because it is the most common method employed in Oklahoma.

Three general varieties of costs comprise the total cost of producing any farm commodity. These are variable (operating), fixed, and overhead costs. Variable costs are those operating inputs which change with the level of production. Examples include herbicide, fertilizer, insecticide, irrigation, custom harvest, and ginning costs. Fixed costs are independent of production. Examples include real estate and personal property taxes, insurance on buildings and equipment, interest payments on intermediate and long-term debt, maintenance of the farmstead, as well as depreciation on equipment. Overhead costs are those which are difficult to allocate to a given enterprise. Examples include telephone, utilities, and accounting services. Overhead costs are included in whole-farm budgets, but are usually excluded from enterprise budgets.

The distinction between fixed and variable costs is important in decision-making. In deciding which crop to produce, how to produce it, and how much to produce, in the short run, only variable costs should be considered if the enterprise is part of the current operation and if additional machinery is not necessary. In the determination of overall enterprise profitability, however, fixed costs must also be considered.

Production costs associated with machinery operations depend on several factors including farm size, machinery and equipment size, and the tillage operations performed. The budgets illustrated represent a benchmark farm machinery inventory of 100- to 150-horsepower technology. Machinery labor is priced at $6.00/hour. The hours of labor required to operate a machine are assumed to be 120 percent of actual operation time because of machinery adjustments, lubrication, and maintenance.

The money to cover monthly cash shortfalls may be borrowed from an agricultural lender where interest is based on the length of time the money is required and the interest rate. Interest obligations only occur for the time during which funds are borrowed.

The interest rate on operating capital is represented in the budgets at 11 percent. Money may also be supplied through internal financing. In other words, money may be "borrowed" from savings to cover shortfalls, resulting in lost interest income. The farm manager's problem is determining how much borrowed capital should be employed in the business. Increased leverage results in greater financial risk because of larger fixed commitments to creditors. Enterprise budgets, in conjunction with other records and financial statements, can assist both farmer and lender with questions related to the most profitable use of credit.

The level of fertilizer applied is based on average soil productivity. Nitrogen and phosphorus are the elements most likely to be deficient in Oklahoma cotton production. In irrigated areas, recommended rates average from 50 to 70 lbs. of nitrogen/acre. This generally assumes some residual nitrogen in the soil (the irrigated budget shows 81 lbs. of nitrogen/acre without residual nitrogen). Lower rates are usually applied under dryland conditions due to lower yield potential. In Oklahoma, yields under irrigation average more than twice those on dryland. Pesticides, including fungicides, herbicides, and insecticides, may be required to ensure high levels of lint quality and quantity. The requirements may vary from year to year due to differing pest populations or climatic conditions. Insecticides, growth regulators, and harvest aids are generally not applied on dryland cotton due to limited cost effectiveness. Those particular expenses were excluded in the dryland budget.

Ginning involves the separation of cottonseed and trash from cotton lint while maintaining the fiber quality demanded by the manufacturer and ultimate consumer. Ginning costs are the largest single item in the cotton production budget averaging approximately 25 percent for the U.S. as a whole. Following ginning, additional expenses are incurred with the cost of bags, ties, and a per-bale checkoff assessment designed to stimulate demand for cotton merchandise. The lint is then transported to a compress and warehouse to be stored until sold.

For each cotton production system, a budget lists the quantity of operating inputs, unit price, and total costs. An estimate of total variable and fixed costs is supplied as well as of gross returns. Government cotton deficiency payments are not included in either budget. Returns above total operating costs show a return to the producer's overhead, risk, land, labor, management, and investment capital. As long as returns above total operating costs are positive, production is economically rational for an already ongoing enterprise. Also shown are the returns above all costs except overhead, risk, and management. When these returns are positive, the enterprise is self-supporting, contributes funds to general farm maintenance, and rewards the producer for his management efforts. Thus, the farmer is paid for his resources. The budgets do not include a land charge, i.e., it is assumed the producer owns the land.

A second pair of tables (Tables 4-3 and 4-4) provides an estimate of expected returns above operating costs for various price and yield combinations at 5 percent increments for price and 10 percent increments for yield. These tables illustrate the importance that lint quality and quantity have on returns.

Numerous production risks are associated with growing cotton. Lint quality (grade, fiber length, micronaire, and fiber strength) is influenced by variety, cool summer temperatures, hail, early fall freezes, drouth, heat, excess moisture, harvesting methods, plant diseases, insects, weeds, and irrigation practices. The above factors affect cotton yield as well. Harvest-aid chemicals were included in the irrigated cotton budget. Properly used, they may make possible an earlier harvest, preserve quality, and maximize yield potential. More information on this cultural practice may be found in Chapter 13 entitled "Growth

Regulators and Harvest Aids in Cotton."

Table 4-1. Enterprise budget for furrow-irrigated cotton production in southwestern Oklahoma.

Cotton, Altus-Lugert Irrigation District
Clay Loam Soil, Furrow Irrigation — 08/30/95
Custom Harvest (Picked) — Southwest

Operating Costs:	Units	Price	Quantity	Value	Your Value
Cottonseed	LBS.	0.70	24.00	16.80	
Preplant Herbicide	ACRE	5.63	1.00	5.63	
Nitrogen (N)	LBS.	0.22	81.00	17.82	
Phosphorus (P_2O_5)	LBS.	0.18	46.00	8.28	
Systemic Pesticide	ACRE	11.50	1.00	11.50	
Ginning	CWT.	2.00	22.00	44.00	
Bagging, Ties, Etc.	BALE	21.64	1.35	29.21	
Hoeing Labor	HOUR	6.00	2.00	12.00	
Custom Harvest/Hauling	LBS.	0.10	650.00	65.00	
Irrigation	ACIN.	2.74	23.33	63.92	
Rent Fert. Spreader	ACRE	2.44	1.00	2.44	
Insecticide	ACRE	5.25	2.00	10.50	
Insecticide	ACRE	5.95	2.00	11.90	
Crop Insurance	ACRE	14.00	1.00	14.00	
Growth Regulator	ACRE	10.00	1.00	10.00	
Harvest Aids	ACRE	18.25	1.00	18.25	
Insecticide	ACRE	9.55	2.00	19.10	
Insecticide	ACRE	7.55	2.00	15.10	
Irrigation Labor	HOUR	6.00	6.36	38.16	
Annual Operating Capital	DOL.	0.11	104.04	11.44	
Machinery Labor	HOUR	6.00	2.84	17.04	
Machinery Fuel, Lube, Repairs	ACRE	26.71	1.00	26.71	
Total Operating Costs				468.80	

Fixed Costs:	Units	Amount	Value	Your Value
Machinery				
Interest at 10.675%	DOL.	230.81	24.64	
Depr., Taxes, Insur.	DOL.		25.81	
Total Fixed Costs			50.45	

Production:	Units	Price	Quantity	Value	Your Value
Cotton Lint	LBS.	0.59	650.00	383.50	
Cottonseed	CWT.	5.50	10.40	57.20	
Total Receipts				440.70	
Returns Above Total Operating Costs				-28.10	
Returns Above All Specified Costs				-78.55	

See Appendix Section A4-1 For Furrow-Irrigated Cotton Notes. — Sahs, Hutson
Fertilizer is in Actual Units.
No Government Deficiency Payments Assumed.

Processed by the Dept. of Agric. Econ. - Oklahoma State University.
Program Developed by the Dept. of Agric. Econ. - Oklahoma State University.

Table 4-2. Enterprise budget for dryland cotton production in southwestern Oklahoma.

Cotton
Loam Soils, Dryland 08/30/95
Owned Harvest Equipment (Stripped) Southwest

Operating Costs:	Units	Price	Quantity	Value	Your Value
Cottonseed	LBS.	0.70	14.00	9.80	
Preplant Herbicide	ACRE	4.22	1.00	4.22	
Bagging, Ties, Etc.	BALE	21.64	0.54	11.69	
Nitrogen (N)	LBS.	0.22	32.50	7.15	
Phosphorus (P_2O_5)	LBS.	0.18	46.00	8.28	
Ginning	CWT.	2.00	8.80	17.60	
Rent Fert. Spreader	ACRE	2.44	1.00	2.44	
Crop Insurance	ACRE	8.00	1.00	8.00	
Hoeing Labor	HOUR	6.00	1.00	6.00	
Annual Operating Capital	DOL.	0.11	28.07	3.09	
Machinery Labor	HOUR	6.00	3.98	23.88	
Machinery, Fuel, Lube, Repairs	ACRE	46.23	1.00	46.23	
Total Operating Costs				148.38	

Fixed Costs:	Units	Amount	Value	Your Value
Machinery				
Interest at 10.675%	DOL.	547.47	58.44	
Depr., Taxes, Insur.	DOL.		62.39	
Total Fixed Costs			120.83	

Production:	Units	Price	Quantity	Value	Your Value
Cotton Lint	LBS.	0.56	260.00	145.60	
Cottonseed	CWT.	5.50	4.16	22.88	
Total Receipts				168.48	
Returns Above Total Operating Costs				20.10	
Returns Above All Specified Costs				-100.73	

See Appendix Section A4-2 For Dryland Cotton Notes. Sahs, Hutson
Fertilizer is in Actual Units.
No Government Deficiency Payments Assumed.

Processed by the Dept. of Agric. Econ. - Oklahoma State University.
Program Developed by the Dept. of Agric. Econ. - Oklahoma State University.

Table 4-3. Effects of yields versus prices on per acre returns above total operating costs for furrow-irrigated cotton production in southwestern Oklahoma.

	Prices ($/lb.)					
Yields (lbs./acre)	.53 (-10%)	.56 (-5%)	.59* (0)	.62 (+5%)	.65 (+10%)	Breakeven ($/lb)
	returns/acre above operating costs					
520 (-20%)	-119.78	-104.18	-88.58	-72.98	-57.38	.76
585 (-10%)	-93.43	-75.88	-58.33	-40.78	-23.23	.69
650*	-67.09	-47.59	-28.10	-8.59	10.91	.63
715 (+10%)	-40.74	-19.29	2.16	23.61	45.06	.59
780 (+20%)	-14.39	9.01	32.41	55.81	79.21	.55
Breakeven (lbs./acre)	777	735	698	664	633	

* Reference point.

Table 4-4. Effects of yields versus prices on per acre returns above total operating costs for dryland cotton production in southwestern Oklahoma.

	Prices ($/lb.)					
Yields (lbs./acre)	.50 (-10%)	.53 (-5%)	.56* (0)	.59 (+5%)	.62 (+10%)	Breakeven ($/lb)
	returns/acre above operating costs					
208 (-20%)	-20.22	-13.98	-7.74	-1.50	4.74	.60
234 (-10%)	-7.86	-0.84	6.18	13.20	20.22	.53
260*	4.50	12.30	20.10	27.90	35.70	.48
286 (+10%)	16.86	25.44	34.02	42.60	51.18	.44
312 (+20%)	29.21	38.57	47.93	57.29	66.65	.41
Breakeven (lbs./acre)	251	237	224	213	202	

* Reference point.

APPENDIX

Section A4-1. Notes for furrow-irrigated cotton budget.

1. Lint and Cottonseed Yield: A normal lint yield of 650 lbs./acre is assumed for furrow-irrigated cotton produced in the Altus-Lugert Irrigation District. Seed yield is 1.6 times lint yield. Average irrigated lint yields for 1985-94 reported by the Oklahoma Agricultural Statistics Service are:

Southwest Oklahoma Average 605, High 892, Low 428
Jackson County Average 653, High 961, Low 389

2. Cotton Lint Price: Assuming strict low middling (SLM), 1 1/16 inch staple. The approximate 1985-94 net average December Lubbock spot price was $0.59/lb. lint. Deficiency payments would be added to the budget for normal yields on planted base acreage. For example, under the 1994 program, a deficiency payment of ($0.729 - $0.683 =) $0.046/lb. of lint or ($0.046 * 650 =) $29.90/acre would be paid, assuming a normal yield of 650 lbs., a target price of $0.729, and a 12-month average market price of $0.683/lb.

3. Cottonseed: 15 lbs./acre, 1.6 plantings/year, seed @ $35/50-lb. bag (treated). This estimate implies a need to replant 6 out of 10 years.

4. Preplant Herbicide: 1 quart of Treflan/acre @ $22.50/gallon.

5. Systemic Pesticide: Payload is applied at 0.75-1.0 lbs./acre ($11.50) to control thrips, mites, and nematodes for several weeks after planting.

6. Fertilizer: Assumed 8 lbs. of lint produced/lb. of N used and for reasons of simplicity, disregarded residual N in soil. Other nutrient sources such as anhydrous ammonia may be used if they provide lower cost.

7. Irrigation: Cost assumes $27.50/acre foot of water plus an $8.50/acre charge from the irrigation district and a $2/acre charge for expendable tools and siphons. An application efficiency of 60 percent was used for furrow irrigation. If cotton requires around 27 inches of water for the production specified and rainfall supplies 13 inches, about 14 net inches of irrigation are needed. To derive a net of 14 inches applied per acre, 23.3 inches are required. The total irrigation cost/acre inch is $2.74.

	Assumptions
Total inches of water required for cotton production	27
Total inches of water supplied by rainfall	13
Total inches of water to be supplied by irrigation	14
Application efficiency for furrow irrigation	60%
Total inches of irrigation water to be applied	23.3
Cost of water/acre foot	$27.50
Cost of water/acre inch	2.29
Total cost of water/acre	53.40
Irrigation district charge/acre	8.50
Expendable tools, siphons/acre	2.00
Irrigation cost/acre	63.90
Irrigation cost/acre inch	2.74

Section A4-1. Notes for furrow-irrigated cotton budget (continued).

8. Machinery: Practices are typical for farms using a machinery set suited to a mix of irrigated and dryland cotton is southwest Oklahoma. The timing of operations can be changed easily. Some may want to calculate costs for smaller or larger machines to substitute for the 4- and 6-row equipment assumed. The fixed cost items are affected more by size, use per year, and machine purchase price than are the cash operating costs.

9. Insecticides: The expense for eight sprayings reflects an average of the following applications. Each treatment is applied twice.

Name	Cost/Acre	Cost to Apply	Total Cost/Acre
Vydate (low rate)	$2.00	$3.25	$5.25
Vydate (high rate	2.70	3.25	5.95
Fury	6.30	3.25	9.55
Furadan	4.30	3.25	7.55
Average cost/acre			$7.08

10. Growth Regulator: A growth regulator (Pix) is applied in July with 8 oz. of product/acre included in one of the insecticide applications.

Name	Pints Applied	Cost/Acre	Cost to Apply	Total Cost/Acre
Pix	0.5	$10.00	$0.00	$10.00

11. Harvest Aids: Cotton is conditioned with one application of Prep and a defoliant (e.g., Def).

Name	Pints Applied	Cost/Acre	Cost to Apply	Total Cost/Acre
Prep	1.33	$10.00	$3.25	$13.25
Def	2.00	5.00	0.00	5.00
				18.25

12. Crop Insurance: A typical crop insurance cost for irrigated cotton in the area of $14/acre is provided.

13. Custom Harvest and Hauling: Custom picking, moduling, and hauling were assumed at $.10/lb. of lint ginned. Two pickings are included. The budget could be modified for an owned picker, module, and module hauler. The custom rate is commonly offered by operators in the area. This rate is less than total cash operating and fixed costs of an owned picker used, for comparison purposes, 200 hours/year over a 10-year machine life.

Source: Walker, Odell and Darrel Kletke, Crop and Livestock Cost and Returns Budgets - Some Suggestions for Improvement, Department of Agricultural Economics, Oklahoma State University, Publication A.E. 9164, 1991.

Section A4-2. Notes for dryland cotton budget.

1. Lint and Cottonseed Yield: A normal lint yield of 260 lbs./acre is assumed for dryland cotton produced in southwestern Oklahoma. Seed yield is 1.6 times lint yield. Average dryland lint yields for 1985-94 reported by the Oklahoma Agricultural Statistics Service are:

Southwest Oklahoma Average 262, High 373, Low 186
Tillman County Average 256, High 383, Low 143

2. Cotton Lint Price: Assuming strict low middling (SLM), 1 inch staple. The approximate 1985-94 net average December Lubbock spot price was $0.56/lb. lint. Deficiency payments would be added to the budget for normal yields on planted base acreage. For example, under the 1994 program, a deficiency payment of ($0.729 - $0.683 =) $0.046/lb. of lint or ($0.046 * 260 =) $11.96/acre would be paid, assuming a normal yield of 260 lbs., a target price of $0.729, and a 12-month average market price of $0.683/lb.

3. Cottonseed: 10 lbs./acre, 1.4 plantings/year, seed @ $35/50-lb. bag (treated). This estimate implies a need to replant 4 out of 10 years.

4. Preplant Herbicide: 3/4 quart of Treflan/acre @ $22.50/gallon.

5. Fertilizer: Assumed 8 lbs. of lint produced/lb. of N used and for reasons of simplicity, disregarded residual N in soil. Other nutrient sources such as anhydrous ammonia may be used if they provide lower cost.

6. Machinery: Practices are typical for farms using a machinery set suited to a mix of irrigated and dryland cotton is southwest Oklahoma. The timing of operations can be changed easily. Some may want to calculate costs for smaller or larger machines to substitute for the 4- and 6-row equipment assumed. The fixed cost items are affected more by size, use per year, and machine purchase price than are the cash operating costs.

7. Insecticides: An insecticide charge is excluded from the dryland cotton budget. Dryland cotton farmers generally spray once in every 3 years, given the economic reality that spraying dryland acreage only pays in years of anticipated higher than average yields. One spraying for budworms or bollworms, boll weevils, aphids, fleahoppers, etc. would cost $5 to $10/acre depending on the chemical used (includes $3.25/acre for application). To reflect a 1- in 3-year requirement, a charge of $3 may be added if desired.

8. Harvest Aids: Harvest conditioning is not normally done on dryland cotton. If used, an application of Prep costs about $10/acre for materials plus $3.25/acre for application.

9. Crop Insurance: A typical crop insurance cost for dryland cotton in the area of $8/acre is provided.

10. Harvest and Hauling: An owned four-row stripper is assumed, and cotton is hauled to the gin by trailer. Cotton is stripped one time. An acre requires 20 percent of a 4800-lb. capacity trailer (260 lint yield * 1800 lb. gross weight/bale with 480 lbs. of lint/bale). With .5 hours required/load to haul cotton to the gin, each acre requires .20 x .5 = .10 hours for hauling.

11. Other practices such as planting winter cover crops on sandy soils, growing cotton on sub irrigated bottom land, and using custom harvest and modules instead of an owned stripper and trailers can be included by modifying the dryland budget. Winter cover crops are established by drilling one to two bushels of wheat and/or rye between cotton rows prior to harvest. Grazing may be available, and the cover crop is then plowed under during spring tillage. Custom stripping is about $0.09/lb. of lint ginned, and module hauling is $35/module.

Source: Walker, Odell and Darrel Kletke, Crop and Livestock Cost and Returns Budgets - Some Suggestions for Improvement, Department of Agricultural Economics, Oklahoma State University, Publication A.E. 9164, 1991.