BREAK-EVEN YIELDS AND PRICES FOR COTTON AND ALTERNATIVE CROPS, MISSISSIPPI, 1997

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Abstract

Break-even relationships for cotton and alternative crops in Mississippi are summarized. The limitations of this approach are discussed.

Introduction

Recent changes in farm legislation and current relative futures prices for cotton and alternative crops have heightened grower interest in break-even analysis. Typically break-even analysis is conducted utilizing direct costs. Direct cost has two components: direct cost not proportional to yield (DCNPY), and direct cost proportional to yield (DCPY).

Direct cost not proportional to yield is generally expressed as dollars per acre. Direct cost proportional to yield is generally expressed as dollars per unit of output or yield (pounds of lint for cotton and bushels for corn and soybeans). The cost items usually excluded are fixed costs, overhead costs, as well as land and management charges.

The Department of Agriculture Economics at Mississippi State University routinely releases budgets (per acre costs and returns tables) for cotton and other crops on all annual basis. Table 1 lists the components of direct costs employed in this report plus budget yields and fixed cost estimates.

The cost of producing these crops varies considerably. The range in direct cost varies from less than $75 to more than $300 per acre. Cotton fixed costs per acre is more than twice the fixed cost per acre for soybeans and 60% larger than the fixed cost per acre for corn.

Procedure

Break-even analysis begins by equating revenue (R) for the competing crops (cotton - C and corn - K in this example).

We write:

$$RC = RK \tag{1}$$

where: RC = return for cotton
RK = return for corn
Then: $YC*PC+1.55*YC*PCS-DCNPYC-DCPYC*YC=YK*PK-DCNPYK-DCPYK*YK$ (2)
where:

YC = Yield of cotton (lbs. Of lint/a.)
PC = Price of cotton ($/lb.)
1.55*YC = lbs. of cottonseed/a.
PCS = Price of cottonseed (Fixed at $0.05/lb.)
DCNPYC = Direct cost not proportional to yield, cotton ($/a.)
DCPYC = Direct cost proportional to yield, cotton ($/lb.)
YK = Yield of corn (bu./a.)
PK = Price of corn ($/bu.)
DCNPYK = Direct cost not proportional to yield, corn ($/a.)
DCPYK = Direct cost proportional to yield, corn ($/bu.)

Solving for break-even PK and YK we find:

$$PK = (RC+DCNPYK+DCPYK*YK)/YK \tag{3}$$

$$YK = (RC + DCNPYK)/(PK-DCPYK) \tag{4}$$

The results are summarized in Tables 2 & 3.

The break-even price of corn declines as the yield of corn increases and increases as the price or yield of cotton increases. When cotton price is 60¢ per pound of lint, cotton yield 600 pounds per acre and corn yield of 80 bushels, the break-even corn price is estimated to be $2.29.

Break-even corn yield is inversely proportional to corn price and directly proportional to cotton price and yield. Some of the break-even corn yields in Table 3 are probably not agronomically possible. Break-even soybean price and yield relationships are reported in Tables 4 and 5.

Other Costs

Over time, the farm firm must cover all costs or the firm is not viable, i.e. it will not survive. Making crop adjustments from year to year based solely on direct costs can be risky.

For example: Consider a cotton farmer with cotton and soybean acreage that is making equipment payments on his cotton harvesting equipment and has his soybeans custom harvested. If he decides to shift to 100% soybeans and maintain his flexibility to shift back to cotton and soybeans in the next year, then he may want to keep is cotton harvesting equipment. Then Tables 2 through 5 do not apply.

The Department of Agriculture Economics, Mississippi State University estimates cotton harvesting fixed costs per acre as $56.48, $2.82, and $3.18 or $62.48 for picker, boll buggy, and module builder respectively. Tables 6 through 9 replace Tables 2 through 5 with the corn or soybean crop charged to cover the cotton harvesting fixed cost of approximately $62 per acre. This can be accomplished by adding the cotton harvesting cost to the direct cost not proportional to yield for the alternative crop.

Including a constant to cover cotton harvesting fixed costs adjusts Tables 2 through 5 as a function of price and yield. Therefore, the adjustment varies across the columns and rows of Tables 2 through 5. Hence Tables 6 through 9 are repeated for the convenience of the reader.

Limitations

The grower is cautioned not to use the specific numbers reported in Tables 1 through 9. They should use their own. These numbers are known to be quite variable from farm to farm or firm to firm. Equations 1 through 4 will help the grower develop his own break-even tables.

Break-even analysis based solely on direct costs assumes complete flexibility to adjust from year to year and ignores other cost items that must be covered in the long run if the firm is to survive. Additionally, year to year adjustments in crop mix can affect these other costs. More importantly, year to year adjustments in crop mix can affect the growers flexibility to change the crop mix in future years. This is especially true as it relates to on-farm labor requirements and capital requirements. Major annual adjustments should be made with extreme care.

It is suggested that growers not stop with field by field break-even analysis, but conduct break-even analysis for the entire farm. By utilizing this approach, the other costs, especially fixed and overhead costs that may be impacted can be more easily identified and estimated. Finally, the grower is cautioned that any annual adjustments in crop mix that impact overhead costs probably limit year to year flexibility in crop mix to a degree that would not be healthy for most firms.

In summary, current or historical crop mixes on given farms are probably related to very sound economic decisions and radical changes from year to year should be viewed as major changes requiring thorough assessment.

It is proper to do the break-even analysis based on direct costs on a field by field basis. Then, the grower should assess the potential crop mix changes and their affect on other cost items. The idea is to survive. That is to survive in the long run, for many years. However, when radical adjustments are necessary for survival next year, i.e., the ability to farm one more time, then radical changes may be justified. But, in many cases it may be better to accept the losses at that time, get out of farming, and not lose massive amounts of additional funds.

Correctly done, break-even analysis is a form of prior planning. To take full advantage of break-even analysis, the growers should fix some or all of their input and output prices weeks or months before planting.

Break-even analysis is not as simple as it appears or is often presented.

Table 1. Estimated Direct and Fixed Cost, and Yield per acre, Cotton, Corn, and Soybeans, Mississippi, 1996.

	Cotton	Corn	Soybeans
Yield	825 lb.	100 bu.	27 bu.
DCNPY	$325.00	$148.64	$ 73.96
DCPY	$ 0.10/lb.	$ 0.16/bu.	$ 0.16/bu.
FC	$ 77.04	$ 48.32	$ 31.21

Source: Department of Agricultural Economics, Mississippi State University, Annual budgets

Table 2. Break-even Corn price for selected Cotton prices & yields and Corn yields, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
CORN YIELDS	80	100	120	80	100	120	80	100	120
COTTON YIELD	Dollars / Bushel								
600	2.29	1.86	1.58	2.66	2.16	1.83	3.04	2.46	2.08
700	3.01	2.44	2.06	3.45	2.79	2.35	3.88	3.14	2.64
800	3.73	3.02	2.54	4.23	3.42	2.87	4.73	3.82	3.21
900	4.45	3.59	3.02	5.01	4.04	3.40	5.58	4.49	3.77
1000	5.17	4.17	3.50	5.80	4.67	3.92	6.42	5.17	4.34

Table 3. Break-even Corn yield for selected Cotton prices and yields and Corn prices, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
CORN PRICES	2.25	2.75	3.25	2.25	2.75	3.25	2.25	2.75	3.25
COTTON YIELD	Bushels / Acre								
600	81	66	55	96	77	65	110	89	74
700	109	88	74	126	102	85	143	115	96
800	137	110	92	156	126	105	175	141	118
900	164	133	111	186	150	126	207	167	140
1000	192	155	130	216	174	146	240	194	162

Table 4. Break-even Soybean price for selected Cotton prices and yields and Soybean yields, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
SB YIELDS	15	25	35	15	25	35	15	25	35
COTTON YIELD	Dollars / Bushel								
600	6.52	3.98	2.89	8.52	5.18	3.74	10.52	6.38	4.60
700	10.37	6.29	4.54	12.71	7.69	5.54	15.04	9.09	6.54
800	14.22	8.60	6.19	16.89	10.20	7.33	19.56	11.80	8.47
900	18.07	10.91	7.84	21.07	12.71	9.12	24.07	14.51	10.41
1,000	21.92	13.22	9.49	25.26	15.22	10.92	28.59	17.22	12.34

Table 5. Break-even Soybean yield for selected Cotton prices and yields and Soybean prices, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
SB PRICES	5.50	6.50	7.50	5.50	6.50	7.50	5.50	6.50	7.50
COTTON YIELD	Bushels / Acre								
600.00	18	15	13	23	20	17	29	25	21
700.00	29	24	21	35	30	26	42	35	30
800.00	40	33	29	47	40	34	54	46	40
900.00	50	42	37	59	49	43	67	57	49
1,000.00	61	51	44	70	59	51	80	67	58

Table 6. Break-even Corn price for selected Cotton prices and yield and Corn yields, Cotton harvesting fixed cost per acre considered, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
CORN YIELDS	80	100	120	80	100	120	80	100	120
COTTON YIELD	Dollars / Bushel								
600	3.07	2.49	2.10	3.44	2.79	2.35	3.82	3.09	2.60
700	3.79	3.06	2.58	4.23	3.41	2.87	4.66	3.76	3.16
800	4.51	3.64	3.06	5.01	4.04	3.39	5.51	4.44	3.73
900	5.23	4.22	3.54	5.80	4.67	3.92	6.36	5.12	4.29
1000	5.96	4.80	4.02	6.58	5.30	4.44	7.21	5.80	4.86

Table 7. Break-even Corn yield for selected Cotton prices and yields and Corn prices, Cotton harvesting fixed cost per acre considered, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
CORN PRICES	2.25	2.75	3.25	2.25	2.75	3.25	2.25	2.75	3.25
COTTON YIELD	Bushels / Acre								
600	111	90	75	126	101	85	140	113	95
700	139	112	94	156	126	105	172	139	117
800	167	134	113	186	150	126	205	165	139
900	194	157	131	216	174	146	237	191	160
1000	222	179	150	246	198	166	270	218	182

Table 8. Break-even Soybean price for selected Cotton prices and yields and Soybean yields, Cotton harvesting fixed cost per acre considered, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
SB YIELDS	15	25	35	15	25	35	15	25	35
COTTON YIELD	Dollars / Bushel								
600	10.69	6.48	4.67	12.69	7.68	5.53	14.69	8.88	6.39
700	14.54	8.79	6.32	16.87	10.19	7.32	19.20	11.59	8.32
800	18.39	11.10	7.97	21.05	12.70	9.11	23.72	14.30	10.26
900	22.24	13.41	9.62	25.24	15.21	10.91	28.24	17.01	12.19
1,000	26.09	15.72	11.27	29.42	17.72	12.70	32.75	19.72	14.13

Table 9. Break-even Soybean yield for selected Cotton prices and yields and Soybean prices, Cotton harvesting fixed cost per acre considered, Mississippi, 1997.

COTTON PRICES	0.60	0.60	0.60	0.65	0.65	0.65	0.70	0.70	0.70
SB PRICES	5.50	6.50	7.50	5.50	6.50	7.50	5.50	6.50	7.50
COTTON YIELD	Bushels / Acre								
600	30	25	22	35	30	26	41	34	30
700	40	34	29	47	40	34	54	45	39
800	51	43	37	59	49	43	66	56	48
900	62	52	45	70	59	51	79	66	57
1,000	73	61	53	82	69	60	92	77	67