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The Place of COTTON As a Source of FARM INCOME In SOUTHWESTERN OKLAHOMA

By

PETER NELSON

K. C. DAVIS

LEO V. BLAKLEY

and

RAYMOND B. MARSHALL

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater

A. E. Darlow, Director Louis E. Hawkins, Vice Director

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By
PETER NELSON, K. C. DAVIS, LEO V. BLAKLEY
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RAYMOND B. MARSHALL
Department of Agricultural Economics

SOUTHWESTERN OKLAHOMA is one of the few areas in the United States where farmers can switch easily from one major cash crop to another. Thus relative production costs and probable net returns from each crop are of special interest.

This publication provides information on production costs and probable net returns for cotton and wheat. Because mechanization is affecting the cost of growing cotton, the figures on that crop are presented for two methods, mechanized and unmechanized.

Mechanization is, of course, a matter of "more or less," not "yes or no." The words "mechanized" and "unmechanized" are used here merely as a matter of convenience. The "mechanized" system used in this bulletin consists of more use of the rotary hoe, and replacement of hand-snapping by stripper harvesting. (The specific practices used in the "mechanized" and "unmechanized" systems are shown in Tables VIII and IX, pages 14 and 15.)

Factors considered here in comparing wheat with cotton are: (1) Production costs; (2) net returns per acre at various yield and price levels; and (3) stability of net returns from year to year.

The figures used in the comparisons are based on actual costs reported by farmers, and on crop acreage, yield, and price reports of the U. S. Department of Agriculture.

The concluding section of the publication applies the cost and return figures to three different cropping systems which might be used on a 320-acre farm in southwestern Oklahoma. The calculations shown in this section are presented in such a way that an individual farmer can substitute his own acreages and expected yields, at given prices, to prepare a "budget" for his own farm.

PRODUCTION COSTS

Table I shows the costs involved in producing cotton and wheat in southwestern Oklahoma. These figures are based on actual farm records obtained in Beckham, Caddo, Jackson, Stephens, Tillman and Washita counties in 1947.* Costs will vary from year to year, of course; but the general relationships will remain somewhat similar.

The items shown as fixed costs in Table I are those which do not vary with yield, therefore they are shown on a per acre basis. The costs affected by yield, such as cost of harvesting, are shown per pound or per bushel.

Comparing cotton and wheat, it can be seen there is considerable difference in both the amount of labor used and the ratio of fixed to variable costs. Cotton requires more labor and more capital per acre than does wheat, even when cotton production is mechanized. Wheat, as compared with cotton, uses more capital than labor, because the ratio of fixed to variable cost is considerably higher. **Thus the amount of labor available, and the money on hand for investment in crop production, become factors in deciding whether to plant wheat or cotton.**

NET RETURNS PER ACRE

After the production costs shown in Table I had been found, they were used to calculate net returns per acre at various yields and selling prices. The resulting figures are given in Tables II and III, for cotton and wheat respectively.

The effect of mechanizing cotton production is shown in Table II and Figure 1. The mechanized system begins to produce a net return at lower yields, and also at lower prices.

Tables II and III show that a half-bale yield of "mechanized" cotton sold at 28 cents per pound produces a greater net return per acre than 20-bushel wheat sold at $2.25.

* Detailed information is given in Okla. Agri. Exp. Sta. Bul. B-350, "Cotton Growing in Southwestern Oklahoma," by William F. Lagrone.

No deduction for loss of grade due to mechanical harvesting is made in the foregoing calculations. Information collected in southwest Oklahoma for the harvest seasons 1947-48 through 1952-53 indicates that the deduction for loss of grade, probably would be less than $1 per acre.*

STABILITY OF NET RETURNS

No farmer wants to "make a killing" one year and then starve for four or five. Therefore stability of income from year to year becomes important when alternative crops are being compared.

Calculations based on average yields of wheat and cotton in eight southwestern Oklahoma counties for the years 1939 through 1951 indicate there is little difference between wheat and cotton in year-to-year variation of net returns per acre.** What little difference did exist was in favor of cotton.

The first step in figuring probable variation in net returns was to find the probable variation in yield. Since yields of wheat in bushels cannot be directly compared with yields of cotton in pounds of lint, it was necessary to use a statistical device, the coefficient of variation. Using this device, it was possible to start with the actual reported yields for 1939-51 and make an estimate of the probable range of high and low yields in future years. The results of this calculation are shown in Table IV.

The probable range of yields was calculated in two different ways: Two years out of three; and 19 years out of 20. In either case, the figures in Table IV are estimates of chance. For example, the chances are that in two years out of three the average yields of cotton lint in Crop Reporting District VII will be between 120 and 220 pounds per acre. Or, looked at from the other direction, there is one chance in three that in any one year the yield may go lower than 120 pounds or higher than 220 pounds.

The method of calculating net returns shown here can be applied to your farm in the following manner:

Disregard the yield figures in Table IV. Instead, use the yields which can be reasonably expected on your farm. Then proceed as in

* Data for the harvest seasons 1947-48 through 1949-50 are reported in Okla. Agri. Exp. Sta. Bul. B-364, "Economic Aspects of Machine Harvesting Cotton in Oklahoma," by John D. Campbell. Unpublished data gathered for each season since, through 1952-53, confirms the earlier results.

**Yields used in the calculations are based on those reported by the U. S. Bureau of Agricultural Economics for Crop Reporting District VII, which includes Caddo, Comanche, Cotton, Greer, Harmon, Jackson, Kiowa and Tillman counties.

the example, using any price column from Table II and Table III that seems reasonable.

The accuracy of your calculations will depend, of course, on how close the costs of production on your farm are to the averages used in computing the figures in Tables II and III.

After the probable yields were calculated, the next step in figuring probable net returns was to apply these yield figures to the figures for net returns per acre given in Tables II and III, as in the following example:

EXAMPLE—

Problem: Find the net return per acre for the lowest yield of cotton on the "two out of three" probability basis; that is, 120 pounds

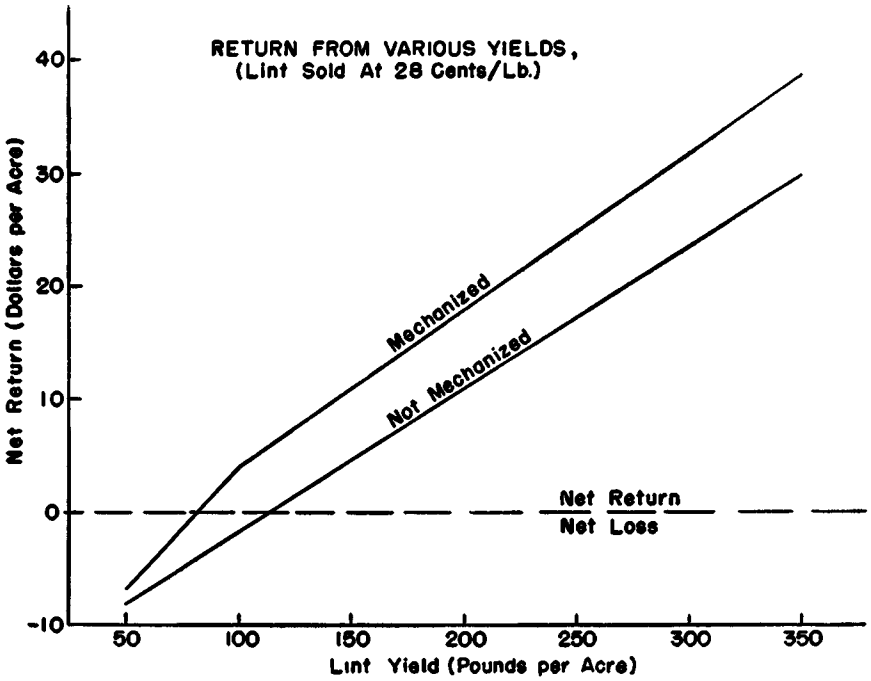

Figure 1.—Effect of Mechanization on Net Returns from Cotton. The lower costs of production when cotton growing is mechanized result in profitable production at lower yields. In this case, where the selling price of lint is assumed to be 28 cents per pound, the crop begins to pay a return at a yield of less than 85 pounds per acre. With the higher costs of unmechanized production, the yield must be about 115 pounds of lint per acre to break even.

of lint per acre. Assume the price of lint will be 28 cents per pound, and that it is produced by the mechanized method.

Solution: In Table III, find the net return under the 28-cent column for a 120-pound yield of mechanized cotton. The table does not show a figure for 120 pounds. However, it does show figures for 100 pounds and 150 pounds; so the 120-pound figure can be calculated by interpolating between the 100- and the 150-pound figures, as follows:

The net return for a 100-pound yield is $3.98 and for a 150-pound yield it is $10.97. Thus the 50-pound increase (from 100 to 150 pounds) increases the net return by $10.97 minus $3.98, or $6.99. The 20 pounds is 20/50th of 50 pounds, so the corresponding increase in net returns is 20/50th of $6.99, or $2.80. Add this to the net returns for a 100-pound yield, and we have $3.98 plus $2.80, or $6.78 as the net returns for the 120-pound yield.

(End of Example)

The net returns per acre from high and average yields of cotton, and from low, high, and average yields of wheat, can be figured in the same way. If we assume that wheat sells at $2.00 per bushel, the results of all this calculation will be as shown in Table V.

From these calculations, it appears there is little if any choice between wheat and cotton insofar as year-to-year variation in net income per acre is concerned. The range of variation is slightly less for cotton than for wheat; but the percentage differences are slight.

"BUDGETS" FOR THREE CROP SYSTEMS

On the average, it appears that cotton, when mechanized, can yield higher net returns per acre than wheat, and that the variation in net returns from year to year is about the same for the two crops. The question still remains, "How will it work out on my farm?"

One way to analyze the probable effect of a change in cropping systems is to prepare a budget for each of the alternatives being considered. The following paragraphs indicate, by example, how this can be done. The example is applied to a 320-acre unit, handled in three different ways. The three assumed alternatives are shown in Table VI. In each, all use of land remains the same except for the relative acreages of wheat and cotton. System A is primarily a wheat farm, with some cotton. System B has equal acreages of these two crops, and cotton production is not mechanized. System C is a cotton farm with some wheat, with cotton production mechanized.

These budgets are not presented as being representative of any particular type of farm. However, all labor and other costs used are as reported by southwestern Oklahoma farmers in 1947.*

Wheat Calculations

Table VII shows the wheat budget for each of the three systems. Since wheat would be handled the same way in all three systems, the man and tractor hours per acre would be the same for all three, and the per acre cost of seed and of custom harvesting would also be the same. The only difference in cash cost is in the amount of labor hired.

Cotton Calculations

For cotton, the assumed systems involve differences in handling the crop as well as different acreages. Therefore the calculation of relative costs is somewhat more complicated than for wheat.

Table VIII shows the number of man hours and tractor hours used to grow an acre of cotton up to harvest in each of the three systems. In Table IX, the hours of man labor and tractor operation are transplanted into dollar costs, and harvesting and other costs are added to find the total cash expenditure. Finally, in Table IX, the net return is calculated for an average yield and an assumed price.

Totals for Entire Farm

After the net return per acre has been figured, the total return for each crop under each plan is easily found. Simply multiply the net return per acre by the number of acres of that crop. The result is shown in Table X. To make it more realistic, the assumed incomes from grain sorghum and cattle can be added; but they are the same for all three systems since the land devoted to these two enterprises is the same in all three.

System B, with 120 acres of cotton, shows an increased net income of only $355 over System A with only 40 acres of cotton, because of the greater cost of harvesting the larger acreage by hand. The effect of more complete mechanization is shown by the relatively much larger net return for System C, where the cotton is harvested by machinery.

* Details are given in Okla. Agri. Exp. Sta. Bul. B-350, "Cotton Growing in Southwestern Oklahoma."

PRODUCTION COSTS

TABLE I.—Costs Involved in Producing Cotton (Mechanized and Unmechanized*) and Wheat (by Usual Methods); Southwestern Oklahoma.

	Fixed costs (per acre)	Variable costs (per pound of lint, or per bushel)
COTTON, UNMECHANIZED*		
Fixed costs (per acre)	$14.51	
Variable costs (per pound lint)		
Snapping		$0.0759
Stripping		---
Hauling		0.0069
Waste		---
Ginning		0.0223
Total variable costs		$0.1051
COTTON, MECHANIZED*		
Fixed costs (per acre)	10.00	
Variable costs (per pound lint)		
Snapping		$0.038
Stripping		0.0051
Hauling		0.0069
Waste		0.02023
Ginning		0.02266
Total variable costs		$0.09289
WHEAT, USUAL METHODS		
Fixed costs (per acre)	7.15	
Variable costs (per bu.)		
Harvesting		$0.0205
Hauling		0.0153
Total variable costs		$0.0358

* See Tables VIII and IX, pp. 14 and 15, for differences between unmechanized and mechanized production.

RETURNS—COTTON

TABLE II.—Net Return per Acre of Cotton, Mechanized and Unmechanized, as Affected by Yield and Price; Southwestern Oklahoma.
(dollars per acre)

(YIELD) And yield is: (lbs. lint per acre)	(PRICE) When lint is sold at: (cents per pound)			
	21¢	25¢	28¢	32¢
		Unmechanized		
50	—10.77	— 9.27	— 8.15	— 6.65
100	— 7.04	— 4.04	— 1.79	1.21
150	— 3.31	1.19	4.57	9.07
200	.43	6.43	10.93	16.93
250	4.17	11.67	17.29	24.79
300	7.90	16.90	23.65	32.65
350	11.63	22.13	30.01	40.51
		Mechanized		
50	— 5.63	— 4.13	— 3.01	— 1.51
100	— 1.27	1.73	3.98	6.98
150	3.09	7.59	10.97	15.47
200	7.45	13.45	17.95	23.95
250	11.82	19.32	24.94	32.44
300	16.18	25.18	31.93	40.93
350	20.54	31.04	38.92	49.42

RETURNS—WHEAT

TABLE III.—Net Returns per Acre of Wheat as Affected by Yield and Price; Southwestern Oklahoma.
(dollars per acre)

	(PRICE) When grain is sold at: (dollars per bushel)			
	1.50	1.75	2.00	2.25
(YIELD) And yield is: (bushels per acre)				
5	— 2.38	— 1.56	— .73	.10
8	.51	1.84	3.16	4.48
10	2.54	4.21	5.89	7.57
12	4.42	6.42	8.42	10.42
14	6.30	8.63	10.95	13.27
16	8.32	10.99	13.67	16.35
18	10.20	13.20	16.20	19.20
20	12.08	15.41	18.73	22.05

PROBABLE YIELDS

TABLE IV.—Probable Variations* in Yields of Cotton and Wheat; Crop Reporting District VII.**

	Cotton (Lbs. lint per acre)	Wheat (Bushels per acre)
Actual yield, 1939-1951**	170.4	10.9
Probable range of yields:†		
Two years out of three	120 - 220	7.8 - 14.0
19 years out of 20	70 - 270	4.7 - 17.1

* Statistical factors: Cotton—standard deviation, ±50.2 lbs.; coefficient of variation, .29: Wheat—standard deviation, ±3.1 bu.; coefficient of variation, .28.

** The counties included in Crop Reporting District VII are Caddo, Comanche, Cotton, Greer, Harmon, Jackson, Kiowa and Tillman.

† For explanation see text, page 5.

PROBABLE VARIATION IN NET RETURNS

TABLE V.—Calculated Probable Range in Net Returns per Acre for Mechanized Cotton and Wheat Produced by Usual Method.*

	Percent of average	Net returns per acre
Cotton (mechanized)		
Low yield (120 lb. lint per acre)	49	$ 6.78
Average yield (170 lb. lint per acre)	100	13.76
High yield (220 lb. lint per acre)	151	20.75
Wheat		
Low yield (7.8 bu. per acre)	41	$ 2.90
Average yield (10.9 bu. per acre)	100	7.03
High yield (14.0 bu. per acre)	156	10.95

* For explanation see text, page 7.

DESCRIPTION OF ASSUMED SYSTEMS

TABLE VI.—Assumed Farming Systems Used to Illustrate Application of Budget Method of Analyzing Effects of Changing Crops.
(Acres)

	System A	*System B*	*System C*
Wheat	200	120	40
Cotton	40	120	200
Grain sorghum	20	20	20
Hay	10	10	10
Temporary pasture	10	10	10
Total crops	280	280	280
Pasture (permanent)	32	32	32
Farmstead	8	8	8
Total	320	320	320

WHEAT "BUDGETS"

TABLE VII.—Per Acre Wheat Production Costs and Net Returns for Three Assumed Farming Systems.

	System A (200 A. wheat)	System B (120 A. wheat)	System C (40 A. wheat)
Seed and seed treatment	$ 2.25	$ 2.25	$ 2.25
Land preparation and planting*			
Man labor ($1.00 per hour)			
One-half hired (A)	1.30	-------	-------
One-fourth hired (B)	-------	.65	-------
None hired (C)	-------	-------	0.00
Tractor cost ($1.15 per hour)	2.99	2.99	2.99
Harvesting cost (custom)	4.50	4.50	4.50
TOTAL CASH EXPENDITURE	$11.04	$10.39	$ 9.74
Gross return per acre (10.9 bu. @ $2.20)	$23.98	$23.98	$23.98
Less land rent; one-third of crop	— 7.99	— 7.99	— 7.99
Operator's gross return	$15.99	$15.99	$15.99
Less cash expenditure	—11.04	—10.39	— 9.74
OPERATOR'S RETURN for labor and management	$ 4.95	$ 5.60	$ 6.25

* 2.60 man-and-tractor hours per acre, divided as follows: One-waying, .30 hours; disking, .40; flat breaking on the average of once in two seasons, 1.10; harrowing, .25; subsurface tillage, .25; and planting, .30.

HOURS PER ACRE—COTTON

TABLE VIII.—Time Spent in Various Operations for Producing Cotton in Three Assumed Farming Systems. (Hours per acre)

	System A (40 A. cotton)		System B (120 A. cotton)		System C (200 A. cotton)	
	Man	Tractor	Man	Tractor	Man	Tractor
Pre-planting						
Cutting stalks	.25	.25	*	*	*	*
One-waying or disking	.40	.40	*	*	*	*
Moldboard plowing	1.00	1.00	*	*	*	*
Harrowing	.20	.20	*	*	*	*
Listing	.40	.40	.70	.70	.70	.70
Planting**	.50	.50	.32	.32	.32	.32
Cultivation†						
Harrowing	.25	.25	*	*	*	*
Rotary hoe	1.60	1.60	2.00	2.00	2.00	2.00
Hand hoeing (chopping)††	2.00	---	1.00	---	1.00	---
Plowing	1.20	1.20	1.60	1.60	2.00	2.00
Spraying or dusting***	---	---	---	---	---	---
TOTAL hours per acre, pre-harvest	7.80	5.80	7.72	6.72	8.12	7.12

* Same as for System A. Asterisks are used instead of the actual figures, in order to show more clearly where the differences between the three systems occur.

** Figures allow for replanting once every other year. In other words, the figures here are for 1½ plantings.

† Farm management data show that machines are used more intensively on the larger acreages in an attempt to reduce labor costs.

†† System A uses no hired labor here. System B and System C use hired labor for this phase of cultivation.

***Relatively little use of insecticides was made on cotton in southwestern Oklahoma at the time the cost figures used in this study were obtained, therefore no figures were obtained on the cost of insect control. However, this is a cost which is not necessary every year in the section of Oklahoma covered by this study, and its omission from this calculation is perhaps offset by omission from the wheat figures of an allowance for chemical control of greenbugs.

COTTON "BUDGETS"

TABLE IX.—Per Acre Costs and Returns from Cotton in Three Assumed Farming Systems.

	System A (40 A. cotton)	System B (120 A. cotton)	System C (200 A. cotton)
Pre-harvest costs (From hours in Table VIII)			
Tractor at $1.15 per hour	$ 6.67	$ 7.73	$ 8.19
Hired labor at $.85 per hour	---	.85	.85
Service*	---	1.00	2.00
Harvesting cost**	16.11	17.90	3.00
Other costs			
Seed	1.00	3.00	3.00
Hauling to gin			
Trailers	1.00	.67	.67
Towing trailers (tractor or other)	.70	.70	.70
Labor	---	---	1.00†
Ginning	4.30	4.30	4.42††
TOTAL CASH EXPENDITURE	29.78	36.15	23.83
Gross return per acre			
179 lbs. lint at 31.60¢	$53.85	$53.85	$51.16***
276 lbs. seed at 3.55¢	9.80	9.80	9.31***
Total gross return per acre	63.65	63.65	60.47
Less land rent; one-fourth of crop	—15.91	—15.91	—15.12
Operator's gross return	47.74	47.74	45.35
Less cash expenditure	—29.78	—36.15	—23.83
OPERATOR'S RETURN for labor and management	$17.96	$11.59	$21.52

* This is a miscellaneous cost usually associated with larger acreages.

** System A hand snaps with 90 percent hired labor. System B hand snaps with 100 percent hired labor. System C harvests mechanically on a custom basis.

† One-third hired labor.

†† A part of the cotton is ginned after the higher ginning rates effective November 15.

***This allows a 5 percent reduction in value for any loss in grade or waste.

NET INCOME OF FARM

TABLE X.—Net Farm Income for Each of the Three Assumed Farming Systems.

	System A (200 A. wheat; 40 A. cotton)	System B (120 A. wheat; 120 A. cotton)	System C (40 A. wheat; 200 A. cotton)
Wheat	$ 990.00	$ 672.00	$ 250.00
Cotton	718.40	1,390.80	4,304.00
Total, wheat and cotton	$1,708.40	$2,062.80	$4,554.00
Grain sorghum	150.00	150.00	150.00
Cattle	400.00	400.00	400.00
Total for farm	$2,258.40	$2,612.80	$5,104.00

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