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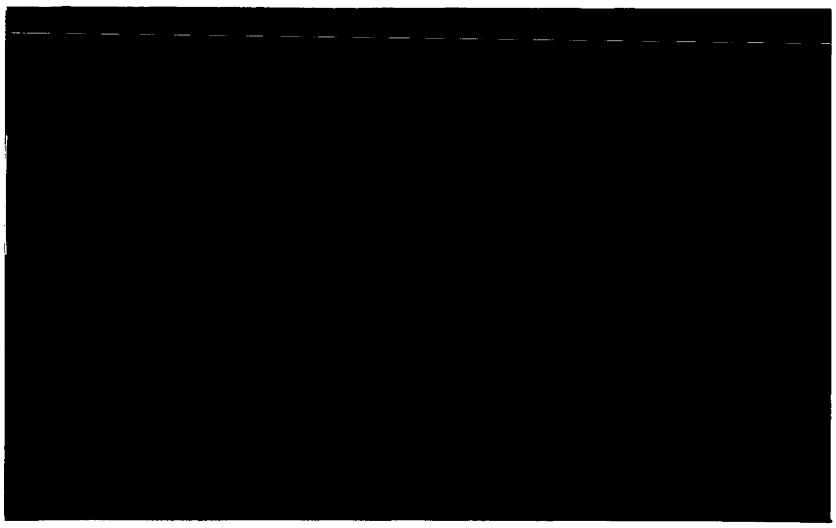

GAINS AND LOSSES FROM THE UPLAND COTTON PROGRAM, 1984-1987

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Working Paper No. 89-13

June 1989

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The U.S. cotton program has evolved since the 1930s but has involved as sustained a level of intervention as any of the major farm products. In the 1980s the basic structure of the cotton program has been similar to the grain programs, but with a few unique features that are very important. There are also unique analytical problems in assessing the cotton program. Cotton exports and cotton policy have both been more volatile in the 1980s than have exports and policy for the major grains. Moreover, there have been fewer econometric studies of cotton supply and demand parameters. Consequently, analytical uncertainty about price and output conditions in the absence of the cotton program is even greater than for the grains, and the estimated gains and losses are more sensitive to the particular year studied. This chapter considers each marketing year separately for crops harvested from 1984 to 1987.

Program Characteristics

The cotton pricing provisions are similar to the target price/loan features of the grains, established in the Food Security Act of 1985. The main difference is the "marketing loan" provision which permitted market prices to fall as much as necessary to meet world market conditions in 1986, 1987, and 1988. The market situation for cotton developed in rough parallel to the grains. The 1980s began with relatively high farm prices and low stocks, but by 1982 export demand declined and stocks accumulated rapidly. The cotton carryover increased from 2.6 million bales at the end of the 1980 crop year to 7.8 million bales carried out of the 1982 crop year. The PIK

program and drought of 1983 enabled most of these stocks to be marketed, but problems of surplus reappeared in 1984 and 1985 even more rapidly than for the grains. This was apparently the main reason for more drastic policy changes to maintain export markets in cotton than for the grains.

The marketing loan program for 1986-88 requires the calculation of an "adjusted world market price" (AWP). Whenever the AWP is below the loan rate producers may repay the loan at the AWP. In 1986/87 the AWP was set at 80 percent of the loan rate (44 cents per pound compared to the 55 cent loan rate). In 1987/88 the AWP is determined weekly, based on world trading prices of the base quality of SLM 1 1/16 inch cotton (micronaire 3.5-4.9) adjusted to an average U.S. location. Further adjustments are made for individual qualities that a producer places on the market. For the 1987 crop, when a producer or the producer's marketing cooperative placed cotton under loan, 52.5 cents per pound was received from the CCC. If the world price adjusted to local conditions is 40 cents, the producer can discharge the loan obligation by paying 40 cents per pound plus interest (although no interest was charged on 1986-crop redemptions). Thus, the cotton program essentially provides payments to producers equal to the difference between the target price and the world market price. Moreover, producers who forego CCC loans receive loan deficiency payments on their production otherwise eligible for loan, not to exceed the farm program acreage times the farm program payment yield. The loan deficiency payment rate is equal to the difference between the loan rate and the AWP in effect during the week in which the cotton is sold. The sum of loan and ordinary deficiency payments is subject to a $250,000 payment limitation. Producers are allowed to decide whether or not to forego the loan program on a bale-by-bale basis.

Essentially, these provisions mean that the loan rate is no longer a market price floor established by CCC commodity acquisition. The loan rates instead determine the level from which a payment is calculated subject to a $250,000 limit rather than the $50,000 limit on deficiency payments. The waivers of interest and storage charges in 1987 increased the incentive for growers to hold cotton during the 18-month loan period, however, and this provides some market support.

Table 1 provides basic market and program data for the four crop years, 1984 to 1987. The target price was held at 81 cents per pound until 1987, when it declined 2 percent to 79.4 cents per pound. Acreage reduction was required in every year with a 10 percent paid diversion added (also required) in 1985. The participation rate climbed from 70 percent (of base acreage) in 1984 to 93 percent in 1986 and 92 percent in 1987.

Analysis of Program Effects

One of the principal difficulties in analyzing cotton policies is the scarcity of econometric estimates of the total (domestic use and export) farm-level demand elasticity. Starbird et al. provide a judgement that the short-run (one-year) domestic mill demand elasticity is -.20 to -.35 and the export demand elasticity is -.5 (pp. 45, 52). Given the substitutability of other fibers for cotton, the domestic mill demand is likely to be more elastic than this range indicates over the longer term. Jones-Russell and Sporleder find a slightly greater domestic elasticity, and Duffy, Chen, and Wohlgenant all estimate export demand elasticities in the neighborhood of -2. With about 45 percent of U.S. cotton exported and 55 percent used domestically in 1987/88, a domestic-use elasticity of -.3 and export elasticity of -.5 implies an overall

short-run elasticity of demand of:

$$-.3(.55) - .5(.45) = -.39.$$

However, if the export demand elasticity of -2 is used, probably more relevant for the 1980s with more than a single year to adjust to price changes, the overall demand elasticity is -1.065. The simulations to follow used a total demand elasticity of -1.065 for the base case, but less elastic demand is also considered.

The difficulty of identifying a total demand elasticity for the 1980s is apparent from the data on total disappearance (domestic use plus exports) plotted against market price, in figure 1. Supply shifts and/or changes in the CCC loan rate should permit identification of the demand curve, but the data suggest that shifts in demand have predominated instead. It is likely that the exchange rate of the dollar for foreign currencies explains part of the demand shifts. During the 1978-87 period, the Federal Reserve Board's real multilateral trade weighted value of the dollar index has at its highest value (132.0) in 1985 and at the two of the three lowest (83.2 and 90.6) in 1979 and 1987 (U.S. Council of Economic Advisers, 1988, p. 371).

Moreover, the 1985 crop year includes the months in which the transition to the marketing loan program was occurring. During the spring and summer of 1986, it was known that CCC market support would end on August 1, 1986, as the new (1986) crop year started. Since a substantial decline in market prices was expected to occur at that date, foreign buyers postponed purchases, thus greatly reducing exports in the last months of the 1985/86 marketing year (table 2). This means that the "85" point is an outlier not because demand was inherently weak but because of export purchase postponement. Still

looking at the 1985 and 1986 crop years together, and the weak exports at the beginning of the 1985 crop year -- before the 1985 Act was passed by Congress -- the evidence indicates reduced export demand as compared to earlier years.

Year-by-Year Program Analysis

Figure 2 shows estimated 1987 program effects following the methods used in earlier chapters. Total demand is 14.5 million bales at a season-average farm price of 63.7 cents per pound, determining point A. The rest of the demand curve is extrapolated using the -1.06 demand elasticity.

Production under program constraints is 14.5 million bales. In 1987 the U.S. average cotton yield was 702 pounds per acre, exceptionally high. However, the participation analysis is based on the yields that farmers could have expected in the planting season. Table 3 shows the relevant data. Expected revenue per pound is estimated as:

$$(1) \qquad R^* = \frac{\left[Y_p P_T + (Y^* - Y_p)P^*\right](1 - \alpha)}{Y}$$

where Y_p is payment yield, Y^* is expected actual yield, P_T is the target price, P^* is the expected market price, and α is the percentage of base acreage idled under the ARP. The ERS cost of production data indicate variable costs of about $220 per acre (Starbird et al., p. 149), and labor costs of about $20 per acre. Moreover, "skip-row" practices which leave land idle in the midst of planted fields, in strips at least 160 inches wide from plant to plant, count toward ARP requirements, and this permits some economies in use of land and by conserving water reduces production costs in subsequent

years when these areas are planted. Using $10 per acre fallowed as the value of this practice, the savings per acre of cotton land diverted from production are $250. To obtain the savings per pound of cotton are

$$(2) \qquad V = \frac{\alpha C}{Y^*}$$

where C is the cost savings per acre.

Using a normal yield of 600 pounds per acre as Y*, and 52 cents as the 1987 expected market price, the 1987 program parameters give a value of R* of 59.5 cents per pound, and of V, 10.4 cents per pound, for an overall expected return of 69.9 cents per pound for participants. This expected return exceeds the expected market price by 17.9 cents per pound, indicating that it pays to participate. Indeed, the participation rate was 92 percent.

Table 3 shows these numbers, with comparable calculations for the 1984, 1985, and 1986 crop years. The participation rate as a function of net return for participating suggests that a two-thirds participation rate would be achieved at a net return of about 11 cents per pound. This estimate is used as discussed in more detail in the wheat chapter to infer the market price at which the average producer would be indifferent between participating and not participating, which is the price at which the no-program quantity would be produced. This is the "no-program supply price" shown in table 3 for each crop year.

Alternatively, the "break-even" price can be used for the same purpose (see Chapter 1 for discussion). It suggests a higher no-program supply price, as shown in table 3.

To obtain the no-program supply curve, the participating acreage is returned to production, subject to a .3 slippage coefficient (as estimated in Norton). The slippage occurs because some idled cotton acreage would not return to cotton production, and because yield on the diverted acreage is lower than the average yield of cotton land. Once the no-program supply is located, its intersection with the demand curve identified earlier is found using an elasticity of supply of 0.5 (value from USDA-ERS FAPSIM model).

The resulting supply-demand equilibrium is shown in figure 2 and in table 4, under alternative assumptions. The two alternatives shown in figure 2 differ only in yield in the no-program situation. Point E, the base case, assumes no-program yield to be the "normal" 600 pound per acre level. The dashed supply curve assumes the no-program yield to be the actual 1987 yield of 706 pounds per acre. Neither is more correct in any absolute sense; they simply answer different questions. The dashed supply curve tells the 1987 no-program situation in a year with 1987's actual yields, while point E represents a "normal" 1987. The former is a better reflection of what actually might have happened in 1987 without programs, but the latter is a better reflection of the inherent economics of the 1987 program.

Table 4 shows what difference the alternative assumptions make for gains and losses. With actual 1987 yields, the price of cotton falls by substantially more than with normal yields, so the gains to farmers from having the program are substantially greater. The third column shows results of the break-even approach, using normal yield so that the most meaningful comparison is with the first column. Because the break-even price is higher than the no-program supply price in column 1 (compare the bottom two rows of table 3), the no-program supply curve estimated by this method is located to

the left of S in figure 2. Therefore, the market price does not fall so much in the absence of the cotton program. Note that the method of estimating no-program supply price makes less of a difference in gain and loss estimates than does the yield assumption.

The fourth column of table 4 considers a less elastic demand for cotton, -.5 for exports implying a total demand elasticity of -.39 as compared to -1.06 in the other simulations. Otherwise the inelastic demand case is the same as the base case of column 1. With inelastic demand the market price falls more, output expands less, and producers have more to lose by an end to the program.

Finally, the last column of table 4 shows a crude simulation of risk-averse cotton producers in the no-program situation, following the approach used in the wheat chapter. It is crude because it is simply assumed that cotton producers require a risk premium of 10 percent of the price received in order to produce the same quantity that they would have produced at a given expected price under the more stable environment of the cotton program. This means the supply curve is shifted vertically by 10 percent as compared to the base case. For example, if a 50-cent farm price called forth 12 million bales of cotton in the base case, then with risk aversion a 55-cent price is required to generate 12 million bales. The no-program situation shown in table 4 under this scenario has less production by 0.5 million bales than in the base case, and a market price 1.9 cents per pound higher. The consumer costs of the cotton program are only half as much as in the base case, because the program only raises the market price about half as much when risk aversion is as important as here simulated. But even in this case the producer gains and deadweight losses are not greatly changed, because these depend

predominantly on payments and idled acreage, respectively.

Overall, the varying assumptions in table 4 make a substantial difference in the estimates of producer and consumer gains, but the worldwide deadweight loss is quite stable at about $500 million. In all the scenarios this loss is mostly the opportunity cost of idled land, which is the same in each case. With a rental value of cotton land of $100 per acre and 4 million acres idled, the opportunity cost is $400 million.

Next the 1986, 1985, and 1984 programs are considered. The base case method is followed -- assume 600 pounds per acre no-program yield and export demand elasticity of -2.0. For the 1986 program the results are as shown in figure 3 and table 5. At a lower 1986 no-program farm price of 9.0 cents per pound, total demand is lower at 12.0 million bales, indicating a shift in demand to the left as compared to 1987. Note however that the estimated no-program price is higher than with the program in 1986. This occurred because the use of stocks from previous years under marketing loan provisions enabled 1986 consumption plus exports to exceed production by 4.4 million bales.

The 1985 program led to quite different results as compared to 1986. The 1985 loan levels held up the market price so much that production exceeded use by 5 million bales. Demand was even weaker in 1985/86 than in 1986/87, with 8.2 million bales sold at an average farm price of 56.8 cents per pound. This outcome is depicted as point A in figure 4. On the supply side, the cost of compliance was a little higher in 1985 and 1984 because, according the ERS estimate, land rental returns were about $10 per acre (1.8 cents per pound) higher. On the other hand, 10 percent of acreage idled received a diversion payment of 30 cents per pound of cotton that could have been grown, which is 10 cents per pound on the 30 percent total ARP. So the net cost of partici-

pation was 10 - 1.8 = 8.2 cents per pound lower in 1985. The equilibrium no-program prices and quantities are: P = 37.4 cents and Q = 11.0 million bales. Thus, extremely low prices are required to clear the market. Indeed the price seems absurdly low. The problem is in large part the shifting of export demand from the 1985 to the 1986 crop year because of the implementation of the marketing loan program, as discussed earlier. As a crude attempt to adjust for this transitory effect, divide the 1985/86 and 1986/87 exports equally between the crop years, giving exports of 4.2 million bales each year (2.3 million bales more than the actual 1985/86 exports of 1.9 million bales). This gives a no-program price of 47.9 cents per pound (dashed demand curve in figure 4). The alternative gains and losses are shown in parentheses in table 5.

The cotton program of 1984 is shown in figure 5. Total demand was 11.6 million bales at an average farm price of 58.7 cents per pound. At the no-program supply price (from table 3), no-program output is estimated at 15.7 million pounds, shown as point B in figure 5. The corresponding equilibrium no-program price and quantity are: P = 51.0 cents per pound and Q = 13.7 million bales. The no-program output turns out to be almost exactly the same as the output that the cotton program generated.

Discussion of Overall Gains and Losses

Because the analysis of each particular year's cotton program is idiosyncratic, especially 1987 with its high yield and 1985 with its transitory export dearth, the best way to obtain an overall indication of cotton program effects is by looking at the 4-year average effects. For example, actual cotton production in 1984-87 averaged 12.6 million bales,

while simulated no-program production averaged 12.8 million bales. Thus, the cotton program overall in the mid-1980s had only a slight positive effect on output -- the production incentive created by the target prices barely offset the effects of acreage diversion programs. Only a small change in the supply or demand elasticity used could change the direction of the production effect.

Actual farm-level prices in 1984-87 averaged 57.7 cents per pound, while the simulated no-program price averaged 52.0 cents. The average level of price support in this sense appears modest. But this comparison does not include the payments that farmers received. The overall producer gains averaged $1,180 million, or 19.5 cents per pound. The closest approximation to a producer subsidy equivalent (PSE) from this study is obtained by taking this 19.5 cent net gain per pound as a fraction of the no-program market price, i.e., 19.5/52.0 = .375. The cotton program in 1984-87 thus generated a PSE rate of 37.5 percent.

The domestic consumer gains are the price change caused by the program times the average of program and no-program domestic demand: for the 4-year average, 5.7 cents per pound times 3.3 billion pounds, or a $190 million loss. Similarly the foreign buyers' loss is $80 million.

For the average of the four years we have producers gaining $1.2 billion, U.S. consumers losing $0.2 billion, and taxpayers losing $1.0 billion. However, the redistributional story varies substantially from year to year because of stock adjustments as we first built up stocks and then dumped them under the marketing loan regime. For example, in 1986 the farm price of cotton would have been much higher without the cotton program according to figure 3. This is not so much because of what was done in 1986 as because of previous policies that caused the large stocks that were moved into

consumption and export channels in 1986. Thus it is misleading to look at any single year as reflecting only the particular policies of that year.

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Table 1. Program parameters for upland cotton

	1984/85	1985/86	1986/87	1987/88
Target price	81.0	81.0	81.0	79.4
Loan rate	55.0	57.3	55.0	52.25
Base acres(mil.)	15.6	15.8	15.5	15.3
Payment yield (lb./acre)	601	613	608	593
ARP percent				
required	25	20	25	25
paid	0	10	0	0
Participation rate	70	82	93	92
Diverted acreage (percent)[1]	22	34	35	31
Payments (millions)	655	1,054	1,386	951
Farm price	58.7	56.8	51.5	63.7
Production (mil. bales)	12.9	13.3	9.5	14.5
Total use	11.6	8.2	14.0	13.9
Exports	6.1	1.9	6.6	6.3
(share of use)	(53%)	(23%)	(48%)	(45%)
Change in stocks	1.3	5.3	-4.3	0.8
Ending stocks	4.0	9.3	4.9	5.7
Yield(lb./acre)	599	628	547	702

[1] Acreage enrolled with ASCS as diverted from cotton production, as a percentage of acreage planted. No adjustment for slippage is made.

Source: USDA-ERS, Cotton and Wool Situation and Outlook Yearbook, Sept. 1988, and USDA-ASCS.

Table 2. Cotton exports and spot market prices.

Crop year and month	Exports (1000 bales)	Market price[1] (cents per pound)
1984/85		
March 1985	662	60.18
April	578	61.71
May	453	60.11
June	375	59.76
July	267	59.55
1985/86		
August	207	57.87
Sept.	200	56.38
Oct.	218	56.14
Nov.	235	56.03
Dec.	197	56.25
Jan. 1986	187	58.39
Feb.	192	59.81
March	188	61.75
April	173	62.62
May	81	63.95
June	59	65.24
July	23	65.73
1986/87		
August	393	26.81
Sept.	387	33.56
Oct.	648	43.95
Nov.	552	45.74
Dec.	570	54.18

[1]Average strict low middling spot price for 1 1/16 inches (USDA ERS, 1986, p. 24)

Table 3. Gains from participation under the cotton program

	1987	1986	1985	1984
	----------¢/lb.----------			
Expected revenue	59.5	60.9	65.0	60.8
Saved variable costs	10.4	10.4	8.3	10.4
Expected market price	52	52	57	57
Net return for participating	17.9	19.3	16.3	14.2
Participation rate (%)	(92)	(93)	(82)	(70)
No-program supply price (2/3 part.)	63.9	64.9	68.0	66.5
Break-even price	69.9	71.3	73.3	71.2

Table 4. 1987 No-program situation: alternative estimates.

	Assumptions				
	Base case (normal yield)	Actual 1987 yield	Break-even approach	Inelastic demand	10% risk premium
No-program price (cents/lb.)	60.4	54.6	62.2	58.0	62.3
No-program output (mil. bales)	14.7	16.4	14.3	14.4	14.2
Producer gains ($ million)	670	1,230	540	830	530
Domestic consumer gains	-120	-360	-60	-210	-50
Taxpayers gains	-980	-980	-980	-980	-980
Sum of U.S. gain	-430	-110	-500	-360	-500
Foreign gains	-100	-290	-50	-170	-40
Worldwide gains	-530	-400	-550	-530	-540

Table 5. Estimated gains from the cotton program

	1987	1986	1985	1984	Average
No-program output (mil. bales)	14.7	12.0	11.0 (12.4)[a]	13.7	12.8
No-program price (cents/bale)	60.4	59.0	37.4 (47.9)	51.0	52.0
Producer gains (mil. dollars)	670	650	2,230 (1,660)[a]	1,160	1,180
Domestic consumer gains (mil. dollars)	-120	240	-690 (-290)	-220	-200
Taxpayer gains (mil. dollars)	-980	-1,390	-1,060 (-1,060)	-655	-1,020
Foreign gains (mil. dollars)	-100	230	-210 (-200)	-240	-80
Sum of U.S. gains	-430	-500	490 (310)	280	-40
Sum of worldwide gains due to U.S. program (mil. dollars)	-530	-270	280 (110)	40	-120

[a]Alternative 1985 values in parentheses increase export demand by 2.3 million bales in the no-program situation to reflect the transitory decline in demand caused by announcement of the marketing loan program for the 1986 marketing year.

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Figure 1. Cotton price and quantity used

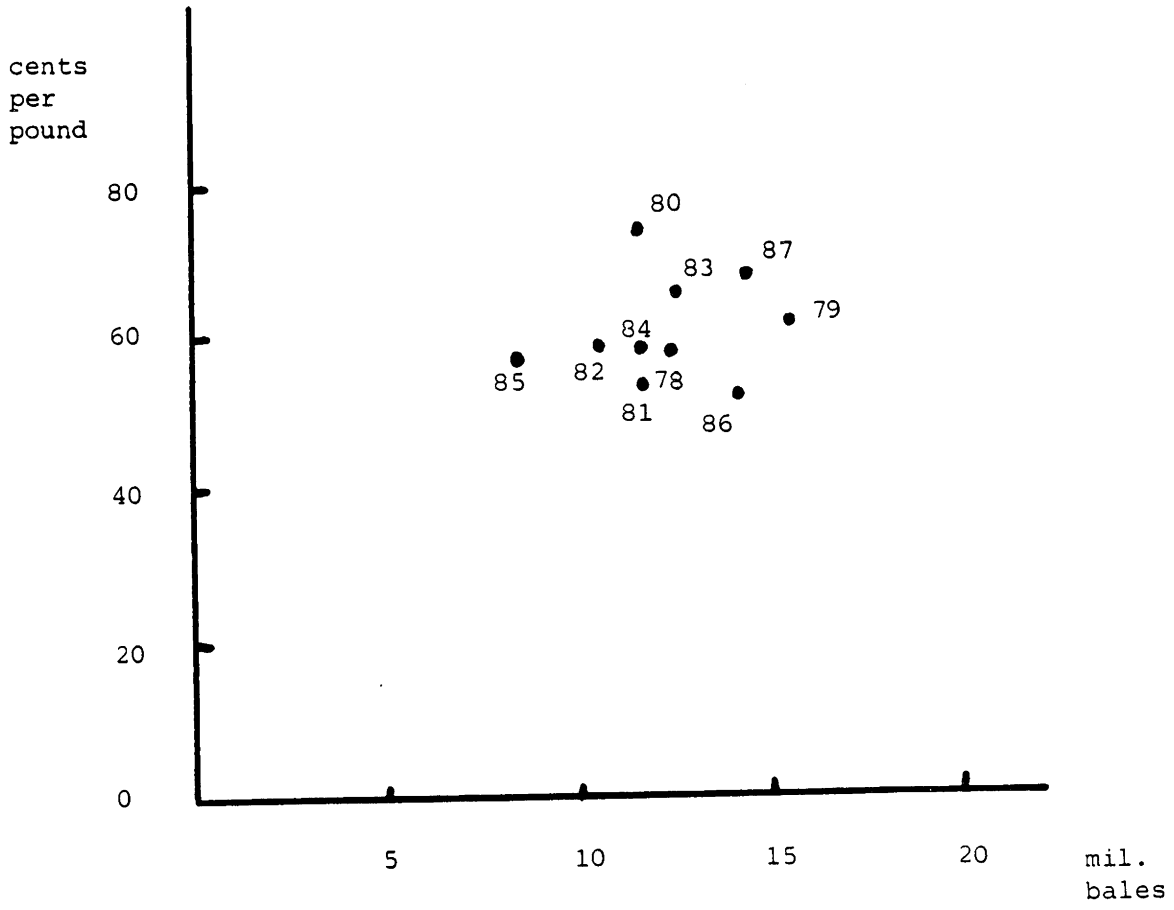

Figure 2. 1987 Cotton Program

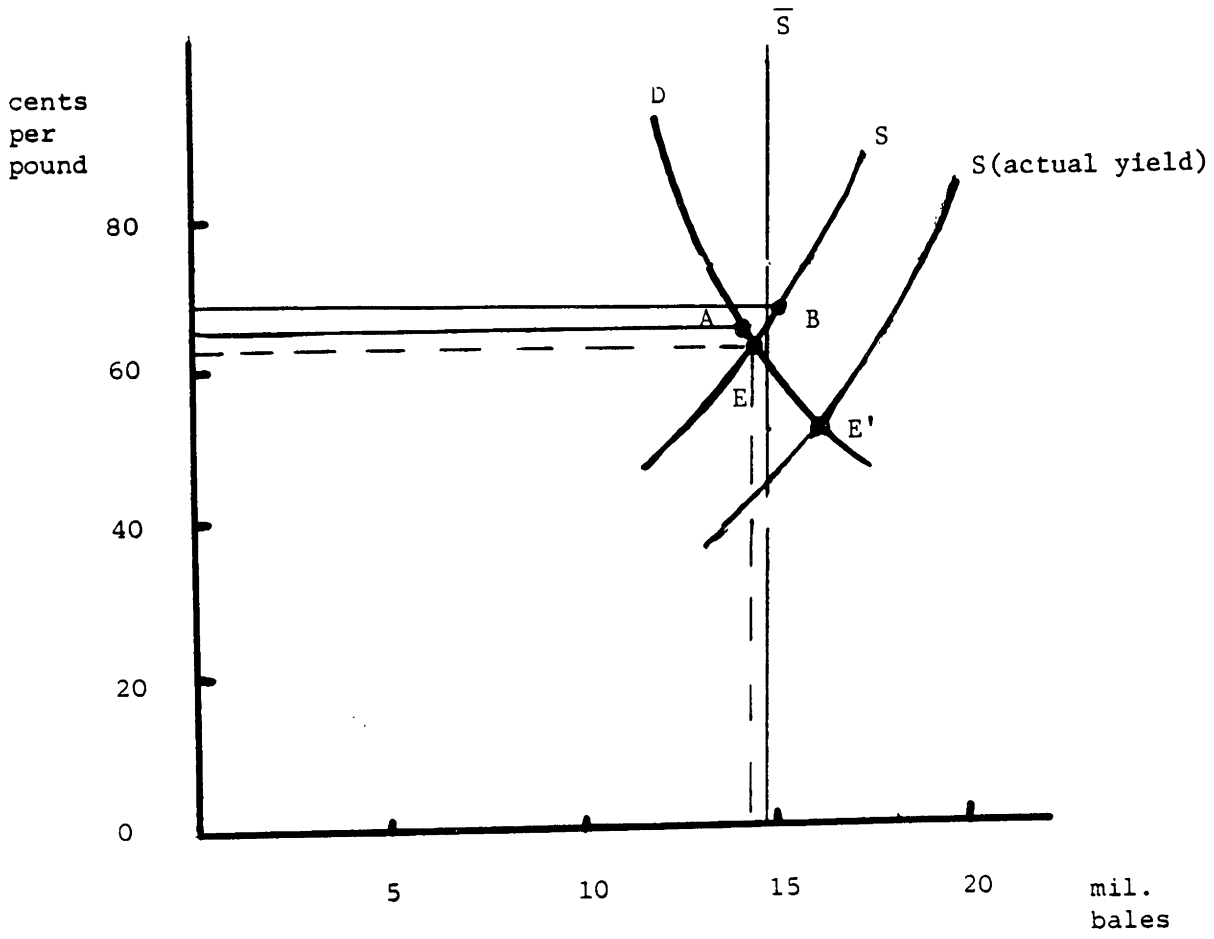

Figure 3. 1986 Cotton Program

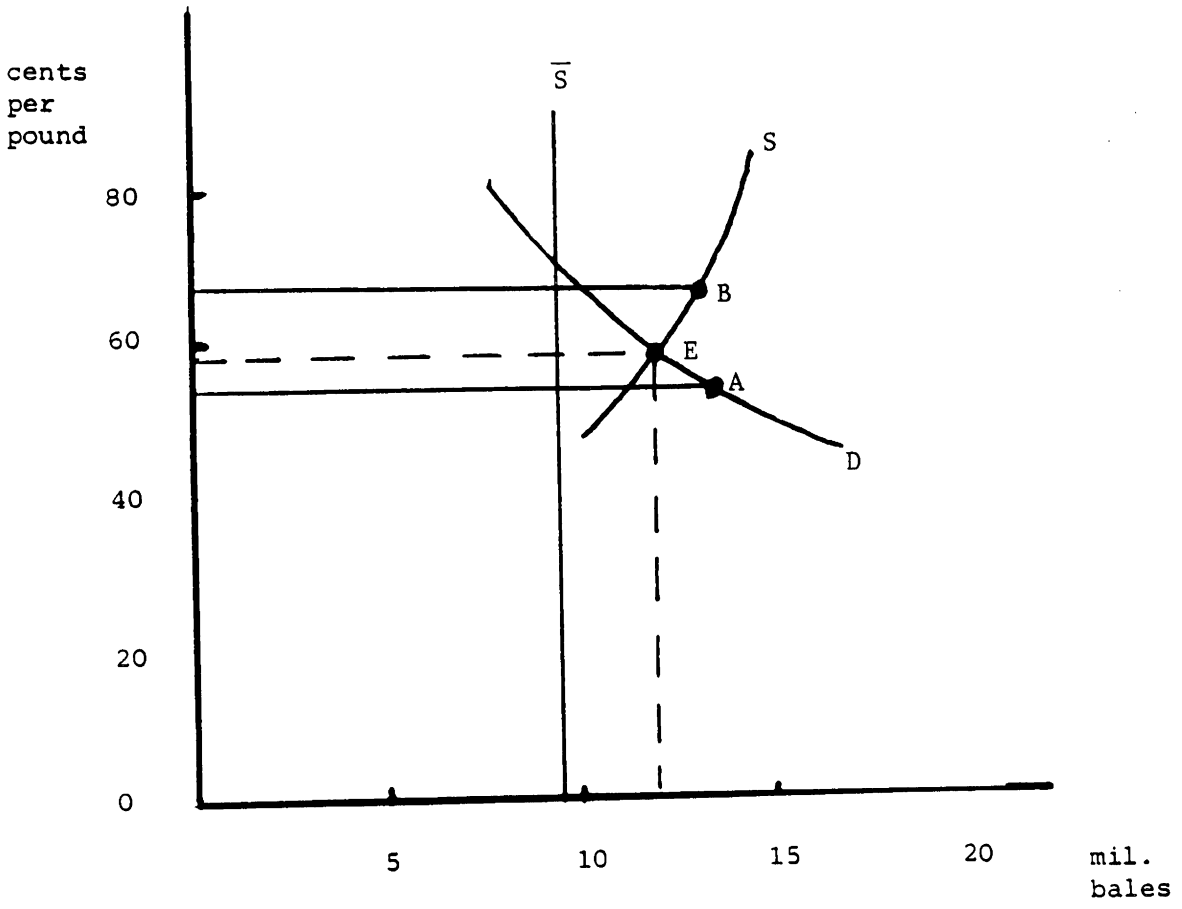

Figure 4. 1985 Cotton Program

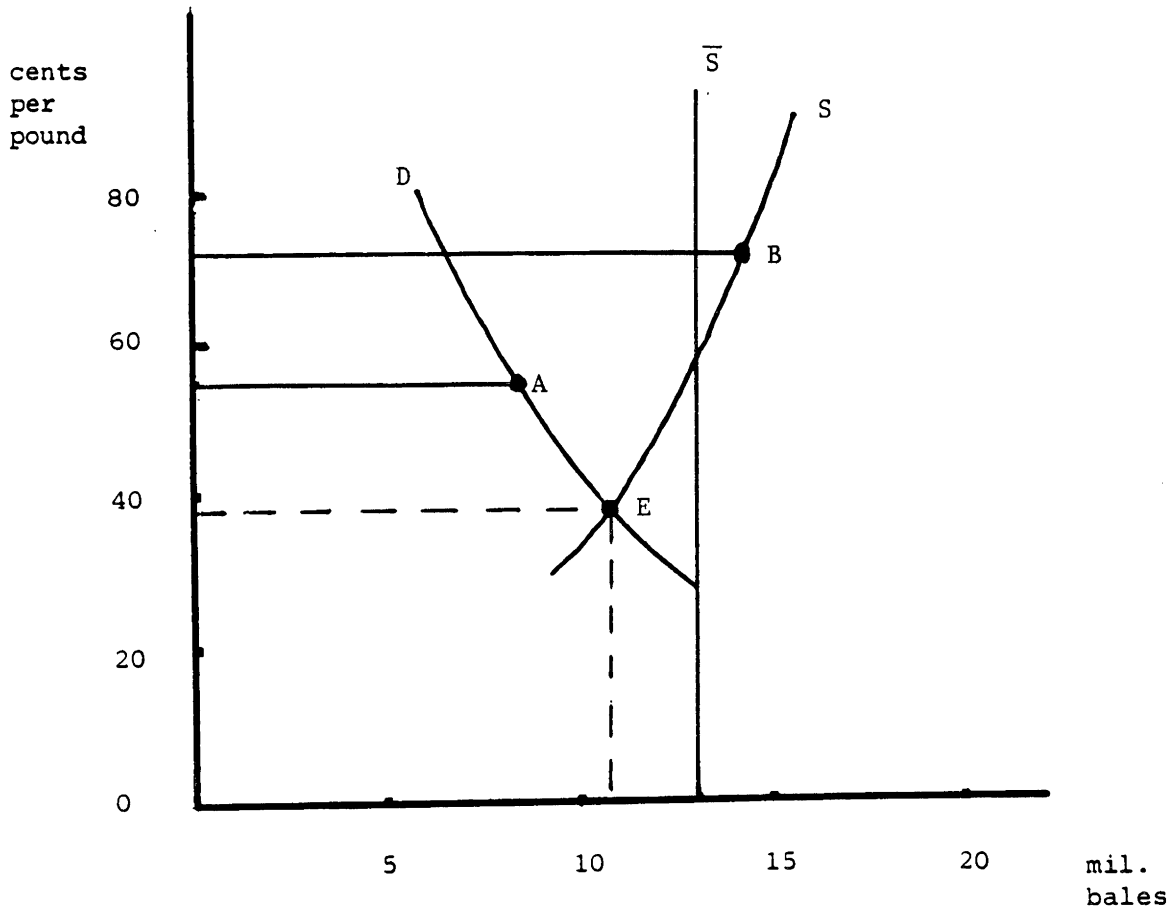

Figure 5. 1984 Cotton Program