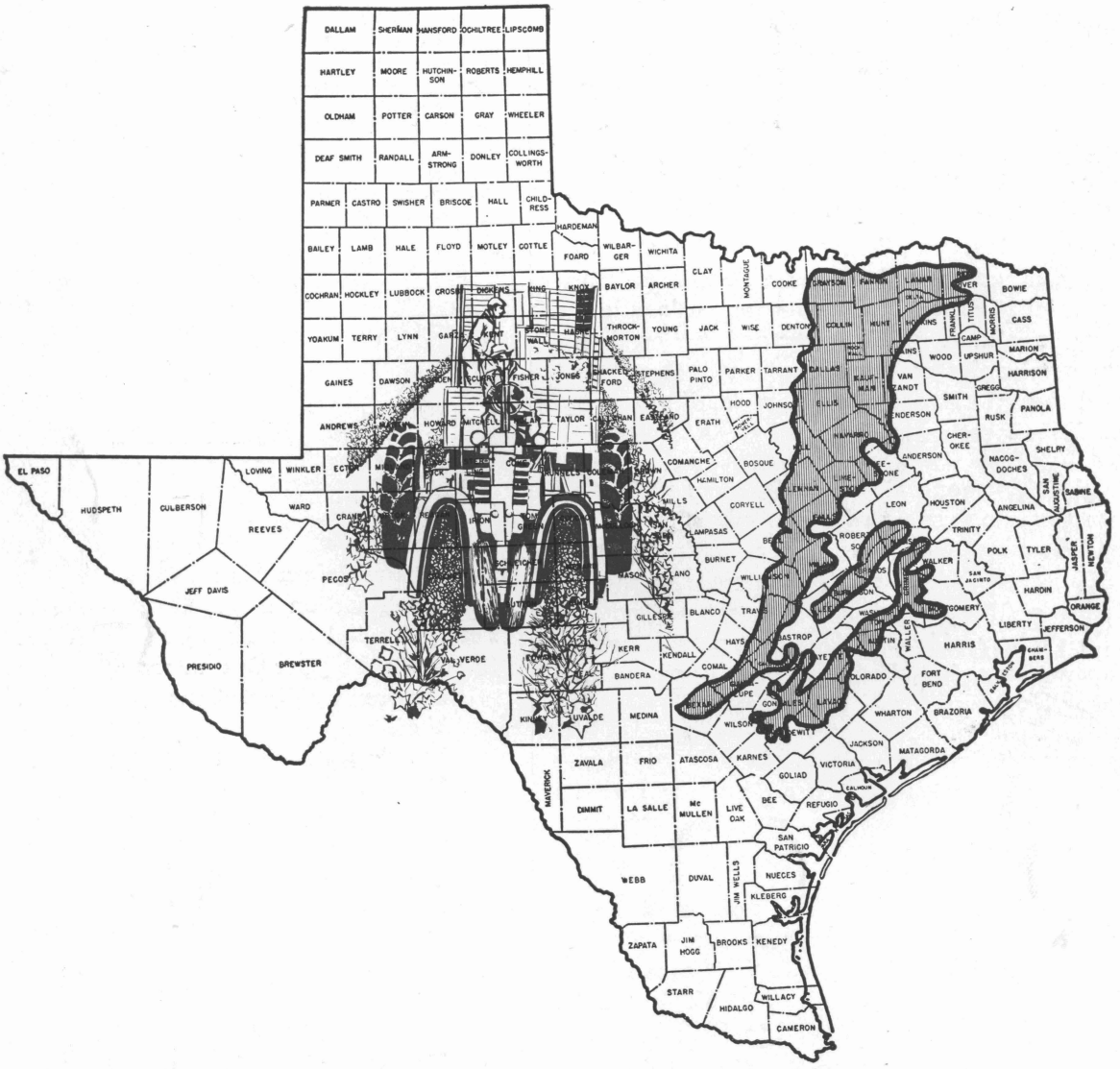
Economics of Mechanical Cotton Stripping on Blackland Farms



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IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE

SUMMARY

Harvesting cotton with mechanical strippers is more economical on the Blackland Prairies than hiring labor crews to pull or snap by hand. An economical evaluation of machine versus hand harvesting covering both "good" and "bad" years, and years with and without acreage controls, indicates that stripping increases the returns from cotton production.

Income may increase $10 to $25 a bale when cotton is stripped instead of being hand-harvested. An average increase of $14 per bale was recorded in a study of harvesting methods during 1952-55. Growers who used improved production methods throughout the season obtained the best results. Proper seedbed preparation, adequate insect control, timely cultural practices and efficient desiccation or defoliation and stripping operations are necessary to obtain good yields and better than average grades for maximum returns. Gins are equipped to turn out acceptable grades if properly harvested seed cotton is delivered.

Good stripper operators usually have no more field loss than do farmers who hire crews to hand-harvest their crop. However, on cooperating farms, about 200 pounds more seed cotton were required to produce a 500-pound bale of machine-stripped cotton than a bale of hand-pulled cotton. The average discount for stripped cotton versus hand-pulled cotton was 100 points, or $5 a bale.

Farmers with average yields of only a quarter-bale an acre cannot expect a satisfactory return from cotton at current prices, regardless of the harvesting methods used.

Growers with 50 or more acres of cotton, and with yields of a half-bale or more per acre, can harvest cotton more economically with their own strippers than by hiring stripping done at $1 per hundredweight of seed cotton, hauled to the gin.

A fiber and fabric test, conducted as a part of this study, showed no significant difference in intrinsic value in cloth woven from cotton, half of which was hand-pulled and the rest machine-stripped.

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Economics of Mechanical Cotton Stripping on Blackland Farms

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AN INCREASING NUMBER OF FARMERS in the Blackland Prairies area of Texas are adding to their farm returns by harvesting cotton with mechanical strippers. Experience gained over a number of years has convinced some stripper users that harvesting all their cotton by machine is satisfactory and economical. Others rely on hired labor for early-season harvest and use strippers for the rest.

The study reported here was made to permit an economic evaluation of machine versus hand harvesting of cotton in an area in which machine stripping is relatively new.

An unfavorable growing season in 1952 resulted in low yields on cooperating farms and in the area in general. Record high yields were obtained the following year. There were no cotton acreage restrictions in 1952-53, but allotments in 1954 brought about a marked reduction in cotton acreage. A hot, dry season in 1954 resulted in very low yields.

Relatively good yields were obtained on the reduced cotton acreage in 1955. The 1956 season, however, was similar to that of 1954. The hot, dry weather resulted in low yields and low returns from cotton. Detailed production records were not obtained from cooperating farmers in 1956 because of the similarity to 1954 conditions. This report, therefore, is an evaluation of mechanical cotton harvesting in 2 "good" and 3 "bad" years.

BACKGROUND INFORMATION

Before World War II, parts or all of the 33 counties included in the Blackland Prairies area (as shown on the cover) produced 33 percent of the Texas cotton crop on 32 percent of the Texas cotton acreage. During the 5 years when records were obtained from cooperators, the percentages of the State's cotton production were 20 and 24, respectively. Blackland cotton formerly sold at premium prices when longer staple and preferred character were recognized by buyers as typical of many localities in the area. With farm labor scarcity, caused by wartime conditions, many growers changed from planting open-boll varieties to tighter, more storm-resistant types to permit harvest workers to "pull" or "snap" bolls, instead of the slower and more expensive "picking" that was done previously.

Volume leadership in the area was lost with the increase in production of irrigated cotton on the High Plains and in the Lower Rio Grande Valley. The damaging freeze in the Valley in 1951, which killed most of the citrus trees, combined with the relatively high prices received for cotton during the postwar years, initiated the increase in acreage of cotton as a substitute cash crop. The phenomenal increase in the number of irrigation wells, and the expanded acreage of irrigated cotton on the High Plains during 1948-53, established this part of West Texas as the major cotton-producing area of the State.

CURRENT SITUATION

In the Blackland area, cotton acreage per farm and total cotton acreage have been reduced under the acreage allotment programs. Although present allotments are based on historical records of individual farms, the average cotton acreage in the area is almost a third of the cropland on cotton-producing farms. A majority of the growers use storm-resistant varieties more suitable to the rougher harvesting by hand-pulling or by machine. About a fourth of the producers in the Blackland counties participated in the soil bank program in 1953. Cotton acreage on these farms, as well as on "nonagreement farms," generally was on the best cotton land available.

An adequate number of gins in the area have been modernized to the extent that the rougher-harvested cotton can be ginned satisfactorily. However, even the best gins cannot turn out a high-quality product unless the seed cotton delivered to them has been harvested properly.

FARMS STUDIED

In 1952, a number of growers in Hill, Ellis and Johnson counties planned to harvest cotton with strippers. Sixty-three of these farmers provided the information for this study. Of the 3,226 bales of cotton grown on these farms, 2,772 bales, or 86 percent, were harvested by mechanical strippers. All the cotton on 34 farms was harvested mechanically. In ad-

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dition, 35 machine owners custom-harvested 1,134 bales for other farmers in the area.

Of the cotton grown on cooperating farms, 74 percent was harvested mechanically in 1953; 91 percent in 1954; and 88 percent in 1955.

Bales harvested per machine on cooperating farms during the study were:

	1952	1953	1954	1955
Own cotton	44	80	23	44
Custom harvested	18	18	6	8
Total.....	62	98	29	52

Of the 63 operators, 39 used strippers for the first time in 1952. Twenty operators began stripping in 1951; 2 in 1950; and the rest in 1949. It was observed generally that the growers having more experience using strippers produced the better grades.

Reports from county agents in the area indicate a substantial increase in the number of cotton strippers since 1952, while, statewide, stripper numbers have doubled.

SUCCESSFUL STRIPPER OPERATIONS

The following operations are presented to summarize the experiences of the more successful farmers in the area who have adopted mechanical harvesting as a regular part of their cotton production program.

Preplanting Operations

To be most successful with a stripper, plans should be made before planting time. Steps should be taken to assure a relatively weed-free field. Long, straight rows are desirable. On contoured or terraced fields, the number of point-rows should be kept to a minimum. Residue from a preceding crop should be disposed of to prevent corn, sorghum or cotton stalks from clogging the gathering units of the stripper the following fall.

Varieties

A variety of cotton with storm-resistant characteristics is essential for satisfactory mechanical-stripper harvesting. During the study, cooperating farmers used several of the stripper-type varieties available in the area. Growers and cotton breeders are concerned with the desirability of variety improvement to obtain seed with higher germination and better-yielding varieties of longer staple length.

Planting

On most farms, planting was in 38-inch rows, but 40-inch rows are recommended for most strippers. Planting solid in the rows has become almost a universal practice with stripper operators. Close planting makes for the thicker, more uniform stand necessary for good stripper harvesting.

Growers have increased the amount of seed planted per acre for machine harvesting. A bushel was used by some farmers, but 24 pounds of nondelinted seed per acre was the most common rate among cooperators in the study.

Fertilizing

Very few cooperators used fertilizer on their cotton. However, most farmers are interested in obtaining higher yields. Experimental work at the Blackland Experiment Station at Temple shows little net returns from the use of commercial fertilizer. A few cooperators have tried, or plan to use experimentally, anhydrous ammonia either ahead of planting or as a side-dressing in midseason.

Cultivating

The number of cultivations and amount of hoeing necessary to control weeds and retain soil moisture depend on the season and field conditions. Successful stripper operators keep in mind that it is easier to do a good job of harvesting on a field relatively free of weeds. During the growing season, the planting beds are worked down so the crop can be laid by with a slight depression between the rows. The leaf-trash then will tend to collect between the rows, thus leaving the rows of plants relatively clean with a minimum of debris in the way of the gathering units at harvest time.

Experiments at Substation No. 23 at McGregor with herbicidal oil applications hold considerable promise for successful weed control under careful cultural practices, as a preplanting operation and during the growing season. Particular attention is given to the eradication of Johnsongrass. Reduction or elimination of hand labor and "stoop work" places cotton in a better competitive position with synthetic fibers.

Insect Control

The frequency of application and the kind and amount of poison required, depend on the season and the seriousness of insect infestation. Several cooperators followed the "early-poisoning program" each year, chiefly to control thrips, flea hoppers, aphids and overwintering boll weevils. In 1952, where recommended practices were followed, cooperating farmers realized a net increase of $7.65 per acre. Controlling insects in the early stages of cotton plant development encourages early and determinant fruiting and more uniform maturity of the crop, permitting early harvest and resulting in better grades.

Cooperators in Hill, Johnson and Ellis counties in 1955, who planted cotton before May 15 and then controlled insects early in the season, realized $58 more per acre than did the growers with late cotton

and little or no insect-control program. Early and complete destruction of the cotton plants after harvesting is another step in minimizing insect damage.

Desiccation-Defoliation

At least 80 percent, and preferably 90 percent, of the bolls should be open before chemicals are applied ahead of stripping. Desiccation or defoliation before plant maturity often results in reduced yields and causes ginning difficulties, with weak and short fibers and a lower price to the grower. Desiccation dries the leaves on the plant without removing them, whereas defoliation causes the leaves to fall.

Application with a four-row sprayer having two to four nozzles per row was common, although some use was made of airplanes on a custom-rate basis. Experience varied widely, so that no exact "best way" can be stated as to sprayer speed, tank pressure and many other items. On farms where good results were obtained, precautions were taken to insure complete plant coverage. Trying to defoliate when the wind is blowing more than 10 miles an hour makes it difficult to do a good job.

Desiccation is preferred over defoliation by most growers. The most common desiccant, pentachlorophenol (PCP) concentrate, under a variety of trade names, was used on the farms in this study. An average of a barrel of material was applied to 7 acres of cotton. This chemical mixture consisted of 4 gallons of concentrate in 50 gallons of diesel oil. The cost averaged $2.50 per acre for spray material alone, including limited use on a few farms of a 2,4-D additive to prevent regrowth.

In testing seed produced during the first 3 years of the study, no harmful results were observed in seed from plants treated with 2,4-D. However, tests on seed grown in 1955 showed that germination was about 50 percent for seed from 2,4-D-treated plants and about 75 percent for seed from plants treated with other chemicals in preharvest preparation. Seedlings from 2,4-D-treated seed showed leaf and root symptoms typical of 2,4-D damage and poor growth. Several cooperating farmers in 1953-54 used some 2,4-D as a "plant-killer" with no harmful results evident in the seed, probably because the plants were more nearly dormant at harvest time. However, because of late rains in 1955, many plants were in active growth when sprayed. This is the only reason advanced so far as to why the 1955 seed tests differed from previous tests. Meal made from cottonseed produced on defoliated plants showed no toxic effects from chemical treatment of the plants.

Thirty to 40 acres may be sprayed at one time, with a few days interval before applying chemicals to another similar block. This procedure permits stripping under optimum conditions that might not exist if too many acres were desiccated or defoliated ahead of the stripper. Unless a plant-killer is used, serious regrowth may occur, especially in a harvest season marked by frequent rains. Most operators plan to start stripping cotton 7 to 10 days after chemical application. However, considerable variation may be caused by plant conditions in certain fields, or by rain that may delay the stripping operation for several days. Sometimes repeating application on parts or all of a field may be necessary, thereby increasing harvesting costs. An unusually dry season at harvest time may permit stripping 3 to 5 days after applying chemicals.

Some cooperators have applied arsenical sprays, but the danger of poison to humans and livestock is an ever-present hazard that demands caution in their use.

Stripping

The skill of the tractor driver often determines the amount of cotton lost in the stripping operation. He must keep the tractor on the rows, drive at the proper speed, keep the elevator adjusted to put cotton in the trailer, manipulate the tractor carefully at turn-rows, and so on. When other conditions are favorable, a good stripper usually has a smaller field loss than would an average crew of hand-pullers. Time spent in making proper stripper adjustments before starting to harvest will help obtain optimum results. Variations in plant conditions often occur from one field to another, or even in different parts of the same field. A good operator will keep rollers, gathering units and other parts of the stripper adjusted to changing plant and field conditions to obtain the best results.

Possibly a tractor driver can harvest cotton alone, but most operators have someone in the trailer to distribute the cotton as it comes from the elevator. If someone is in the trailer, unnecessary tramping should be avoided to prevent dirt and trash from becoming imbedded in the lint. A blower attachment is commonly used on the elevator. This permits better load distribution, eliminates some dirt and trash and makes it possible to concentrate many of the green bolls in the front end of the trailer. If there are many green bolls, they may be ginned after drying.

Where the cotton stalks meet or overlap in the middles, wheel shields on the tractor are advisable. If a field contains "dead cotton" resulting from root rot or some other reason, roller attachments or "stalk-walkers" are recommended. These press-wheels, or rollers, attached at the back end of the gathering units prevent dead plants from being pulled into the gathering mechanism.

Hauling

The more experienced operators prefer trailers holding around 4,500 to 5,000 pounds of seed cotton (2-bale capacity). Using wire on the sides of the

trailer has some advantages. It makes the trailer lighter and some dirt and trash is blown or jostled out enroute to the gin. Disadvantages of such wire-side trailers, however, are the destructibility of the wire and their limited use in hauling other crops.

A good trailer now costs about $400. If long hauls are contemplated, the tires should be kept in good condition. Because of the limited use of trailers during the year, the annual cost per acre, or per bale, is a significant item.

A large crop, such as occurred in 1953, caused some congestion at most gins at the height of the harvest season. Longer than usual hauls were made often to get more prompt ginning, thus making empty trailers available more quickly.

Ginning

Many gins in the area have modern cleaning and drying equipment. Gin improvement is necessary to permit handling hand-pulled as well as stripped cotton. Less than 2 percent of the Blackland cotton is now estimated to be picked by hand.

Good ginning is necessary to get the highest grade possible from a given load of seed cotton. Adequate cleaning equipment is required. If drying is needed, too much or too little heat can affect the quality of the fiber. At the peak of the ginning season, there is a temptation to gin each bale in the shortest possible time. This procedure does not produce the highest possible grade in all instances. Neither ginners nor growers benefit from the ginning of cotton that is immature, has many green bolls or is too wet or trashy. Even the best gins cannot turn out high grade lint from poorly harvested cotton. Growers often urge fast ginning to get their trailers back as soon as possible. In this highly competitive business, ginners try to please their customers, so farmers and gin operators alike share the responsibility for the rapid processing which may result in overdrying, 2-sided bales and other quality reducing effects.

Plant Disposal

By cutting or shredding and covering stalks immediately after the cotton is harvested, more time is allowed for plant decomposition and some insect control results. Where the pink bollworm-control program is in effect, plant disposal is required.

Postseason Field Preparation

More soil compaction is experienced in stripping than in hand-harvesting cotton. In defoliating and stripping, the rows are traveled extra times with tractor, stripper and trailers. Operators often center-furrow after harvest to breakup the compacted soil between the rows, thus permitting fall rains to penetrate the subsoil and retard run-off.

Harvesting Experiences

Wide variations in yield per acre occurred in the area and on the cooperating farms during the study, Table 1. During a 27-year period (1928-54), yields in the area averaged 153 pounds of lint, varying from 106 to 234 pounds per acre, according to USDA crop reports. Below-average yields occurred in 1952, 1954 and 1956. Yields in 1953 and 1955 were above average, with 1953 a record high year. Hand-harvesting costs to cooperating farmers, including hauling and ginning charges, averaged $57.54 per bale during 1952-55. Comparable costs for stripped cotton, including defoliation or desiccation, averaged $38.33 per bale, Table 2.

Yields of mechanically harvested cotton during 1952-55 averaged 140, 284, 117 and 218 pounds of lint per acre, respectively. In the part of the Blackland where the study was made, seasonal rainfall in 1954 was below the average for the whole area. This situation with respect to season and resulting yields should be kept in mind in considering the following comparisons and analyses.

Two ginners in the area, who were patronized by a number of the cooperating farmers, supplied Smith-Doxey grade information, bale weight and gin

TABLE 1. COTTON ACREAGE AND YIELD IN TEXAS AND BLACKLAND AREA AND YIELD ON COOPERATING FARMS, 1952-56, AND AVERAGE 1946-55

Year	Cotton acreage		Yield, lint per acre		
	Texas	Blackland area	Texas	Blackland area	Cooperating farms
	1,000 acres	1,000 acres	Pounds	Pounds	Pounds
1952[1]	11,756	2,630	155	135	140
1953[1]	9,568	2,466	217	234	284
1954	8,065	1,901	245	133	117
1955	7,270	1,668	281	219	218
1956	6,200	1,583	280	129	[2]
Average 1946-55	8,617	2,472	208	163	[2]

[1]No acreage control program.
[2]Records not obtained.

turnout data on all bales ginned during 1953-54 for which they had knowledge of the harvesting method used. Four gins cooperated in 1955. Grade and staple differences, as reflected in quotations from a leading cotton merchant, were applied to each bale in arriving at the value of the cotton. Most of the stripped cotton was the Lankart-57 variety. The hand-harvested cotton consisted of Rowden, Deltapine, Empire, Lankart and other varieties common to the area.

The harvesting costs per bale for stripped cotton averaged 68, 50, 88 and 58 percent of the costs for hand-harvested cotton during 1952-55, respectively. This variation in relative costs was caused largely by the significant difference in average yields per acre. The importance of getting high yields to assure economies of machine harvesting is emphasized by the results of the study. Farmers could not prevent the unseasonally hot, dry summers in 1952, 1954 and 1956, but cultural practices discussed earlier are those the more successful growers try to follow in achieving higher than average yields. The yield on some farms was so low in 1954 and 1956 that had it not been for strippers, probably no cotton would have been harvested from many of the fields. Even with workers in plentiful supply, it would have been difficult to get them to pull cotton when 6 to 8 acres were needed to provide a bale.

Changing Cotton Acreage

Cooperating farmers planted 70 percent of their cropland in cotton in 1952 and 66 percent in 1953. Under the acreage allotment program, cotton was produced on about half the cropland acreage in 1953, and was reduced to a little more than 40 percent in 1955.

Participation in the soil bank program in 1956, in addition to the acreage-allotment program, was extensive in the area. More than 19,000 farmers put almost 250,000 acres in the reserve program. A record of participation was not obtained from farmers cooperating in this study in 1956, but it may be presumed that the combination of allotment and reserve programs resulted in a substantial decrease from the average of 264 acres in 1952.

About a fourth of the farmers participated in the acreage-reserve program in 1957. Participants placed 16.5 acres per farm in the cotton-acreage reserve, for which they received an average of $28.35 an acre. The acreage available for cotton production averaged 25.4 per farm for all cotton farms in the 33-county area.

As cotton acreage decreased under the allotment and conservation programs, more of the cropland in the area was planted to corn, sorghums and small grain, particularly oats. Cotton continues as the chief money crop, but with decreasing acreage and subsequent smaller production per farm, net farm returns have diminished.

Two items remained relatively steady during the study. Wage rates for hired labor, both for hoeing and for snapping cotton, varied little. The local loan rate for Middling cotton, 15/16-inch staple, was

TABLE 2. COMPARATIVE DATA FOR HAND AND MACHINE-HARVESTED COTTON, 1952-55

Item	1952	1953	1954	1955	Average
Cost per bale:			Dollars		
Hand-harvested cotton:					
Snapping and hauling	43.05	42.19	42.20	46.76	42.52
Ginning	14.68	15.01	16.37	15.69	15.02
Total	57.73	57.20	58.57	62.45	57.54
Machine-harvested cotton:					
Defoliating, stripping and hauling	18.92	9.61	22.36	12.40	16.15
Overhead, stripper	5.47	3.46	11.70	6.52	6.31
Ginning	15.00	15.35	17.60	17.02	15.87
Total	39.39	28.42	51.66	35.94	38.33
Hand-harvested cotton:					
Farms, number	29	31	5	9	18
Acreage harvested per farm	54	75	62	24	60
Bales harvested per farm, number	16	46	16	11	28
Yield per acre, pounds	143	292	122	224	226
Average seed cotton required per 500-pound bale, pounds	2,050	1,875	2,110	2,175	1,931
Wage rate per cwt. seed cotton, dollars	2.10	2.25	2.00	2.15	2.12
Machine-harvested cotton:					
Farms, number	63	51	36	17	42
Farms doing custom work, number	35	29	12	7	21
Acreage harvested per operator	211	166	119	115	168
Bales harvested per operator, number	62	98	29	52	65
Yield per acre, pounds	140	284	117	218	185
Custom rate charged per cwt. seed cotton, dollars	1.25	1.00	1.00	1.00	1.00
Average seed cotton required per 500-pound bale, pounds	2,150	2,100	2,150	2,250	2,160

TABLE 3. ESTIMATED COST OF HARVESTING 100 ACRES OF COTTON AT THREE LEVELS OF YIELD, WITH HARVESTING DONE BY HAND AND MECHANICAL STRIPPER, USING 1959 PRICES

Item	Yield, pounds of lint per acre		
	125	250	375
	— — — — Dollars — — — —		
Mechanical harvesting:			
Stripping cost	975	1,100	1,300
Hauling and ginning[1]	806	1,612	2,417
Total harvesting cost	1,781	2,712	3,717
Harvesting cost per bale	68	52	48
Hand harvesting:			
Snapping	1,313	2,625	3,938
Hauling and ginning[2]	747	1,494	2,241
Total harvesting cost	2,060	4,119	6,179
Harvesting cost per bale	79	79	79

[1]Gin charges: 65c per cwt. seed cotton plus $4 per bale for bagging and ties = $18.95, plus 25c per cwt. seed cotton for hauling to gin = $24.70 total per bale. Assumes 2,300 lb. seed cotton required per 500-lb. gross-weight bale.

[2]Gin charges: 65c per cwt. seed cotton plus $4 bale for bagging and ties = $17.65, plus 25c per cwt. seed cotton for hauling to gin = $22.90 total per bale. Assumes 2,100 lb. seed cotton required per 500-lb. gross-weight bale.

31.80, 32.57, 33.12, 33.41 and 31.56 cent a pound in 1952-56, respectively.

Over the season, and as an average at the cooperating gins, machine-stripped cotton was valued at about $5 less per bale than hand-pulled cotton. Hand-pulled Middling 15/16-inch cotton was discounted by an average of 300 points off the loan basis, while stripped cotton averaged 400 points off. If these discounts were applied to the average harvesting costs on the cooperating farms, the return advantage for stripped cotton would be a little above $14 a bale, Table 2.

Average harvesting cost per bale, hand-harvested cotton	$57.54
Average harvesting cost per bale, machine-harvested cotton	$38.33
Difference	$19.21
Additional discount per bale, machine-harvested cotton	$ 5.00
Net advantage of machine harvesting	$14.21

TABLE 4. ESTIMATED PREHARVEST COST OF PRODUCING 100 ACRES OF COTTON AT THREE LEVELS OF YIELD, USING 1959 PRICES

Item	Yield, pounds of lint per acre		
	125	250	375
	— — — Dollars — — —		
Labor	625	695	775
Tractor and machine use	375	400	430
Seed	330	340	350
Poison material	200	350	500
Total preharvest cost[1]	1,530	1,785	2,055
Preharvest cost per bale harvested	59	34	26

[1]Excluding overhead.

EVALUATION OF HARVESTING METHODS

Economic data obtained from this study may be useful to a Blackland cotton farmer who is undecided as to whether to continue harvesting by hand or to change completely to harvesting with a stripper.

It is impractical to illustrate comparative costs and returns for a large number of individual farms. However, assumed situations may serve as a guide in determining the relative economy of the harvesting method under selected yield and price levels. Production methods, as disclosed in the study, using 1959 cost rates, have been used in estimating costs and returns, Tables 3 to 7.

ASSUMPTIONS

Size of farm: 400+ acres

Total cropland: 300 acres

Cotton allotment: 100 acres

Cotton lint, yield per acre: three levels—125, 250 and 375 pounds.

Prices received for lint: two levels—

Hand-harvested cotton, 25 and 30 cents per pound.

Machine-stripped cotton, 24 and 29 cents per pound.

These prices reflect 100 points off for machine-harvested cotton.

Value of cottonseed: $40 per ton.

Preharvest costs reflect average Blackland operations, seeding and poisoning rates, using current prices. No fertilizer applications are included.

Harvesting costs include hauling to the gin. Hand-snapping and defoliation are charges against the applicable harvesting method.

Table 7 shows estimated returns to land and management from cotton. From these estimates, returns from machine harvesting are $5 to $6 more a bale over hand-harvesting when yields are around 125 pounds of lint per acre. With yields at one-half to three-fourth bale per acre, returns are $22 to $27 more a bale, respectively.

Ownership of Stripper

On a farm with 100 acres of cotton or less, where yields average a quarter bale per acre, it probably would not be economical to own a stripper unless custom work could be done each year. If low-yielding cotton on the smaller acreages can be stripped at a custom rate of $1 per hundredweight of seed cotton, delivered to the gin, it probably would pay to hire stripping. However, it is not always possible to hire work at the most opportune time.

TABLE 5. ESTIMATED COST OF PRODUCING 100 ACRES OF COTTON AT THREE LEVELS OF YIELD, WITH HARVESTING DONE BY HAND AND MECHANICAL STRIPPER

Item	Machine harvest			Hand harvest		
	Pounds of lint per acre			Pounds of lint per acre		
	125	250	375	125	250	375
	Dollars					
Preharvest costs	1,530	1,785	2,055	1,530	1,785	2,055
Harvesting costs	1,781	2,712	3,717	2,060	4,119	6,179
Total costs[1]	3,311	4,497	5,772	3,590	5,904	8,234
Cost per bale	127	86	74	138	114	106

[1]Excluding charges for overhead, land and management.

This analysis indicates that if stripping can be hired at $1 per hundredweight, a farmer having only 50 acres of cotton with yields averaging one-fourth bale per acre could save $180 by hiring custom stripping rather than owning and operating his own stripper. He could own a stripper, harvest his cotton and arrange to net at least $180 worth of custom stripping to break even. With 100 acres of cotton yielding only a quarter bale per acre, the advantage of hiring the harvesting done at the foregoing rate would be small and could be offset readily by more timely harvesting, usually resulting in better grades, or by doing some custom stripping for others. Where the cotton acreage is more than 50, with yields of half a bale per acre or more, it is more economical to own a stripper.

Fiber and Fabric Testing

Throughout the study, efforts were made to get comparisons of quality between hand and machine-harvested cotton. However, it was difficult to do so because identical situations were rare. On the few farms where the same variety of cotton was harvested by the two methods from the same or similar fields and then ginned at the same gin, little difference was observed in either grade or staple, especially when proper preparations were made and a good job of stripping was done.

Fiber quality determination as a pricing factor is now a cotton marketing requirement of increasing importance. Micronaire measurement and often strength determination, as supplements to grade and staple, are depended on by many firms. The current loan-evaluating schedules frequently do not permit a spread among the various classifications that indicates effective market demands. Therefore, discounts and premiums based on grade and staple alone cannot necessarily reflect the real value of cotton as an end-use product.

An attempt was made in 1955 to learn more about the end-use value of cotton as related to the method of harvesting. The following procedures and findings summarize the results of the study.

Two samples, each containing about 25 pounds of lint, were obtained from each of four farmers in different locations in the Blackland. One sample was hand-pulled cotton, the other defoliated and machine-stripped cotton. Seed cotton for each sample on the same farm was of the same variety, produced under identical conditions, harvested from the same field and ginned at the same gin on the same day. The gin speed and heat applications were alike. Everything but harvesting methods were as much alike as possible.

The eight samples were tested at the Textile Research Laboratories, Texas Technological College, Lubbock, Texas. The results are shown in Table 8.

Yarns of 14's count were made from each sample. At the Brenham Cotton Mills, these yarns were used

TABLE 6. ESTIMATED VALUE OF LINT AND SEED PRODUCED ON 100 ACRES OF COTTON AT THREE LEVELS OF YIELD AND TWO PRICE RELATIONSHIPS, WITH HARVESTING DONE BY HAND AND MECHANICAL STRIPPER

Item	Machine harvest			Hand harvest		
	Pounds of lint per acre			Pounds of lint per acre		
	125	250	375	125	250	375
	Dollars					
Value of lint and seed:[1]						
At 25c per lb. hand-harvested cotton	3,555	7,111	10,666	3,686	7,372	11,058
At 30c per lb. hand-harvested cotton	4,208	8,416	12,624	4,338	8,677	13,015

[1]Assumes 100 points off ($5 per bale) for machine-stripped cotton as compared with hand-pulled cotton. Cottonseed valued at $40 per ton.

TABLE 7. ESTIMATED RETURNS TO LAND AND MANAGEMENT FROM 100 ACRES OF COTTON AT THREE LEVELS OF YIELD AND TWO PRICE RELATIONSHIPS, WITH HARVESTING DONE BY HAND AND MECHANICAL STRIPPER

Item	Machine harvest			Hand harvest		
	Pounds of lint per acre			Pounds of lint per acre		
	125	250	375	125	250	375
	Dollars					
Value of lint and seed at 25c per lb., hand-harvested cotton[1]	3,555	7,111	10,666	3,686	7,372	11,058
Production cost, 1959 prices:	3,311	4,497	5,772	3,590	5,904	8,234
Returns to land and management	244	2,614	4,894	96	1,468	2,824
Return per bale	9.40	50.27	62.74	3.70	28.23	36.20
Value of lint and seed at 30c per lb., hand-harvested cotton[2]	4,208	8,416	12,624	4,338	8,677	13,015
Production cost, 1959 prices:	3,311	4,497	5,772	3,590	5,904	8,234
Returns to land and management	897	3,919	6,852	748	2,773	4,781
Return per bale	34.50	75.36	87.84	28.77	53.32	61.29

[1]24c per lb. for machine-harvested cotton.
[2]29c per lb. for machine-harvested cotton.

as filler in weaving light-weight twill, which was given a differential dye at the Southern Regional Research Laboratory, New Orleans, Louisiana. Each sample of cloth was subjected to breaking strength tests at the USDA Cotton Testing Laboratory, College Station, Texas. Results of the breaking tests also are shown in Table 8.

The higher nep count in the stripped cotton obtained on Farms I and II was reflected to some extent in the cloth appearance after dyeing. Otherwise, the color absorption in the eight samples appeared about the same.

No significant difference in breaking strength of the fabrics was measurable in comparing cloth made from hand-harvested and cloth made from machine-harvested cotton. In this rather detailed test of the end-use product—cotton cloth—little difference in intrinsic value was discernible when comparing fabric woven from cotton part of which was nondefoliated and hand-pulled, and part defoliated and machine stripped. The average penalty, or difference in value, of a 500-pound bale of cotton of $5.33, reflecting against the rougher-harvested, stripped cotton, was more than offset by the lower cost of harvesting. Assuming the same difference in costs between hand and machine harvesting on the four sample farms as was obtained on cooperating farms in the study, the net advantage of about $15 a bale for machine harvesting is evident.

TABLE 8. LABORATORY TEST OF COTTON FROM FOUR BLACKLAND FARMS, 1955

Item	Unit	Farm I		Farm II		Farm III		Farm IV	
		Sample bale							
		1	2	3	4	5	6	7	8
		Harvested by —							
		Hand	Machine	Hand	Machine	Hand	Machine	Hand	Machine
Upper-half mean	Inches	0.88	0.88	0.88	0.88	0.86	0.88	0.99	0.94
Uniformity ratio	Percent	75	75	75	76	81	78	78	80
Pressley strength	1,000 lb.	86.9	85.5	76.7	82.8	82.5	82.1	81.3	82.2
Fabric-breaking strength	Pounds	112.4	114.4	93.4	92.0	105.4	101.4	103.0	99.8
Fineness	Micronaire	3.5	3.4	4.7	3.9	4.2	4.3	4.6	5.2
Maturity	Percent	84	80	82	78	76	81	78	83
Light reflectance	Percent	61	64	69	62	60	62	56	58
Picker-card waste	Percent	9.95	10.17	7.79	10.16	9.84	11.0	8.05	9.80
Shirley analysis	Percent	4.2	4.0	2.3	5.2	8.2	4.8	4.0	4.9
Neps per 100 square inch	Number	28	48	26	47	22	28	14	14
Equivalent grade and staple[1]	Dollars	SLM29	LM+29	M+29	SLM29	SLM28	LM+29	SLM+32	SLM30
Value per pound of lint	Cents	30.66	29.16	32.26	30.66	29.66	29.16	33.46	32.71
Value per 500-pound bale	Dollars	153.30	145.80	161.30	153.30	148.30	145.80	167.30	163.55
Harvesting cost per bale[2]	Dollars	56.14	41.75	56.14	41.75	56.14	41.75	56.14	41.75
Returns above harvest cost	Dollars	97.16	104.05	105.16	111.55	92.16	104.05	111.16	121.80
Added returns per bale from machine-harvested cotton	Dollars	—	6.89	—	6.39	—	11.89	—	10.64

[1]Staple, thirty-seconds of an inch. Classification determined from above analyses.
[2]Average costs on sample farms in the study, 1955.

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Location of field research units of the Texas Agricultural Experiment Station and cooperating agencies

State-wide Research

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The Texas Agricultural Experiment Station is the public agricultural research agency of the State of Texas, and is one of ten parts of the Texas A&M College System

ORGANIZATION

IN THE MAIN STATION, with headquarters at College Station, are 16 subject-matter departments, 2 service departments, 3 regulatory services and the administrative staff. Located out in the major agricultural areas of Texas are 21 substations and 9 field laboratories. In addition, there are 14 cooperating stations owned by other agencies. Cooperating agencies include the Texas Forest Service, Game and Fish Commission of Texas, Texas Prison System, U. S. Department of Agriculture, University of Texas, Texas Technological College, Texas College of Arts and Industries and the King Ranch. Some experiments are conducted on farms and ranches and in rural homes.

OPERATION

THE TEXAS STATION is conducting about 400 active research projects, grouped in 25 programs, which include all phases of agriculture in Texas. Among these are:

- Conservation and improvement of soil
- Conservation and use of water
- Grasses and legumes
- Grain crops
- Cotton and other fiber crops
- Vegetable crops
- Citrus and other subtropical fruits
- Fruits and nuts
- Oil seed crops
- Ornamental plants
- Brush and weeds
- Insects
- Beef cattle
- Dairy cattle
- Sheep and goats
- Swine
- Chickens and turkeys
- Animal diseases and parasites
- Fish and game
- Farm and ranch engineering
- Farm and ranch business
- Marketing agricultural products
- Rural home economics
- Rural agricultural economics
- Plant diseases

Two additional programs are maintenance and upkeep, and central services.

Research results are carried to Texas farmers, ranchmen and homemakers by county agents and specialists of the Texas Agricultural Extension Service

AGRICULTURAL RESEARCH seeks the WHATS, the WHYS, the WHENS, the WHERES and the HOWS of hundreds of problems which confront operators of farms and ranches, and the many industries depending on or serving agriculture. Workers of the Main Station and the field units of the Texas Agricultural Experiment Station seek diligently to find solutions to these problems.

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