

Oklahoma Farmers' Experiences With COTTON STRIPPERS

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The Experiment Station's Cotton Mechanization Research Program.

This bulletin reports preliminary information collected by the Agricultural Economics Department on one phase of the Oklahoma Agricultural Experiment Station's broad, over-all research program on cotton mechanization. Other departments are working on other phases of the program. The Experiment Station as a whole works closely with farmers and the industry in order to coordinate the work on cotton problems of both producers and processors.

The new 300-acre Oklahoma Cotton Research Station near Chickasha is devoted largely to cotton breeding and research on cotton mechanization under the direction of the Agronomy and Agricultural Engineering Departments. The research at Chickasha is supplemented by other work at several points in the State, particularly at the Southwest Cotton Station near Tipton and the fiber-testing laboratory at Stillwater.

The cotton research in the Agronomy Department's Office of Cotton Improvement includes work on the problem of defoliation and on breeding and adaptation of varieties to machine harvesting. Plant breeders emphasize that varieties must produce the yields farmers want and the fiber quality spinners will buy, as well as having a plant form suited to mechanical harvesting.

The Agricultural Engineering Department is testing several types of cotton harvesting machines, as well as working on various improvements. That phase of the program also includes testing and designing machines for planting, cultivating, and weed and insect control.

Plant pathologists have shown that delinting and chemically treating cottonseed reduces seedling diseases, gives more uniform stands, and reduces chopping. Chemical weed control is being investigated.

The Department of Agricultural Economics is investigating the economic aspects of mechanized production and machine harvesting of cotton under farm conditions, the economic effects of machine harvested cotton on gins, and the problems involved in the marketing of machine harvested cotton.

OKLAHOMA FARMERS' Experiences With Cotton Strippers

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Mechanical harvesting of cotton is of such great interest in Oklahoma at present that the Experiment Station authorized the author and an assistant to collect information on the subject from men having experience with mechanical harvesters or with cotton thus harvested. The survey was made in part to gather information useful to other research workers in developing varieties, methods, and machinery for cotton mechanization.

This bulletin summarizes that part of the information likely to be of immediate interest to farmers thinking about buying a cotton stripper or hiring a custom stripper.

The information presented here was gathered in the spring of 1948. It pertains chiefly to experience during the 1947-48 season (that is, the crop planted in the spring of 1947 and harvested in the fall of 1947 or early in 1948). Persons interviewed in securing information included:

- 75 farmers who operated strippers in the 1947-48 cotton harvest.
- 11 farmers who owned strippers but did not operate them last season.
- 18 gin managers who ginned and bought machine-harvested cotton.
- 20 implement dealers who sold and serviced machines.
- 6 farmers who operated cotton sleds.
- 3 farmers who hired their cotton custom stripped.
- 2 farmers who operated cotton picking machines, and
- A few who had used miscellaneous types of strippers.

On the whole, the farmers interviewed had found strippers rather satisfactory. They were able to harvest a fair amount of cotton with their strippers in 1947-48 in spite of unfavorable conditions for using them.

* Elmer L. Davis, a graduate student at the Oklahoma A. & M. College, assisted with the collection and tabulation of the data used for this publication. The author also wishes to express his appreciation to the farmers and others who cooperated by furnishing information.

The problems of waste and lowered grades which limit the use of cotton sleds have been solved largely, but not entirely, with strippers.

The most serious remaining limitation on use of strippers appears to be the presence of leaves and green bolls. The results from chemical defoliation have been irregular, although sometimes very successful. Second growth after defoliation sometimes has caused trouble. Green bolls are still a problem.

Some of the varieties stripped were found rather satisfactory, but additional work remains to be done in breeding varieties especially adapted for machine harvesting and also having desirable yield and quality of lint.

It should be kept in mind while studying this report that the 1947-48 season was very unfavorable for stripper operation. The late summer drought in 1947 prevented cotton plants from producing very many late bolls in most of Oklahoma. The very favorable weather in September and October permitted many farmers to harvest most of their cotton before frost. The large discount on low grades caused them to harvest it as early as they could. In some parts of the State the freeze or other factors caused the leaves to remain on the stalks until very late, so that some cotton was hand harvested that otherwise would have been machine stripped.

TYPES OF HARVESTERS USED

Sleds

Apparently about two customers per gin used cotton sleds of various types in western Oklahoma in 1947-48. Perhaps about as many more sleds were not operated, so it is estimated there were four to five hundred in the State.

Sleds waste considerably more cotton than other means of harvesting. They collect so much trash with the bolls that grades are low and the cotton is hard to gin. They also require considerable labor. Therefore their use tends to be limited to salvage operations where labor cannot be secured for hand harvesting at customary rates.

Factory-Built Strippers

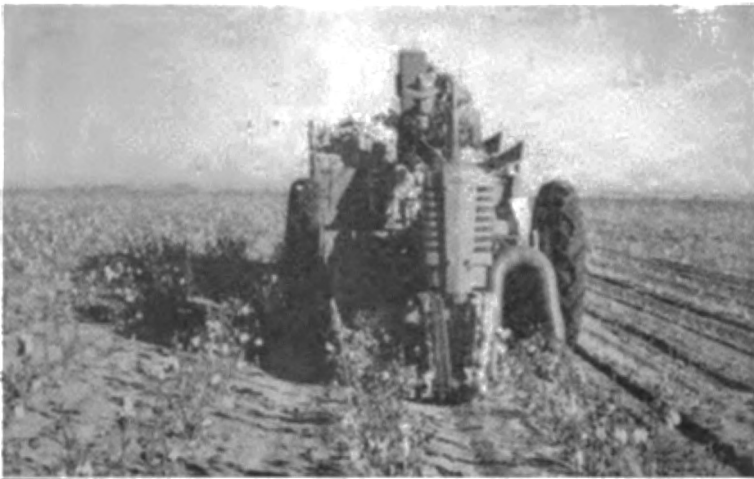
There were 104 tractor-mounted, factory-built cotton strippers in Oklahoma in the 1947-48 season, according to the survey made for this study. Seventy were operated in western Oklahoma and five in northeastern Oklahoma. Eleven others, owned by farmers, were idle last season, almost entirely because of unfavorable con-

ditions for stripper operation. Twelve were operated on a custom basis, eight by dealers and four by farmers, and a dealer who worked in Texas. One stripper was used in Experiment Station research work, and little or no information could be collected on five others.

Several farmers bought strippers for salvaging cotton that was too thin to harvest by hand at customary rates, or for which hand labor could not be obtained. It was found that factory-built strippers wasted much less cotton than sleds, and that the grades from stripped cotton were considerably higher than from sledged cotton.

Miscellaneous Types

A miscellaneous group of cotton harvesting machines of the stripper type was made by farmers, local blacksmiths, or machine shops. The designs varied from devices only slightly more complicated than cotton sleds to machines about as complete as factory-built strippers. It did not appear advisable to include them in this survey because of the wide differences in their performance. A guess on their number is between fifty and one hundred.



Farmers Reported They Found Use of Strippers Profitable.

Farmers interviewed in getting the information presented in this bulletin either owned strippers themselves or had hired a custom stripper. They reported that they stripped an average of 22½ bales per machine, and cost of custom stripping generally averaged about fifty cents to a dollar a hundred less than hand picking. Most of the farmers and ginners interviewed reported that grades were as good as for hand-snapped cotton.

Picking Machines

Three spindle-type cotton picking machines were sold to Oklahoma farmers about 1945, but these machines had been sold or traded out of the State prior to the 1947-48 season. No other cotton picking machines were reported in Oklahoma in 1947-48.

The limited information available on the three machines sold in Oklahoma indicates that they were more successful on medium and long staple varieties than on short staples. The leaves need to be removed for the most satisfactory operation; however, one of the operators had some success without removing the leaves. This operator was fairly well satisfied, and said he would want a picker if he were raising cotton. Semi-retired, he is now raising wheat and cattle. The operator who owned the other two picking machines was not very well satisfied with his results.

The place of this type of machine in the Oklahoma cotton harvest remains to be established.

RESULTS OBTAINED WITH STRIPPERS

Opinions on Stripper Performance

Seventy-four of the 75 stripper-operators stated that their strippers were satisfactory enough for future use. One operator, who farmed land in the Arkansas River bottom, reported his cotton grew too rank to be harvested satisfactorily with his stripper.

Only two of the 75 who operated their strippers in 1947-48 were offering their strippers for sale when they were interviewed, and only three of the strippers not operated that season were for sale. At the time of the interviews, all strippers being offered for sale, with one exception (the man farming river bottom land), were being offered due to special circumstances such as moving off the farm.

Another indication of how satisfactory the operators found their cotton strippers was the effect on their acreage in cotton. Thirty-two farmers bought strippers in the 1947-48 season. Twenty-one of these gave information on their cotton acreages. Nine of the 21 said they planned to plant more cotton in 1948-49 because the strippers would enable them to harvest a larger acreage. The increases planned would have resulted in a 21 percent increase in cotton acreage for the 21 operators. The 23 farmers who bought strippers in the 1946-47 season also planned cotton acreage increases for 1948-49, the planned increase amounting to 11 percent of their 1947-48 acres, which indicates that the effect of strippers in increasing acreage continues for more than one season. It is to be noted that the increases planned by these operators was for a year when the State's total cotton acreage decreased.

Extent Machines Were Used

The 75 farmers who operated their strippers in the 1947-48 crop averaged harvesting 22½ bales per machine. The amounts ranged from 1 to about 70 bales. Forty-nine of the 75 operators did custom harvesting, and about 40 percent of the cotton harvested by strippers was harvested on a custom basis.

The stripper-operators averaged stripping about 21 percent of the cotton they produced last season. Fifty-one percent of the acres stripped had been hand snapped once, 40 percent had been hand snapped twice, and 9 percent was machine stripped the first or only time.

These operators averaged operating their strippers about 12 eight-hour days, and averaged about 17 acres per day or slightly over 200 acres in the season. The acreage they covered ranged from 15 to 700 acres.

The stripper-operators estimated an average stripping season to be about 27 days in length; but last season they averaged operating less than half that many days partly because of the unfavorable season for stripper operation.

Grades of Stripped Cotton

About three-fourths of the operators gave opinions on grades, and nearly two-thirds of those who gave opinions reported that the grades of stripped and hand snapped cotton were about the same. Less than one-tenth thought the grades of the stripped cotton were lower, while the remaining third thought that grades were higher. Opinions were based chiefly on the prices gin managers paid for hand snapped and stripped cotton in eastern Oklahoma and on the United States Department of Agriculture's Smith-Doxey classification in western Oklahoma.

The three farmers who hired cotton custom stripped thought that the grades of stripped cotton were about the same as hand snapped cotton.

Sixteen of the 18 gin managers believed that grades of the stripped and hand snapped cotton were about the same when the cotton was in fair to good condition for stripping. Only two ginners thought stripped cotton made lower grades.

Percentage of Cotton Wasted

Most of the stripper-operators reported that the cotton wasted by strippers was less than the appearance of the field after stripping would indicate. Some of them had picked up the cotton left by strippers and were surprised at the small amount wasted. Cotton

on the ground prior to a rain appears to be wasted by strippers, but some farmers question the advisability of picking up such cotton when hand harvesting.

Most of the men interviewed reported that the percentage of the cotton wasted varied widely among different varieties. Some varieties fall out and string out from wind and weather much worse than others. Some varieties are also knocked out worse when strippers strike the stalks.

Estimates of the operators indicate strippers waste 1.7 percent more cotton than hand harvesters. On the basis of prices for late cotton and the yields of the cotton stripped last season, this would amount to about $3\frac{1}{2}$ pounds per acre worth about 7 cents per pound, or 25 cents per acre.

Ratings of Varieties for Stripping

Stripper-operators in western Oklahoma were of the opinion that the following characteristics were especially desirable in cotton to be harvested with strippers: (1) High degrees of storm resistance, (2) short limbs, (3) medium size stalks, (4) uniform maturity of bolls, (5) easy separation of bolls from stalks, (6) medium high fruiting, and (7) light foliage.

The western Oklahoma stripper-operators were of the opinion that Lankhart 57 and Macha were the best varieties for stripping of the nine varieties stripped most frequently, largely because of their high storm resistance (See Table I). The stripper operators considered Northern Star a good stripping variety but not quite as storm resistant as Lankhart 57 or Macha. Some operators found it too "limby" in some fields and some found the bolls too hard to remove from stalks.

Table I.—Opinions of Stripper-Operators as to Suitability for Stripping of Nine Varieties of Cotton.*

Variety	Ratings and Number of Each					Total No.
	Best	Good	Fair	Poor	Poorest	
Acala 8	1	--	2	4	2	9
D & P L	--	--	3	1	3	7
Half & Half	--	--	2	6	7	17
Hi-Bred	2	5	2	7	4	20
Lankhart 57	21	3	1	--	--	25
Mebane 140's**	7	6	7	5	3	28
Other Mebanes	1	2	--	1	1	5
Macha	6	1	1	--	--	8
Northern Star	4	20	5	4	2	35

* The varieties listed are those most frequently harvested by strippers in Western Oklahoma in 1947-48. Ten other varieties were stripped by these stripper-operators, but they were reported three or less times each.

** Includes Mebane 140, Lockett 140, and Marv-L-Cluster.

In a few areas where only the lower-rated varieties were grown, the stripper-operators were of the opinion that the variety of cotton was a limiting factor in machine harvesting. But in those areas growing a large proportion of the varieties reported better adapted for stripping, variety of cotton was not considered to be a limiting factor in machine harvesting.

The Mebane 140's (which include Lockett 140 and Marv-L-Cluster), Hi-Bred, Half and Half, and Deltapine (or D & P L) all had too little storm resistance, in the opinion of the stripper-operators. However, the Mebane 140's had a very satisfactory type of stalk. The yields of Hi-Bred were good, and the bolls dried out quicker than those of some other varieties. Acala 8 had too many large limbs to be well suited to stripping.

FINANCIAL MANAGEMENT OF STRIPPERS

Labor Needed

Most stripper-operators used two men, one to drive the tractor and one in the trailer to handle the cotton. Some operators used only one man. Several doubted if it paid to use more than one man for stripping cotton making less than one-fourth bale per acre. In three cases, three persons were used to operate the stripper and tractor.

Costs of Operation

Table II gives some idea of the operating cost of strippers during the 1947-48 season, as reported by the people interviewed. It figures out to \$1.43 per acre, with fuel as the only tractor cost included.

Table II.—Estimated Average Cost Per Acre of Stripping Cotton in the 1947 Season.

Cost Item	Cents Per Acre
Depreciation*	35.0
Interest on investment at 5 percent*	08.7
Estimated average repairs per year	09.5
Estimated total for stripper	53.2
Tractor fuel (¾ gallon per acre at 14½¢)	09.7
Cost of Labor**	80.0
Estimated average cost per acre	142.9
	or \$1.43

* Based on \$875, the average cost per stripper as found in this survey, an estimated life of 10 years, and harvesting 250 acres per year.

** Two men harvesting 17 acres in 8 hours at average wage of 85 cents per hour.

The figures in Table II are subject to a good deal of variation. Strippers have not been used long enough to get more than estimates on repair cost and expected life. Obsolescence is difficult to estimate, and apparently for some strippers it will be a larger cost than the cost of wear from operation. The number of acres harvested is an important factor in the per acre cost of depreciation and obsolescence. Some operators used only one man, which reduced the labor cost; and some used family labor, which was not a cash cost. In some cases, the tractor operators furnished only one man when doing custom work.

Ownership

Seventeen of the 75 strippers were owned by partnerships. Fifteen of the 17 were among kinfolks, mostly fathers and sons. Farmers were able to reduce their costs and investments by partner ownership. The desire to reduce the risk of trying a comparatively new device may also have been a factor in some cases. Strippers also had greater capacities than needed on many farms.

Custom Rates and Income

The majority of the stripper-operators charged from 50 cents to \$1.00 less per hundred pounds than the customary rates for hand harvesting. Rates ranged from 75¢ to \$2.00 per hundred pounds and averaged approximately \$1.50. The most common rate for hand snapping was \$2.00 per hundred for the bulk of the crop; and \$2.50 was rather common for the thin part of the crop late in the season, such as many strippers harvested. Eight stripper-operators charged



A Field of Cotton Before and After Stripping.

rates by the acre rather than by the hundred. Seven of these charged \$3.00 per acre and one charged \$2.50. Two operators charged a minimum of \$2.50 per acre if yields were less than 200 pounds and \$1.50 per hundred pounds on yields of 200 pounds or more per acre. Two operators had combination rates. One charged \$1.00 per hundred and 50 cents per acre, and the other charged 75 cents per hundred and \$1.50 per acre. One operator charged 7 cents per pound of lint ginned from the cotton he stripped. One owner leased his stripper without tractor or labor for \$7.50 per bale. Another stripper owner leased his tractor and stripper for \$15.00 per bale, and the men who hired it furnished the tractor fuel, lubrication, and all the labor.

The 49 farmers who did custom stripping averaged custom stripping 14 bales each, ranging from 1 bale to about 70. At \$1.50 per hundred, they would have averaged over \$400 gross income each. Some of the operators reported they made enough by custom stripping, or saved enough on their own plus what they custom stripped, to pay for their strippers in one season. Custom work probably reduced the cost of stripper ownership for most of those who did custom stripping. Those who hired custom stripping apparently saved some on the cost of harvesting their cotton compared to the cost of hand harvesting it.

Custom stripping appears profitable even under the conditions that existed in 1947-48, where sufficient volumes are available.

PROBLEMS OF STRIPPER OPERATOR

The problem reported by stripper-operators and ginners as most seriously limiting the use of strippers was presence of leaves and green bolls. Other problems reported related to width of rows, shape of the middles, condition of soil along the rows, spacing of stalks, and height of stalks. Most of the latter may perhaps be solved to a considerable extent by improvement of machines, changes in planting and cultivation methods, or by breeding new varieties of cotton.

Defoliation

The farmers who tried defoliation to overcome the leaf and green boll problem had highly varying results. Nineteen, or about one-fourth of the farmers who operated strippers in 1947-48, had tried calcium cyanamid as a defoliant in 1947-48 or some prior season. Four of them reported they were well pleased with the way the defoliant removed the leaves, and three others were fairly well pleased. Twelve said their results were irregular, and six reported they were not very well satisfied. (Five of those not well

satisfied and one of those fairly well satisfied were among those who reported defoliant was irregular). Those who reported irregular results stated that it sometimes made the leaves drop satisfactorily, but at other times did not.

Insufficient moisture was recognized by some operators as the cause of incomplete defoliation. They all recognize that defoliation is new and experience will improve their results. Several who reported unsatisfactory or irregular results, plan to try to defoliate their cotton again in the 1948-49 season.

When the defoliant did cause leaves to drop, other problems sometimes developed. It sometimes takes several days for the green bolls to open and dry out, especially under cool, cloudy weather conditions. The open cotton is subject to weather damage while the green bolls are opening. If frost does not come, the defoliated plants sometimes start a second growth of leaves that may create a problem.

Row Widths and Condition of Middles

The most common make of stripper was made for 40-inch rows without any adjustment for other widths. While this stripper operated most satisfactorily on 40-inch rows, it was used on other widths. Several farmers worked out various sorts of adjustments.

Most stripper-operators preferred to have the middles level and the rows slightly ridged. Some operators preferred a small ridge in the center of the middle between pairs of rows, to help guide the small front wheels. Nearly all thought the poorest condition was for the middles between each of a pair of rows to have a medium or small furrow in the center and for the stalks to be in furrows. Furrows in the middles between these pairs of rows, where the big tractor wheels run, tend to collect the leaves and cause a smaller amount of leaves to collect around the base of the stalks.

SUGGESTED IMPROVEMENTS ON STRIPPERS

Several improvements were suggested for the strippers, although 20 of the 75 operators said the strippers were satisfactory as they were. Thirty others suggested only one improvement each. The improvements that the operators reported to be needed in the strippers, with a few exceptions, were widely scattered (See Table III). This indicates that the strippers were generally satisfactory, but that some operators felt certain refinements appeared desirable.

On the whole, the stripper-operators were well satisfied with their strippers because they generally did as much and in some cases more than was expected. Although numerous improvements likely will be made in strippers, farmers' reports indicate that it was other factors that limited the use of strippers the past season.

Improvements, additions, and adaptations to strippers or new inventions may, however, make it possible to solve or assist in solving some of the remaining problems related to machine harvesting. For example, some implement dealers were of the opinion that corn huskers might be adapted for cotton stripping.

Table III.—Improvements Reported Most Frequently by Operators as Needed on Strippers.*

Improvement	Number of Operators Reporting It Needed
Stripper satisfactory as it is (no improvement suggested)	20
Projections full length of roller	8
Device to get cotton from elevator to trailer without waste	7
Automatic adjustment of roller to stalk size (by spring tension)	6
Elevator and elevator braces need to be stronger	6
Burr extractor is needed	6
Needs two rollers per row	5
Gauge wheel needs improvement (rubber tire, scraper, or wider, stouter wheels)	5
Needs greater capacity	5
Needs clutch in stripper to prevent waste at end of rows	4
Should be adjustable for different width rows	4
Should be easier to mount and dismount	3
Elevator needs improved hinge at lower end and flights attached more securely to belt	3
Needs improved lifting mechanism	3

* Two operators reported further reduction in waste was needed. Operators reported the following improvements were needed (with only one operator suggesting each one): (1) a fan to remove trash, similar to a combine; (2) easier adjustment of roller to stalk sizes; (3) flexible adjustment to keep mechanism on rows because of difficult steering; (4) ability to handle taller stalks; (5) an attachment to raise lower limbs; (6) another set of rollers below present rollers running in opposite direction to pull stalks through; (7) reduce beating action of blades and finger rolls (or "kickers"); (8) "Comb" (the part projections pass through to remove cotton) needs to be heavier (they bend); (9) needs a blast of air to remove cotton from rollers; and (10) needs smooth roller without projections.