GINNING RESEARCH

at

CHICKASHA, OKLAHOMA

1951-1955

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OKLAHOMA A&M COLLEGE DIVISION OF AGRICULTURE

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Cotton Ginning Investigations

Preface

The Oklahoma And U. S. Department of Agriculture Joint Ginning Research Program

The increased use of mechanical cotton harvesters during and after World War II emphasized the need for a balanced research program in all phases of cotton production, harvesting, ginning and marketing. The cotton industry in Oklahoma was cognizant of the need for research, and the result of this recognition was the establishment of the Oklahoma Cotton Research Station at Chickasha, Okla. A fully equipped gin was erected and a program of research in ginning roughly harvested cotton has been conducted since the 1950-51 crop year. The Oklahoma Agricultural Experiment Station and the United States Department of Agriculture cooperate in the studies.

As new methods of harvesting are introduced, new problems arise in preparing, conditioning and ginning the crop. Research in cotton ginning has been conducted by the United States Department of Agriculture for approximately 25 years at Stoneville, Miss. Results of the work at that location served as general guides for ginners across the Cotton Belt. However, many specific applications could not be made because of differences in variety, soil type, weather conditions and methods of production and harvest. Therefore the ginning research conducted at the Oklahoma Cotton Research Station is directed toward the adaptation of new equipment and techniques to Oklahoma-type cotton production as well as for neighboring states' areas east of the high plains. If the needs peculiar to each region in Oklahoma and adjacent portions of contiguous states are embraced in the ginning programs, the opportunities exist for significant contributions to cotton production.

The Ginning Laboratory equipment at Chickasha is housed in an Oklahoma-made steel building, 48 ft. wide by 80 ft. long by 24 ft. plate height, with concrete floor and flat-bale down-packing press. The building and equipment were bought and erected at Chickasha in 949 by the Oklahoma Cotton Research Foundation under the enhusiastic leadership of Mr. R. M. Lucas (Pres.), Mr Noble Bennett

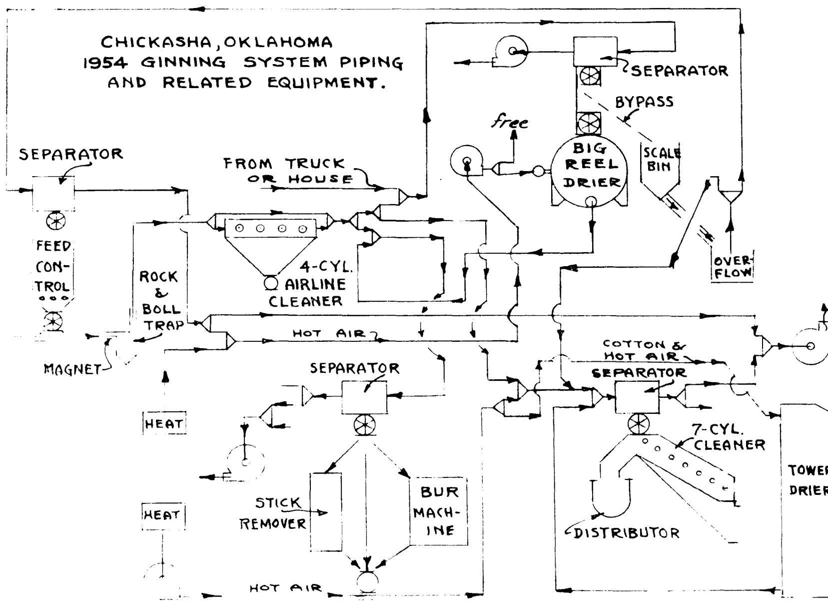

Fig. 1.—Schematic diagram of ginning research system at Chickasha, Okla.

(Vice-Pres.), the late Mr. Horace Hayden (Secy-Treas.), and Directors J. C. Styron, O. A. Reese, G. N. Irish and E. E. Huff. A sketch diagram of the ginning equipment is outlined in Figure 1. This does not indicate the recipro-cleaner attachment to gin stands nor press and power items, but includes more recent additions to the apparatus such as the bulk feed control and other special items.

To facilitate the prosecution of effective research work, the U. S. Dept. of Agriculture Cotton Ginning Investigations from time to time have moved a number of their laboratory special instruments and tools to Chickasha. These items include a Shirley fiber analyzer, moisture ovens, trash fractionator and other items. By means of these laboratory facilities, ginning clinic studies are made on the spot immediately following the tests, thus saving time and fee-testing expenses.

Ginning Research at Chickasha, Oklahoma 1951-1955

Studies on Conditioning, Cleaning and Ginning Rough-Harvested Oklahoma Cotton

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The three purposes in ginning cotton are:

1. Separation of lint and seed into salable products.

2. Preservation of the inherent qualities of the lint and seed.

3. Returning to the producer such qualities and quantities of lint and seed that the monetary return from each will be the highest figure obtainable.

The response of cotton to mechanical treatment has an upper limit, or potential, which is established by many elements prior to arrival of the cotton at the gin. The ginner should know the general production factors and potential of the cotton he is ginning if he is to obtain the best results.

This bulletin has two objectives:

1. To present information on some of the factors affecting the inherent qualities or potential of cotton produced in Oklahoma and north Texas.

2. To report the results of ginning research at the Oklahoma Cotton Research Station for the five-year period 1950-55. In this research, various gin treatments were used on various types of cotton to determine the best response.

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Characteristics of Oklahoma-grown Cotton

Varieties:

Cotton grown in Oklahoma is distinguished by varietal characteristics in three different groups: Open-boll, storm-resistant, and stormproof. The response of the cottons to their environment differs, and therefore the ginning characteristics of each of the three cottons vary somewhat when grown under different conditions. To prepare these cottons for ginning, much foreign matter must be removed at the cotton gin, usually by drying, extracting[1] and cleaning[2].

Open boll type cotton is generally grown in the eastern section of the state and is either hand picked, hand snapped, or mechanically picked. This type of cotton is highly susceptible to damage through exposure to weather. Locks of the open boll cotton may string out and become contaminated with dirt, dust, sand and leaf trash, and become bleached by exposure to sun and moisture. The extraction process in ginning is complicated if this type of cotton is hand snapped because the burs are easily crushed or broken into smaller segments. The cleaning process is complicated by the general presence of excessive moisture in the area of growth which raises the moisture content of the cotton as it stands in the field. The leaf trash in the cotton usually assumes a darker color in the presence of excess moisture.

Storm-resistant type cotton is grown generally in the central and western sections of the state. This type of cotton clings more tightly to the bur and consequently is not so susceptible to contamination by dust, dirt, sand and leaf trash. It is usually harvested by hand snapping or mechanical stripping. Variations in the inherent qualities, and consequent troubles encountered at the gins in cleaning and extracting, are generally the result of poor yields due to low soil fertility, low rainfall, and variation in soil type, or to combinations of these factors. Under optimum conditions the burs of storm resistant cotton do not crush easily and are open enough to respond well to the extraction process.

Stormproof type cotton is characterized by a rather tight and closed boll. It is grown in central and western Oklahoma for harvesting by hand snapping or mechanical stripping. To gain maximum lint turnout, especially if grown under adverse conditions, the bolls must be opened before extracting. The burs of this type cotton shatter rather easily and are easily crushed into smaller pieces. Effective extraction is therefore difficult. The nature of the mature boll being such that little surface area of the seed lock is exposed, the stormproof types generally do not deteriorate in the field so rapidly nor do they collect so much dirt, dust, sand or leaf.

Conditions of Growth:

Factors such as soil type, amount and distribution of rainfall, insect infestation, plant populations and weather hazards greatly influence the inherent qualities of cotton in

[1] A type of "carding" operation on seed cotton to remove coarse burs, stems, etc.

[2] A screening operation with concaves and beaters to remove fine trash.

Oklahoma. Under optimum or normal conditions the cotton fibers may have excellent qualities, but when influenced adversely by any of the foregoing factors, the fibers may be of exceedingly poor quality.

It has been noted during the course of research at Chickasha that any reduction in normal boll size complicates the ginning problem. Reduced boll size and reduced yield indicate immaturity, excessive fineness, more waste due to aborted seeds, and general poor character. The small and knotty bolls require opening before extraction.

Immature fibers in cotton are easily damaged in the cleaning process and grades are lowered because of rough appearance and presence of motes. Dry seeds crack easily and the result is seed-coat fragments in the lint sample. Lint turnout may be greatly reduced by any type of cotton gin lint cleaning because much fiber, trash and motes may be removed. Even when conditions are right for optimum growth of plants, insect damage may cause spots in the lint sample. During harvest, and especially with the use of strippers, more sticks and limbs may be included with the clean cotton. Grass and weeds may also be present. Thus there are many hazards to overcome and the cotton gin holds the final and critical position in the struggle.

Spots:

Off-colored cotton (spotted and tinged) is generaly the result of insect or disease damage or cotton being green at time of freeze or frost. Of the two, frost or freeze damage causes the heaviest discoloration.

It was observed during the period of research that the first snapping of cotton from fields infested with insects generally has a large portion of lint samples in the lightly spotted classification. The second snapping or mid-season harvest may have more white grades due to the majority of the damaged cotton having been gathered with the first crop. The first snapping always includes those bolls that have been forced open by dry weather or insect damage. Scrapped cotton at mid-season usually has a heavier color due to a high proportion of drought stricken or otherwise damaged bolls.

Bolls subjected to freezing temperatures at a certain stage of maturity will become soft and mushy within a few days. If there are large numbers of these bolls at freeze or frost date, a rather lengthy time is required before the cotton is dry enough to harvest and gin. Bales containing heavy concentrations of this cotton are generally classed in the heavily spotted or tinged range. This factor is a great detriment when attempting to produce a high quality bale of lint from cotton harvested by once-over stripping.

Maturity and Wastes:

Factors which affect the maturity of Oklahoma cotton also influence the ginning characteristics. As used in this bulletin, maturity refers to the fiber cell wall thickness rather than to micrograms per inch of fiber. Although no data were collected on this factor, it is plausible that there are extreme variations in fiber maturity because of extreme variations in growth conditions in Oklahoma. This property of the lint fiber is evidenced by ease of damage by machinery, by large amounts of lint "fly" during ginning operations, and by a cohesive or "spider web like" feel in the lint sample.

Waste in the lint sample is directily related to maturity (in this instance meaning waste other than dirt, dust, sand or leaf). Under extreme weather conditions there is a prevalence of malformed seed in various stages, from just a speck to an almost developed seed. The motes (here used to describe fiber cluster formations on undeveloped seeds without kernels) detract from the appearance of the lint sample and are easily detectable to the touch. Formations ranging from motes to full dry seeds are generally easy to crack, and even the smallest amount of cotton gin cleaning usually results in some seed-coat fragments in the lint sample.

Method and Season of Harvest:

As weather and availability of labor may influence the method of harvest, so season and method of harvest in turn seriously influence the selection of machinery to be used in the ginning operation. In Oklahoma, hand snapping may be employed at early-, mid-, or late-season intervals, dependent upon yield. The late-season harvest in this state is generally the scrapping or gleaning operation and frequently the second harvest is mostly below grade scraps. Mechanical pickers are used to a limited extent in first and second harvests. After frost mechanical strippers may be employed to follow hand snapping or machine picking, or they may be used for a once-over operation. The inherent qualities of cotton harvested by hand snapping or machine picking at early- and mid-season intervals are generally high and such cotton generally responds well to the different ginning operations with no undue variation. Scrapped cotton (hand snapped or machine stripped) with few exceptions has lower inherent quality and hence produces only low grades.

Cotton harvested by a once-over stripping operation is highly variable in quality, and the ginner encounters multifold problems in ginning cotton harvested in this manner.

There are two major differences in the makeup of trash gathered in the process of once-over snapping and once-over stripping after frost. The first difference is that the stripped bale of cotton contains a larger amount of sticks and limbs. The second difference is in the fine leaf trash. Stripped cotton may often contain less large leaf, but it usually contains more damaged cotton due to the non-selective principle of operation in mechanical stripping. This damaged cotton often causes more loss in grade than would a larger volume of leaf trash.

Since bur and cotton are both gathered by either hand snapping or machine stripping, the volume by weight of burs to be removed from a bale of cotton harvested by either means is relatively large and constant.

Test Results—1951, 1952 and 1953

In the preliminary test work it was necessary to establish the reaction of Oklahoma cotton to the different ginning processes being developed in the Belt and set some means of evaluating the results, especially since mechanized harvests were in prospect. Therefore the results of research through the 1952-53 crop year were used as basis for future work. In the 1953-54 crop year, the program was revised to include the most promising results of previous experience; and the 1954-55 season witnessed a broader application across the state.

Seed Cotton Drying Tests—1951 and 1952:

In order to determine whether drying was necessary for Oklahoma cotton and what temperature would afford most profitable returns, three series of tests were run in 1951 and six series in 1952. The U. S. Dept. of Agriculture tower type drier was used in the 1951 tests and in three series of the 1952 tests. The reel type drier was used in the remaining three series of 1952 tests. Treatment with each temperature was replicated three times. The figures in Tables 1 through 5 are the averages from treatments shown.

It is evident from Table 1 that as the temperature of the air in the drier was increased the weight of lint produced from a given amount of harvested material decreased. This is attributable to more effective cleaning plus moisture removal involved in drying the seed cotton.

There was no significant increase of grade index for any temperature used for drying above the grade index of the undried control cotton. As shown by Table 2, there was only a slight average increase of grade index as temperatures were increased. However, the risk of damage to the inherent qualities of the lint fibers generally precludes the use of high drying temperatures as a means of raising the grade index unless there is high moisture content.

The data in Table 3 show that there is a decrease in classer's designation of staple length as temperatures for drying are increased. Since much of the cotton was normal as to moisture content to begin with, the reduced staple length was the result of fiber shrinkage plus some breakage of fibers due to overdrying.

Reduction of foreign matter in the lint sample was significant between normal ambient temperatures and those in the drier at 200° F. and 300° F. Foreign matter in the lint showed a slight decrease through better cleaning as drying temperatures were increased. (Table 4.) The greatest reduction was between ambient temperature and 200° F., indicating cleaning in these instances was not enhanced by drying temperatures above 200° F.

As temperatures for drying were increased the percent moisture in the lint was decreased but not in direct proportion to temperature. Table 5 shows it is possible to reduce the moisture content to a very low level by use of high temperatures for drying. The same action occurs similarly for long exposures. The data also indicate that the moisture content of the lint ginned at atmospheric conditions was well below the moisture level of approximately 7.0 percent considered to be optimum for preservation of inherent qualities of the fiber during ginning.

From the data collected during 1951 and 1952 it was evident that on some Oklahoma cottons drying may not be necessary nor contribute appreciably to returns. In some instances, of course, substantial losses were incurred through excessive drying. Of all cottons tested during the five-year period only the green stripped cotton constantly contained enough moisture to warrant drying to prevent rough preparation. However, drying has benefits that should not be overlooked when Oklahoma moisture conditions are too great for optimum cleaning and extracting. Oklahoma gins should maintain adequate drying facilities to meet mechanized production demands, especially for handling machine picked cottons when wet spindles are used.

Seed Cotton Cleaning, Extracting and Lint Cleaning Tests

1951 and 1952 TESTS

Different combinations of overhead machinery and lint cleaning equipment were tested in 1951 and 1952 to determine the effects on lint turnout, grade, staple length, and foreign matter content of lint. Six series of tests were run in 1951 with cotton grown in the Washita River bottom near Chickasha, and three series of tests were run in 1952 with cotton grown under irrigation near Altus, Oklahoma.

Three set-ups or combinations of ginning machinery were used with and without lint cleaners in the foregoing tests. "Overhead" machinery are those items placed ahead of the distributor. In older gins they are actually overhead, but in recent gins they may be placed at floor level, from which point cotton is pneumatically lifted to the distributor. These set-ups are comparatively tabulated as follows:

Simple Set-up

1. Separator
2. Tower Drier
3. 14 ft. Extractor[1]
4. Distributor
5. Extractor Feeders[4]
6. Gin Stands
7. Optional, Lint Cleaners
8. Bale Press

Moderate or Standard Gin Set-up

1. Airline Cleaner[2]
2. Separator
3. Tower Drier
4. 14 ft. Extractor[1]
5. 7-Cylinder Cleaner[3]
6. Distributor
7. Extractor Feeders
8. Gin Stands[5]
9. Optional, Lint cleaners
10. Bale Press

Elaborate Set-up

1. Airline Cleaner
2. Separator
3. Tower Drier
4. 14 ft. Extractor[1]
5. 14 ft. Extractor[7]
6. 7-Cylinder Cleaner
7. 7-Cylinder Cleaner[7]
8. Distributor
9. Extractor-Feeders
10. Gin Stands[5]
11. Optional, Lint Cleaners[6]
12. Bale Press

[1]Master or "Big Bur" type.
[2]52-inch 4-cylinder type.
[3]52-inch inclined.
[4]Super type.
[5]Equipped with U.S.D.A. recipro-cleaner bars built into gin.
[6]Saw-type Government design.
[7]Second time through machine.

The lint cleaning arrangements consisted of gin stand moting[5] for the treatment without lint cleaning, and gin stand moting plus lint cleaners[6] for the with-lint cleaning treatment.

Results of the nine series of tests are summarized in Tables 6 through 9.

There was a significant reduction in weight of lint produced from 2000 pounds snapped or 2400 pounds stripped material when lint cleaners were used (Table 6). The airline cleaner used before the master extractor served to open the dry knotty bolls on the cotton harvested after frost, and lint turnout was consequently increased on those cottons.

The grade indexes in Table 7 show no significant increase due to addition of extra overhead machinery in combination with lint cleaners. Grade index of the lint ginned by the simple arrangement plus lint cleaners was significantly higher than the grade index of the lint ginned by the simple arrangement without lint cleaners. The average grade index of the lint ginned by the simple overhead set-up plus lint cleaners was practically the same as the average grade index of the lint ginned by the elaborate set-up plus lint cleaners and both averages were higher than the average grade index of any other combination. The moderate and elaborate set-ups with lint cleaning equipment had little effect on the grade index of the cottons. The leaf element of grade was usually raised, but the color element of grade dropped and offset it.

There were no differences in staple length of cotton ginned with any combination of overhead and lint cleaning equipment (Table 8).

Percent of foreign matter in the lint sample as shown in Table 9 decreased with the addition of overhead and lint cleaning equipment.

It was indicated in the 1951 and 1952 tests that little was gained through attempts at excessive cleaning of the seed cotton unless the lint could be made completely trash free because premiums for cleanliness were offset by discounts for off color and the final product was worth no more than the original material. The most promising arrangements appeared to be the simple overhead arrangement with maximum amounts of lint cleaning.

1953 TESTS

The seed cotton cleaning and extracting and lint cleaning tests were continued in 1953 with different overhead arrangements.

The two overhead arrangements compared in the 1953 tests were: (1) Reel-type drier; 14-foot master extractor; distributor and unit extractor-feeder-cleaners: and (2) the 4-cylinder, 52-inch width airline cleaner; reel drier; 14-foot master extractor; 14-foot master extractor; 7-cylinder, 52-inch width inclined cleaner; 7-cylinder, 52-inch width inclined cleaner; distributor and unit extractor-feeder-cleaners.

Lint cleaning arrangements were the same as used in 1951 and 1952.

Results of the 1953 tests in general followed the same pattern as those obtained in the tests of the previous two years. The elaborate

[5]Same as in ginning machinery tabulations.
[6]Same as in ginning machinery tabulations.

overhead system with lint cleaning approached the level of returns obtained with the simple overhead arrangement without lint cleaning. The lint produced with the maximum overhead and with lint cleaning was significantly cleaner than the lint produced with the simple overhead and without lint cleaning, but weight loss in reduced lint turnout was not overcome by the per pound value increase of the lint gained by cleaning.

Lint Cleaning

Tests were conducted in 1951, 1952 and 1953 to study an experimental gin stand moting unit as compared with other moting and lint cleaning equipment. The moting unit, developed and covered by public free patent, is shown in Figure 2. These tests were also used to study the effects on turnout and grade index of lint of different amounts of cleaning after ginning.

All cottons used in the tests were grown at Chickasha or Oklahoma City under similar conditions. A simple overhead arrangement was used in all of the 1951 and 1952 series and on the first series of the 1953 tests. The overhead arrangements for the two after-frost treat-

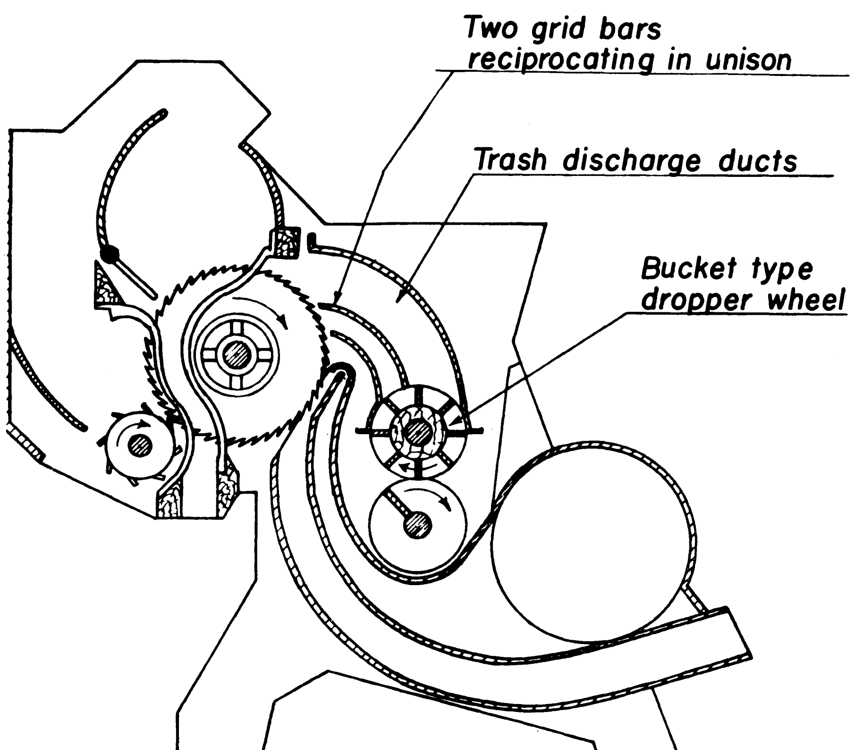

Fig. 2.—U.S.D.A. recipro-cleaner used in gin stand moting tests on Oklahoma cottons 1951 to date. The keen angle grid bars shuttle horizontally 60 times per minute and are an inexpensive type of "built-in" lint cleaning.

ments in 1953 consisted of the 4-cylinder 52-inch-width airline cleaner (first cylinder operating at 800 r.p.m. as a boll opener), reel drier, 14-foot master extractor, 7-cylinder 52-inch width inclined cleaner, distributor and unit extractor-feeder-cleaners. Both arrangements were over 80-saw airblast gins.

One gin stand with centrifugal moting was used without and with saw-type lint cleaners for comparison with the recipro-cleaner gin stand without and with lint cleaners. Results of nine series of tests are given in Tables 10 and 11.

The percent foreign matter in the lint was decreased as lint cleaning equipment was added to the gin arrangement. The recipro-cleaner was not as effective as the lint cleaner in lowering the level of foreign matter in the lint. The recipro-cleaner plus the lint cleaner lowered the foreign matter content significantly below the level of foreign matter in the lint produced by the standard gin without lint cleaning (Table 10).

The grade indexes as shown in Table 11 were not significantly different for any gin arrangement. The recipro-cleaner and lint cleaner combination produced the highest average grade index.

These lint cleaning and moting equipment studies showed that if the foreign matter content could be sufficiently reduced in the final sample, there would be a probability of obtaining significantly greater returns per bale load delivered to the gin. Consequently tests were run later in the 1953 season to verify this theory which has long been held in mechanized production. Results were promising and warranted further study in 1954.

Boll Opening

The first frost or freeze of the autumn season usually halts the growth of the green bolls remaining on the cotton plant. Maximum extraction of cotton from the "hickory nuts" is possible only if the bolls are opened before entering the extracting units. Lint from the frozen bolls may cause heavy discoloration of the sample if there are large numbers of the bolls present at time of harvest. Tests were started in 1951 to determine the effects of boll opening prior to extraction on lint turnout, grade, staple length, and foreign matter content of the lint.

The first cylinder[7] of the 4-cylinder, 52-inch-width airline cleaner in the Ginning Laboratory was modified so that it could be operated selectively at 400, 600 or 800 r.p.m. Two series of tests were run, one in 1951 and one in 1952, to compare an arrangement without the boll opener to the three arrangements with it. The ginning arrangement without the boll opener consisted of the separator, 14-foot master extractor, 7-cylinder inclined cleaner, distributor, and unit cleaner-extractor-feeders over 80-saw airblast gins. The airline cleaner (see Fig. 1, pg. 5) preceded this arrangement, with speed of its first cylinder as mentioned.

The 1951 test used Stoneville 62-2 cotton, stripped late after frost following one previous hand-snapping. Cotton used in the 1952 test was Parrott variety, stripped three weeks after frost and after one

[7]Unlike the others, this cylinder has beater arms which effectively break the unopened bolls.

previous hand-snapping. Both cottons contained a large number of frozen bolls. Principal results of the two series of tests are given in Table 12.

It was concluded from the boll opening tests that on late season Oklahoma cottons harvested as a clean-up operation, boll opening was essential and profitable before the extracting stages of ginning.

The boll opening tests were modified in 1953 to include two additional arrangements, (1) with and without the boll opener, combined with (2) minimum and maximum lint cleaning. Parrott cotton stripped in a once-over operation after frost was used in one series. A second series was run using a mixture of Parrott and Stormproof #1 which had been stripped in a once-over operation after frost. These tests obtained higher lint turnouts when using the boll opener; however, some of the grades were changed from Spotted to Tinged, and some were placed in the Light Spot range from White. Better cleaning contributed to some of the change in color designation.

Rate of Feed And Rate of Ginning

Tests during the 1950 season at Chickasha had shown that the effectiveness of gin stand cleaning was reduced with the faster rates of ginning.

Observations during test runs in 1951 and 1952 indicated that there might be a somewhat faster optimum rate of feed for the overhead machinery as well as an optimum greater rate of ginning. Preliminary tests were initiated in 1953 to ascertain the optimum overhead capacity and rate of ginning for roughly harvested cotton. Rate of ginning, measured in pounds of ginned lint per saw per hour ran up to 9.5 pounds in the 1953-54 tests as compared to generally established older rates of 8.5 pounds.

A bulk seed cotton feed control developed at the Stoneville Laboratory was used to regulate the flow of cotton through the overhead machinery. Mechanical difficulties during operation precluded the drawing of definite conclusions; however, it was noted that, even with uniform feeds, the higher rates of feeding and ginning gave a rough appearance.

The data collected during 1953 warranted further study of mechanically controlled feeding for Oklahoma gins. Other cotton growing states are rapidly adopting bulk feed controls, and there should be significant advantages, especially in affording each machine a better opportunity to do its work.

1954 Test Results

It was concluded from the tests prior to the 1954-55 crop year that there are two courses of action to be followed in ginning Oklahoma cotton if results are to be evaluated on the basis of lint turnout and grade.

One line of economical approach is to use only the minimum amount of machinery and processes necessary to preserve the inherent qualities of the cotton as delivered from the field. Cottons ginned with minimum amount of machinery have a foreign matter content of such level that bale weight from a given amount of harvested material is relatively high.

The second alternative for ginning Oklahoma cotton is to use every available means of lowering the level of trash in the lint to that point whereat the increased grade value of the lint would show increase on return over and above that figure obtainable had the cotton not been subjected to cleaning.

The tests for the 1954-55 crop year were planned according to the two aforementioned courses of action. Cotton was obtained from different points in the state to be used in the test work.

Gin Machinery Arrangements

The following symbols are used in the test records to designate the equipment used in the different combinations:

ALC—4 cylinder, 52-inch-width airline cleaner with first cylinder used as a boll opener.

TD—18-shelf tower drier. (Temperatures of 200° F. at point of contact of heated air and cotton were used when the tower drier was employed in single-stage drying or as first drier in two-stage drying. 150° F. was used in the second stage, when employed.)

RD—Reel type drier. (No heat was used in the 1954 tests.)

7C—7-cylinder, 52-inch-width inclined cleaner.

BM—14-foot master bur extractor.

SR—Experimental stick remover with grid bars at 1⅜ inches clearance.

FDR — Unit extractor-feeder-cleaner.

WOLC—80-saw huller-front gin stand with standard moting.

WLC—80-saw huller-front gin stand with recipro-cleaner plus lint cleaner.

Overhead Cleaning, Drying and Lint Cleaning

MECHANICALLY PICKED COTTON

Deltapine 15 grown in the Arkansas River bottom near Haskell, Okla., was harvested with a mechanical picker on September 27, 1954. A defoliant had been applied, but due to drouth conditions leaf shedding was poor. Total yield of the cotton was estimated to be approximately one bale per acre. At the time of harvest sufficient cotton was opened so that the picker was gathering about ½ bale per acre. Moisture content of hand-picked seed cotton samples averaged 5.38 percent. Samples pulled from the picker basket immediately after harvest averaged 11.50 percent moisture in the seed cotton because wet spindles were used. The cotton was trucked to Chickasha, and at time of ginning starting the following day the seed cotton moisture content averaged 10.62 percent.

Overhead machinery arrangements used on the mechanically picked cotton were as follows:

1. -TD -7C -FDR
2. -TD -BM -7C -FDR
3. -TD -7C -BM -7C -FDR
4. -TD -7C -BM -TD -7C -FDR

All arrangements were used in combination with WOLC and WLC.

Principal results of the one series of tests in 1954 with mechanically picked cotton are summarized in Table 13.

An analysis of the data indicates that Gin Set-up II was the most effective overhead treatment. The maximum lint cleaning arrangement was effective with all combinations of overhead equipment in raising the per pound value of the lint. Gin Set-up IV-WLC gave a significant one grade increase over Gin Set-up I-WOLC. Turnout was reduced by the addition of drying, overhead and lint cleaning equipment. The maximum lint cleaning arrangement removed approximately 13 pounds more of pin and pepper trash and waste fiber than did the standard moting gin from each 1500 pounds of seed cotton. Evaluated on the basis of bale weight multiplied by price per pound, Gin set-up II-WOLC gave the highest immediate return to the producer. In Oklahoma this would be a moderate or standard cotton gin for handling machine picked cottons.

MECHANICALLY STRIPPED COTTON

Stormproof #1 was stripped in a once-over operation after frost at three locations in Oklahoma: Willow, Altus and Chickasha. The Willow cotton was stripped on November 5 after having a desiccant applied on October 19. A number of green bolls were still unopened at the time of harvest but were easily eliminated as they were fully matured and heavy enough to drop out through the green boll separator. Yield of the Willow cotton was approximately 3/4 bale per acre. There was very little evidence of insect infestation. No rain had fallen on the cotton from the time it opened until harvested.

Yield of the Altus cotton was between 1-1/2 and 2 bales per acre. A freeze on October 29 caused the leaves to stick and there was only a partial drop. Damage attributable to insects was low. A large number of green bolls were present at time of freeze, but by the time of harvest (Nov. 15-20), most had opened or dried out. Quantity of frozen bolls was large enough to cause off color in the lint sample.

The Chickasha cotton yielded approximately 1/4 bale per acre and had little insect damage. Rains during the latter part of the season caused deterioration of color of the lint and a large number of green bolls were present at time of frost. The maturity of the green bolls was such that they were very moist after being frozen and did not dry out readily. There was practically no leaf drop because of the freeze. Weather conditions had been such during the growing season that the fibers and seed had not developed fully and consequently complicated the ginning problems.

Lankart 57 was grown at Chickasha under the same conditions as the Stormproof #1. Yield of the Lankart 57 was comparable to the yield of Stormproof #1.

A summary of moisture and trash content of the 1954-55 cottons is given in Table 14.

Two overhead treatments, simple and elaborate, were used without and with drying and without and with lint cleaning on mechanically stripped cotton. Three series were run using the master extractor and two series were run with the stick remover. The gin machinery arrangements were as follows:

Simple—Without Drying	BM or SR-7C-FDR
Simple—With Drying	TD-BM or SR-7C-FDR
Elaborate—Without Drying	ALC-7C-BM or SR-7C-7C-FDR
Elaborate—With Drying	ALC-7C-TD-BM or SR-7C-7C-FDR

Each of the four treatments was combined with WOLC and WLC.

Results of the tests used to determine the effects of overhead cleaning, drying and lint cleaning on these harvests are given in Tables 15 through 17.

Bale weights from 2400 pounds of material as listed in Table 15 show that there was a significant reduction in turnout from simple to elaborate overhead systems, from without drying to drying, and from standard gin moting to maximum lint cleaning. Total reduction in bale weight averaged 45 pounds when using the combination of elaborate overhead with drying and with lint cleaning compared to the simple overhead without drying and without lint cleaning.

As shown in Table 16 the Willow cotton had no designations for off color. All other cottons were in the lower white grades or had a color designation. There were no significant differences between grades of cotton ginned without or with drying nor with simple or elaborate overhead set-ups. There was a significant increase of grade index of lint cleaned over non-lint cleaned samples. Combinations of overhead machinery with or without drying had little effect on the increase of grade obtained through the use of maximum lint cleaning equipment. This lack of increase in grade through overhead combinations corresponds to the slight loss of bale weight, indicating that there is little to be gained in overhead cleaning past the point of removal of such trash as would react adversely in the separation of lint and seed. There was a greater difference in grade index between locations than could be attained through any combination of gin machinery at any given location.

Dollar value of lint from 2400 pounds of stripped material was estimated by taking the four year average discounts as quoted at Chickasha, and subtracting these from a base price of $.3323 for Middling 15/16, then multiplying that figure by the pounds of lint produced from 2400 pounds stripped material. These figures do not reflect current prices or value, but are indicative thereof since the relative values of grades show little or no variation from year to year.

It is evident that under some conditions in Oklahoma there may be greater potential in cleaning lint after it has been ginned than in cleaning the seed cotton prior to its arrival at the gin stand. The use of large amounts of overhead cleaning and/or drying may lower the lint turnout without a consequent increase in the value of the cotton. Analysis of the results in Table 17 indicates no significant dollar differences between simple and elaborate overhead arrangements of cleaning and drying. This would imply that elaborate gins may not pay in Oklahoma. Maximum lint cleaning arrangements were effective approximately 80 percent of the time in showing a profit in combination with any of the overhead arrangements. There was a significant difference in value of cotton grown in Chickasha and at the other locations, the Chickasha cotton being lower because of drouth conditions.

Rate of Overhead Feed and Rate of Ginning

Two series of tests were run with mechanically stripped cotton to study the effects of different rates of overhead feed combined with different rates of feed of the unit extractor to the gin stand and consequent different rates of ginning. The same cotton previously described as Altus Stormproof #1 and Chickasha Lankart 57 were used in the tests.

The overhead and lint cleaning arrangements were:

(1) Airline cleaner, reel drier, bur extractor, unit feeder and gin stand,

and

(2) same as (1) with lint cleaner added.

The overhead[8] was regulated for rate of production of four or six bales per hour to the distributor. The feeders were adjusted to rate of feed to the gin stand of 1 or 1½ bales per hour.

Results of the 1954-55 tests used to study the effects of rate of overhead feed and rate of ginning are given in Tables 18 through 20.

Figures in Table 18 indicate no significant difference in bale weight between the two rates of feed through the overhead. Rate of feed into the gin stand indicated that one bale per hour gave slightly higher lint turnout than did one and one-half bales per hour. There was a significant difference in bale weight between lint not cleaned and that cleaned after ginning.

There were no significant differences in grade index of lint as listed in Table 19 between 4 and 6 bales an hour in the overhead or 1 or 1½ bales an hour through the unit feeder of a gin stand. There was a significant increase of grade index of lint ginned with maximum lint cleaning. There was a difference in response of the cotton to varied rates of feed. The Altus cotton appeared to give less color in the lint sample with the fast rates of feed as compared to the lower rates of feed. This was attributed to the fact that efficiency of extraction was lowered at higher rates of feed and more of the hard locked cotton was thrown out with the trash. The opposite effect was noted in the Chickasha cotton. It tended to assume a rougher appearance and possibly more of the damaged cotton was retained at the higher rates of feed since the cotton and trash were grouped into a finer state at the higher rates of feed.

Values of lint from 2400 pounds of stripped material shown in Table 20 indicate no significant differences in value of lint between any combinations of rates of feed and/or machinery. Value of the lint ginned with one bale per hour fed to the gins averaged slightly higher than the value at the rate of feed of 1½ bales per hour to the gin stand. The lint produced from 2400 pounds with minimum lint cleaning averaged higher

[8] The equipment "overhead" or up to the distributor has ample capacities to serve 4 gin stands.

in total bale value than the lint produced from 2400 pounds with maximum lint cleaning.

It was concluded from the results of the rate of overhead feed and rate of ginning tests that even though no significant difference in lint weight or grade index was shown between rates of overhead feed there is the possibility of damage to the inherent fiber qualities which would preclude the use of the higher rates of production. When ginning at the higher rates of 9-½ pounds per saw per hour production, lint turnout was reduced with no consequent increase in grade. Controlled feeding of the overhead machinery contributed to more uniformity in the baled lint.

Advantages and Disadvantages Of Cleaning Cotton

The returns to the producer and ginner may be measured in terms of lint multiplied by per pound value, and the salability of the product in terms of short term and long term gains. Nature of Oklahoma cotton being such that the major portion of the crop carries some color designation and has a length of staple averaging 29/32nds of an inch, there is a large number of grade and staple combinations which have the same market value. Cottons in the lower classification of grades carry some color even in the White standard. Even though a creditable job of cleaning is accomplished, this off color is still present, and the general character of the cotton is such that the market value after cleaning is no greater than it was prior to cleaning, and in many instances lower. Premimums and discounts for the staple lengths in the 13/16th to 15/16th inch range are marked, and any process which in effect serves to shorten or lengthen the average measurement of the fiber may show a substantial loss or gain. By the same measure, any process which includes or excludes damaged fiber may decrease or increase the value of the cotton through a change in the general characteristics and effective staple length of the end product.

It is concluded that the advantages of adequately cleaning cotton are as follows:

1. The average grade of the cotton is raised, which should make it more salable.

2. More even-running lots of cotton are placed on the market.

Disadvantages of too much cleaning are:

1. To the producer, variations in the character of cotton often affect grade returns through loss of weight and no increase in per pound value.

2. There is greater chance for fiber damage if the added machinery is not operated properly.

3. To the ginner, the costs of installation, maintenance and operation of elaborate equipment are much greater.

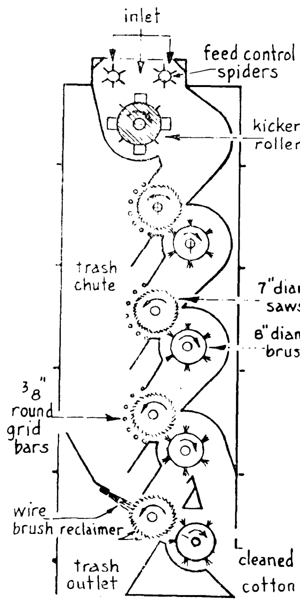

Fig. 3.—1953 pilot model of the new cotton cleaner-stick remover at Chickasha. Left to right, Dr. Hawkins; Prof. Schroeder, the author; and Mr. Gerald Franks, the inventor. Details of the cleaner-stick remover are shown in the diagram at the right.

New Cotton Cleaner-Stick Remover[9]

This recent contribution to the art of cotton ginning was developed by the Cotton Ginning Investigations' Engineers of the U. S. Dept. of Agriculture to specifically meet the mechanized production conditions at Chickasha, Okla., and other similar points in the state.

Figure 3 shows a photo of the first pilot model of this machine at the time of its successful preliminary trials during August 1953. From the results of those tests the development of full size units proceeded. These are now in operation at strategic mechanized production points across the cotton belt and are giving excellent results.

As may be seen in the photograph, the equipment is rather simple. Its new principles embrace worthwhile combinations of toothed cylinders, grid bar assemblies, clearing brushes, separate vertical passageways for seed cotton and trash respectively, and the utilization of centrifugal forces without damage to the fiber.

The tests were continued through the 1954 crop season to fully verify the elements of design, capacity, grid spacings, saw tooth construction and other features, including reclaiming loose fibers.

[9] Gerald N. Franks, Agricultural Engineer, inventor. Charles M. Merkel, Engineer in charge, Stoneville Ginning Laboratory. Charles A. Bennett, in Charge, Cotton Ginning Investigations.

Performance data on the new cotton cleaner-stick remover is not here reported, but the tests proved that approximately 70 or more percent of all sticks, stems, leaf and other foreign matter in the seed cotton as brought to the gin is readily removed in one passage through the machine when the cotton is dry and the rate of feed properly regulated. Two machines, each of 60 inches working length, have proved to be adequate for a 4-stand ginning outfit. Horsepower requirements for two units, placed back to back and integrated into the ginning equipment in a correct manner, vary from 15 to 20 horsepower total.

This machine is now in commercial production by several factories, and descriptive information may be obtained from those sources.

Summary

Results of research in cotton ginning at the Oklahoma Cotton Research Station for the 1950-55 period emphasize the point that the ginning processes serve to preserve the inherent quality of the cotton as delivered to the gin while converting the raw material into the two profitable, salable products of lint and seed. Attempts to do more usually result in loss of revenue to the producer.

Specific conclusions are:

1. Simple overhead arrangements turn out lint with the best fiber properties and characteristics when used on harvested material which contains minimum amounts of damaged cotton. The damaged cotton is more apt to be thrown out in the extracting processes and the resultant value of the lint will be higher than if the damaged cotton was retained.

2. Drying is needed only on damp or wet cotton to prevent rough preparation, or on slightly green cotton to obtain maximum extraction. Extended drying entails the risk of damaging the fiber properties and lowering the cash returns to the producer. The *use,* rather than the *abuse* of drying, prevents loss to the producer.

3. Fast ginning at 9-½ pounds of fiber per saw per hour contributes to somewhat lowered lint turnout without consequent grade increases, but may be necessary for profitable ginning.

4. Uncontrolled or too fast feeding of the overhead system endangers the inherent qualities of the fiber and produces a bale of highly variable characteristics. Controlled bulk feeding offers advantages.

5. The new cotton cleaner-stick remover should prove to be very useful in Oklahoma cotton gins.

Recommendations

There is no question but that overhead and lint cleaning machinery when used properly will lower the foreign matter content of the lint sample when measured in terms of weight. There is reasonable doubt that too much cleaning within the maximum allowable range of grade standards can prove to be profitable for either producer or ginner.

The following recommendations are made on the basis of results and observations during the course of the test work:

1. For highest returns use only enough equipment to equalize the trash content of the lint sample with the other general characteristics of the cotton as delivered from the field, avoiding undue weight loss.

2. Use drying only to prevent rough preparation or secure effective extraction, and adjust temperature reasonable with length of exposure during the drying.

3. Operate the gin stands to produce approximately 6-½ to 7-½ pounds of lint per saw per hour, rather than at top rates of 9 pounds.

4. Provide the overhead ginning arrangement for the expected capacity of the gin stands, and control the rate of flow through the machinery to obtain uniform results.

Equipment of the size as listed below may be used in varying combination to obtain maximum returns and produce up to 1-¼ 500-pound bales per hour per gin stand on four 80-saw gins when processing rough harvested cotton:

Full length drier; 52-inch width opening cleaner of 4 to 7 cylinders; 14-foot master extractor, or two 60-inch stick removers of U. S. Dept. of Agriculture design; 52-inch width finishing cleaner of 6 to 14 cylinders; unit extractor-feeder-cleaners; and approximately 280 to 320 gin saws in huller front stands.

In those gins handling mechanically picked cotton the order of processes should be: Drying, extracting, finishing cleaning.

If stick removers are used for extracting, the grid bar spacings should allow correct clearance for ejection of trash to suit regional needs.

Gins processing hand snapped or mechanically stripped cottons should be equipped so that one of the following orders of processes may be employed as condition of the cotton warrants:

a. Extracting, finishing cleaning.

b. Drying, extracting, finishing cleaning.

c. Opening cleaning, extracting, finishing cleaning.

Arrangement "a" is recommended for hand snapped or machine stripped cotton which includes the major portion of the yield; i. e., predominantly better quality bolls.

Arrangement "b" is recommended for slightly green or wet hand snapped or mechanically stripped cotton.

Arrangement "c" is recommended for late harvested scraps harvested either by hand snapping or mechanical stripping.

The equivalent of a total of 14 cylinders of screen cleaning is the maximum cleaning recommended in the overhead system in the light of the Chickasha tests. If the stick removers are used, less screen cleaning is required than if the master extractor is used. Grid bar spacing in the stick remover should have 1-3/8 inches clearance for hand snapped or mechanically stripped cotton.

APPENDIX A
Code for Grade, Color or Leaf Designation.

Grade	White & EW	Spotted	Tinged	Yellow Stained	Gray
SGM	106	---	--	--	--
GM	105	101	94	86	93
SM	104	99	91	81	91
SM—	103	97	88	78	89
M+	101	95	85	75	86
M	100	93	82	73	84
M—	98	90	80	--	81
SLM+	96	86	77	--	78
SLM	94	83	75	--	75
SLM—	91	81	73	--	--
LM+	88	78	70	--	--
LM	85	75	68	--	--
LM—	82	---	--	--	--
SGO+	79	---	--	--	--
SGO	76	---	--	--	--
SGO—	74	---	--	--	--
GO+	72	---	--	--	--
GO	70	---	--	--	--
GO—	65	---	--	--	--
Below Grade	60	---	--	--	--

Grades below the double line are not tenderable on futures contract.

Constants calculated from the average premiums and discounts for Middling 15/16" for years 1937-38, 1938-39, and 1939-40, Middling 15/16" counted as 100. An average discount for "Below Grade" is not available. The constant adopted for "Below Grade" was 60, or 10 less than the constant for Good Ordinary.

TABLE 1.—Effect of Air Drying Test Temperatures on Weight of Lint Produced From 2000 Pounds of Hand Snapped or 2400 Pounds of Machine Stripped Material—1951 and 1952 Tests.

Year	Variety	Method of harvest	Portion & time of harvest	Control Undried (lbs.)	Temperature at drier inlet 150°F. (lbs.)	200°F. (lbs.)	250°F. (lbs.)	300°F. (lbs.)
			Tower Drier					
1951	Lankart 57	Snapped	First—Before frost	520	502	514	484	488
1951	Stoneville 62	Snapped	Second—Before frost	452	444	453	442	437
1951	Stoneville 62	Stripped	Second—After frost	524	520	496	485	490
1952	Lankart 57	Snapped	First—Before frost	470	477	473	477	482
1952	Lankart 57	Snapped	Second—After frost	450	465	461	458	466
1952	Parrott	Stripped	Second—After frost	533	514	531	524	530
			Reel Drier					
1952	Lankart 57	Snapped	First—Before frost	478	476	463	461	452
1952	Lankart 57	Snapped	Second—After frost	474	465	470	467	462
1952	Parrott	Stripped	Second—After frost	561	558	533	535	527
Average				495.7	491.2	488.2	481.4	481.5

TABLE 2.—Effect of Air Drying Test Temperatures on Grade Index* of Cotton—1951 and 1952 Tests.

Year	Variety	Method of harvest	Portion & time of harvest	Control undried (index)	Temperature at drier inlet 150°F. (index)	200°F. (index)	250°F. (index)	300°F. (index)
			Tower Drier					
1951	Lankart 57	Snapped	First—Before frost	97.4	97.5	97.8	100.1	100.9
1951	Stoneville 62	Snapped	Second—Before frost	100.2	100.8	101.3	101.5	101.5
1951	Stoneville 62	Stripped	Second—After frost	79.0	79.0	79.0	79.0	79.0
1952	Lankart 57	Snapped	First—Before frost	100.8	100.8	100.8	101.0	101.0
1952	Lankart 57	Snapped	Second—After frost	96.3	96.3	96.1	95.3	96.3
1952	Parrott	Stripped	Second—After frost	83.9	84.6	88.0	89.7	94.2
			Reel Drier					
1952	Lankart 57	Snapped	First—Before frost	100.8	101.0	100.8	101.0	101.5
1952	Lankart 57	Snapped	Second—After frost	95.2	96.3	96.4	96.0	95.3
1952	Parrott	Stripped	Second—After frost	85.6	86.5	90.9	89.5	89.0
Average				93.2	93.6	94.6	94.8	95.4

* Grade Index figures here shown are the Government Classification code rating used to more clearly define cotton trade terms, such as, "Strict Good Middling" to "Good Ordinary", and below grade. The code, for example, assigns values to grades as follows: SGM–106; GM–105; SM–104; M–100; SLM–94; LM–85, and so on. Spots, tinges, stains and grays are penalized in these indices.

TABLE 3.—Effects of Air Drying Test Temperatures on Staple Length of Cottons—1951-1952 Tests.
(Staple length in 32's)

Year	Variety	Method of harvest	Portion & time of harvest	Control undried (1/32")	Temperature at drier inlet 150°F. (1/32")	200°F. (1/32")	250°F. (1/32")	300°F. (1/32")
			Tower Drier					
1951	Lankart 57	Snapped	First—Before frost	31.4	31.4	31.3	31.2	31.1
1951	Lankart 57	Snapped	Second—Before frost	29.8	30.0	29.7	29.5	29.3
1951	Lankart 57	Stripped	Second—After frost	28.5	28.3	28.8	28.5	28.0
1952	Lankart 57	Snapped	First—Before frost	29.0	27.8	27.3	28.0	28.0
1952	Lankart 57	Snapped	Second—After frost	28.2	28.8	28.5	27.8	28.0
1952	Lankart 57	Stripped	Second—After frost	29.8	29.3	29.2	29.5	29.3
			Reel Drier					
1952	Lankart 57	Snapped	First—Before frost	28.8	28.3	28.3	28.5	29.5
1952	Lankart 57	Snapped	Second—After frost	28.3	28.5	27.5	28.0	28.7
1952	Parrott	Stripped	Second—After frost	29.8	29.7	29.3	29.5	29.8
Average				29.3	29.1	28.9	28.9	29.1

TABLE 4.—Effects of Air Drying Test Temperatures on Percent Foreign Matter Remaining in Lint Sample After Cleaning—1951 and 1952 Tests.

Year	Variety	Method of harvest	Portion & time of harvest	Control undried (%)	Temperature at drier inlet 150°F. (%)	200°F. (%)	250°F. (%)	300°F. (%)
			Tower Drier					
1951	Lankart 57	Snapped	First—Before frost	4.09	3.75	3.69	3.33	3.70
1951	Stoneville 62	Snapped	Second—Before frost	5.51	4.97	4.22	4.86	4.48
1951	Stoneville 62	Stripped	Second—After frost	8.03	7.81	7.69	8.05	6.81
1952	Lankart 57	Snapped	First—Before frost	4.80	4.93	4.13	4.34	4.50
1952	Lankart 57	Snapped	Second—After frost	8.05	7.71	7.33	6.80	7.39
1952	Parrott	Stripped	Second—After frost	9.27	7.94	7.35	6.84	6.66
			Reel Drier					
1952	Lankart 57	Snapped	First—Before frost	5.03	5.26	4.72	5.00	4.64
1952	Lankart 57	Snapped	Second—After frost	8.39	7.40	7.29	7.69	7.32
1952	Parrott	Stripped	Second—After frost	8.41	8.74	7.59	7.23	7.94
Average				6.84	6.50	6.00	6.01	5.94

TABLE 5.—Effects of Air Drying Test Temperatures on Percent Moisture Content of Lint—1951 and 1952 Tests.

Year	Variety	Method of harvest	Portion & time of harvest	Control undried (%)	Temperature at drier inlet 150°F. (%)	200°F. (%)	250°F. (%)	300°F. (%)
			Tower Drier					
1951	Lankart 57	Snapped	First—Before frost	5.6	5.0	5.5	4.2	2.9
1951	Stoneville 62	Snapped	Second—Before frost	6.0	4.9	4.1	3.2	2.8
1951	Stoneville 62	Stripped	Second—After frost	6.1	5.6	4.6	3.5	2.9
1952	Lankart 57	Snapped	First—Before frost	4.5	3.3	2.4	2.6	2.1
1952	Lankart 57	Snapped	Second—After frost	4.0	3.3	2.8	2.5	2.1
1952	Parrott	Stripped	Second—After frost	6.3	4.9	4.6	3.8	3.6
			Reel Drier					
1952	Lankart 57	Snapped	First—Before frost	4.7	3.9	3.4	2.9	2.5
1952	Lankart 57	Snapped	Second—After frost	4.0	4.1	3.6	3.4	3.1
1952	Parrott	Stripped	Second—After frost	6.5	5.7	5.1	4.6	4.3
Average				5.3	4.5	4.0	3.4	2.9

TABLE 6.—Effects of Different Combinations of Overhead and Lint Cleaning Equipment on Weight of Lint Produced From 2000 Pounds Hand Snapped or 2400 Pounds Mechanically Stripped Cotton—1951 and 1952 Tests.

(Pounds of lint)

Variety	Method of harvest	Portion & time of harvest	Simple overhead		Moderate overhead		Elaborate overhead	
			WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)
1951								
Mebane 6801	Snapped	First—Before frost—Early	503	490	494	483	470	478
Mebane 6801	Snapped	First—Before frost—Late	501	488	495	482	493	492
Stoneville 62-84	Snapped	Second—After frost—Early	431	421	459	427	422	424
Stoneville 62-2	Stripped	Second—After frost—Early	439	419	461	430	443	440
Stoneville 62-2	Stripped	Second—After frost—Late	387	393	394	392	388	369
1952								
Lankart 57	Snapped	First—Before frost—Early	502	485	488	484	498	499
Lankart 57	Snapped	Second—After frost—Early	541	533	546	537	531	519
Lankart 57	Snapped	Third—After frost—Late	448	425	444	442	441	422
Average			464.2	450.3	470.6	457.6	459.6	453.9

TABLE 7.—Effects of Different Combinations of Overhead and Lint Cleaning Equipment on Grade Index of Lint Produced from Hand Snapped and Mechanically Stripped Cotton—1951 and 1952 Tests.

Variety	Method of harvest	Portion & time of harvest	Simple overhead WOLC (index)	Simple overhead WLC (index)	Moderate overhead WOLC (index)	Moderate overhead WLC (index)	Elaborate overhead WOLC (index)	Elaborate overhead WLC (index)
		1951						
Mebane 6801	Snapped	First—Before frost—Early	95.8	96.8	96.2	97.3	96.1	98.0
Mebane 6801	Snapped	First—Before frost—Late	99.0	101.5	100.7	101.5	101.5	101.5
Stoneville 62-84	Snapped	Second—After frost—Early	85.8	93.0	90.6	93.0	93.0	93.6
Stoneville 62-2	Stripped	Second—After frost—Early	81.7	83.0	83.0	81.7	83.0	83.0
Stoneville 62-2	Stripped	Second—After frost—Late	70.2	74.0	70.5	71.5	72.7	76.3
Stoneville 62-84	Stripped	Second—After frost—Late	76.5	79.0	77.7	77.7	77.7	76.3
		1952						
Lankart 57	Snapped	First—Before frost—Early	101.1	101.1	100.9	102.0	101.1	101.3
Lankart 57	Snapped	Second—After frost—Early	100.0	100.2	100.5	100.4	100.0	100.3
Lankart 57	Snapped	Third—After frost—Late	95.5	99.0	96.5	98.6	96.5	99.0
Average			89.5	92.0	90.7	91.5	91.3	92.1

TABLE 8.—Effects of Different Combinations of Overhead and Lint Cleaning Equipment on Staple Length of Lint Produced From Hand Snapped and Machine Stripped Cotton—1951 and 1952 Tests.

Variety	Method of harvest	Portion & time of harvest	Simple overhead		Moderate overhead		Elaborate overhead	
			WOLC (1/32")	WLC (1/32")	WOLC (1/32")	WLC (1/32")	WOLC (1/32")	WLC (1/32")
		1951						
Mebane 6801	Snapped	First—Before frost—Early	29.1	29.2	28.8	28.9	28.7	29.1
Mebane 6801	Snapped	First—Before frost—Late	29.5	29.5	29.5	29.5	29.7	29.8
Stoneville 62-84	Snapped	Second—After frost—Early	29.2	29.0	28.7	29.2	28.8	29.0
Stoneville 62-2	Stripped	Second—After frost—Early	29.8	30.0	30.0	30.0	30.0	29.8
Stoneville 62-2	Stripped	Second—After frost—Late	29.5	29.0	30.2	30.2	30.2	30.2
Stoneville 62-84	Stripped	Second—After frost—Late	30.0	30.2	29.7	30.0	29.7	29.7
		1952						
Lankart 57	Snapped	First—Before frost—Early	32.0	31.8	31.7	31.2	31.2	31.8
Lankart 57	Snapped	Second—After frost—Early	31.3	31.2	31.5	30.8	31.0	31.2
Lankart 57	Snapped	Third—After frost—Late	32.0	32.5	32.3	32.3	32.3	32.5
Average			30.3	30.3	30.3	30.2	30.2	30.3

TABLE 9.—Effects of Different Combinations of Overhead and Lint Cleaning Equipment on Percent Foreign Matter in Lint Sample From Hand Snapped and Machine Stripped Cotton—1951 and 1952 Tests.

Variety	Method of harvest	Portion & time of harvest	Simple overhead		Moderate overhead		Elaborate overhead	
			WOLC (%)	WLC (%)	WOLC (%)	WLC (%)	WOLC (%)	WLC (%)
		1951						
Mebane 6801	Snapped	First—Before frost—Early	4.40	3.38	4.04	4.00	3.53	3.39
Mebane 6801	Snapped	First—Before frost—Late	4.42	3.91	4.19	3.31	3.56	3.14
Stoneville 62-84	Snapped	Second—After frost—Early	6.65	4.84	5.37	4.87	5.34	4.18
Stoneville 62-2	Stripped	Second—After frost—Early	8.70	7.19	7.01	5.93	6.31	5.23
Stoneville 62-2	Stripped	Second—After frost—Late	11.58	7.01	9.50	7.81	8.93	7.04
Stoneville 62-84	Stripped	Second—After frost—Late	9.35	7.45	7.78	6.00	6.42	7.22
		1952						
Lankart 57	Snapped	First—Before frost—Early	2.74	2.84	2.92	2.51	2.88	2.28
Lankart 57	Snapped	Second—After frost—Early	3.25	3.03	3.38	2.40	2.57	2.48
Lankart 57	Snapped	Third—After frost—Late	6.65	4.71	5.84	4.29	5.84	4.28
Average			6.42	4.93	5.56	4.56	5.04	4.36

TABLE 10.—Effects of Different Lint Cleaning and Moting Arrangements on Percent Foreign Matter in Lint Produced From Hand Snapped and Mechanically Stripped Material—1951 to 1953 Tests.

Variety	Method of harvest	Portion & time of harvest	Standard gin		Recipro-cleaner gin	
			WOLC (%)	WLC (%)	WOLC (%)	WLC (%)
		1951				
Stoneville 62-84	Snapped	Second—After frost—Late	5.61	5.61	5.11	4.15
Stoneville 62-84	Stripped	Second—After frost—Late	8.49	7.25	7.21	6.32
Stoneville 62-2	Stripped	Second—After frost—Early	7.58	6.65	6.40	5.28
		1952				
Stoneville 62	Snapped	First—Before frost—Early	4.52	3.59	3.18	3.72
Stoneville 62	Snapped	Second—Before frost—Late	9.22	7.86	8.93	6.71
Stormproof #1	Stripped	First—After frost—Early	7.59	5.68	6.26	5.25
		1953				
Lankart 57	Snapped	First—Before frost—Late	6.03	5.06	5.47	4.33
Lankart 57	Snapped	First—After frost—Early	5.77	5.04	4.78	3.92
Lankart 57	Stripped	First—After frost—Late	7.85	6.41	6.90	5.40
Average			6.96	5.91	6.03	5.01

TABLE 11.—Effects of Different Lint Cleaning and Moting Arrangements on the Grade Index of Lint Produced From Hand Snapped and Mechanically Stripped Cotton—1951 to 1953 Tests.

Variety	Method of harvest	Portion & time of harvest	Standard gin WOLC (index)	Standard gin WLC (index)	Recipro-cleaner gin WOLC (index)	Recipro-cleaner gin WLC (index)
		1951				
Stoneville 62-84	Snapped	Second—After frost—Late	94.0	94.2	94.8	95.3
Stoneville 62-84	Stripped	Second—After frost—Late	77.7	77.7	77.7	79.0
Stoneville 62-2	Stripped	Second—After frost—Early	83.0	83.0	83.0	83.0
		1952				
Stoneville 62	Snapped	First—Before frost—Early	100.0	101.8	101.8	102.3
Stoneville 62	Snapped	Second—Before frost—Late	95.7	100.3	100.3	100.0
Stormproof #1	Stripped	First—After frost—Early	95.3	94.8	94.8	97.3
		1953				
Lankart 57	Snapped	First—Before frost—Late	85.5	86.5	86.5	87.0
Lankart 57	Snapped	First—After frost—Early	88.5	88.5	88.5	88.5
Lankart 57	Stripped	First—After frost—Late	85.5	87.1	84.1	85.7
Average			89.5	90.4	90.2	90.9

TABLE 12.—Principal Results From Boll Opener Tests—1951 and 1952.

Test	Weight of lint from 2400 lbs. (lbs.)		Grade index		Staple length (1/32″)		Foreign matter in lint (%)	
	1951	1952	1951	1952	1951	1952	1951	1952
No Boll Opener	328	578	69.2	93.8	30.8	27.5	11.73	5.57
Boll Opener at:								
400 r.p.m.	406	617	69.2	93.0	30.0	28.0	9.50	5.60
600 r.p.m.	424	604	68.0	93.0	30.2	27.5	11.03	5.42
800 r.p.m.	417	620	69.2	95.0	30.3	27.2	11.53	5.73

TABLE 13.—Principal Results with Mechanically Picked Cotton—1954-1955 Tests.

Gin set-up	Weight of lint from 1500 lbs. seed cotton		Grade index of lint		Value of lint from 1500 lbs. seed cotton		Moisture in lint sample	
	WOLC	WLC	WOLC	WLC	WOLC	WLC	WOLC	WLC
I	529	518	94.0	98.7	159	164	5.40	5.85
II	530	517	98.7	99.3	167	165	5.45	5.80
III	527	506	95.3	99.3	161	161	6.55	6.30
IV	516	508	95.3	100.0	157	163	5.80	5.45

TABLE 14.—Pre-ginning Conditions Affecting Ginning Characteristics—1954-55.

Place of Growth and Variety	Percent moisture in seed cotton		Pounds of trash in 2400 lbs. material			
	Hand picked	Stripped	Hulls	Sticks	Leaf	Other
Willow, Stormproof #1	5.30	8.02	401	24	79	62
Altus, Stormproof #1	5.08	8.58	428	66	55	52
Chickasha, Stormproof #1	6.82	7.84	420	98	142	120
Chickasha, Lt. 57	6.62	8.22	528	83	112	64

TABLE 15.—Weight of Lint Produced From 2400 Pounds of Stripped Material—1954-55 Overhead Cleaning, Drying and Lint Cleaning Tests.

Place of Growth and Variety	Simple overhead				Elaborate overhead			
	Not dried		Dried		Not dried		Dried	
	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)
Willow, Stormproof #1	617	595	610	597	603	595	606	583
Altus, Stormproof #1	661	627	639	611	624	619	624	609
Chickasha, Stormproof #1	539	503	531	497	528	498	532	502
Altus, Stormproof #1	638	607	633	611	635	609	622	599
Chickasha, Lt. 57	580	539	571	521	560	523	568	517
Average	607	574	597	567	590	569	590	562

TABLE 16.—Grade Index of Lint Produced by Each Gin Arrangement 1954-55 Overhead Cleaning, Drying and Lint Cleaning Tests.

Place of Growth and Variety	Simple overhead				Elaborate overhead			
	Not dried		Dried		Not dried		Dried	
	WOLC (index)	WLC (index)	WOLC (index)	WLC (index)	WOLC (index)	WLC (index)	WOLC (index)	WLC (index)
Willow, Stormproof #1	94.7	97.6	97.8	100.0	96.9	100.0	99.6	100.0
Altus, Stormproof #1	85.4	95.7	89.4	96.5	88.1	96.5	88.5	96.5
Chickasha, Stormproof #1	82.4	88.5	88.5	88.5	88.5	90.3	86.6	92.9
Altus, Stormproof #1	88.5	96.5	92.1	96.5	90.4	96.5	92.9	96.5
Chickasha, Lt. 57	88.5	93.8	88.5	90.3	86.6	88.4	88.5	88.5
Average	87.9	94.4	91.3	94.4	90.1	94.3	91.2	94.9

TABLE 17.—Dollar Value of Lint From 2400 Pounds of Stripped Material—1954-55 Overhead Cleaning, Drying and Lint Cleaning Tests.

Place of Growth and Variety	Simple overhead				Elaborate overhead			
	Not dried		Dried		Not dried		Dried	
	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)
Willow, Stormproof #1	177	175	179	179	177	181	183	177
Altus, Stormproof #1	171	182	165	176	159	179	159	176
Chickasha, Stormproof #1	116	118	125	118	124	122	122	128
Altus, Stormproof #1	162	175	171	176	166	176	170	173
Chickasha, Lt. 57	146	149	143	132	138	132	141	127
Average	154.4	159.8	156.2	152.8	152.8	158.0	155.0	156.2

TABLE 18.—Weight of Lint Produced From 2400 Pounds of Stripped Material 1954-55 Rate of Overhead Feed and Rate of Ginning Tests.

Place of Growth and Variety	4 Bales per hour overhead				6 Bales per hour overhead			
	1 Bale per gin		1½ Bales per gin		1 Bale per gin		1½ Bales per gin	
	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)
Altus, Stormproof #1	656	620	637	613	642	612	635	623
Chickasha, Lankart 57	548	506	542	505	549	519	541	513
Average	612	563	590	559	596	566	588	568

TABLE 19.—Grade Index of Lint Produced by the Different Rates of Feed 1954-55 Rate of Overhead Feed and Rate of Ginning Tests.

Place of Growth and Variety	4 Bales per hour overhead				6 Bales per hour overhead			
	1 Bale per gin		1½ Bales per gin		1 Bale per gin		1½ Bales per gin	
	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)	WOLC (lbs.)	WLC (lbs.)
Altus, stormproof #1	93.0	99.0	95.7	99.8	95.3	99.3	95.7	100.4
Chickasha, Lankart 57	86.3	88.5	85.4	88.5	86.0	87.3	83.5	87.3
Average	89.6	93.7	90.5	94.1	90.6	93.3	89.6	93.8

TABLE 20.—Dollar Value of Lint From 2400 Pounds of Stripped Material 1954-55 Rate of Overhead and Rate of Ginning Tests.

Place of Growth and Variety	4 Bales per hour overhead				6 Bales per hour overhead			
	1 Bale per gin		1½ Bales per gin		1 Bale per gin		1½ Bales per gin	
	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)	WOLC ($)	WLC ($)
Altus, Stormproof #1	182	185	185	182	183	182	184	188
Chickasha, Lankart 57	128	122	125	123	129	124	121	123
Average	155.0	153.5	155.0	152.5	156.0	153.0	152.5	155.5