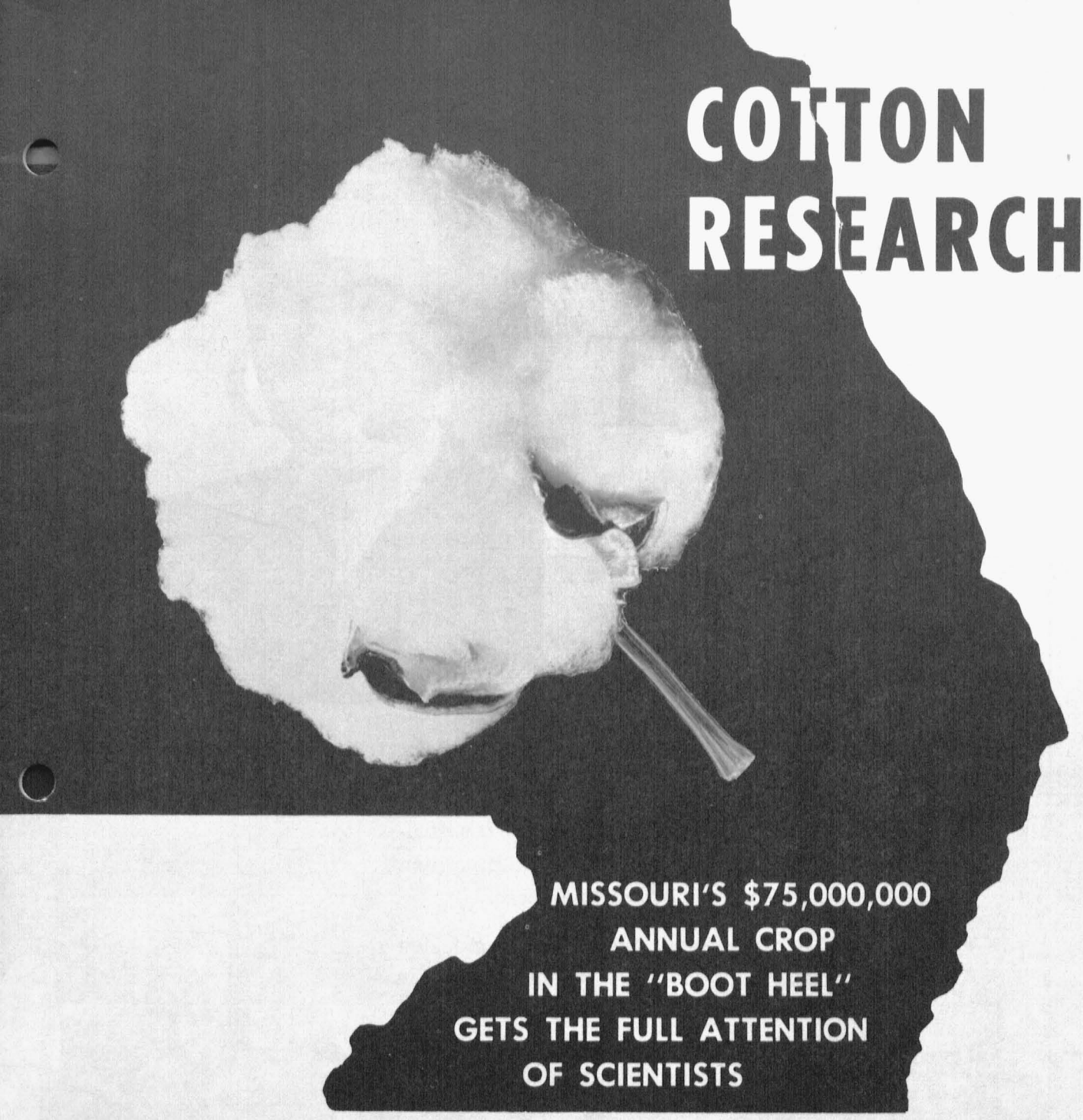
COTTON RESEARCH



MISSOURI'S $75,000,000
ANNUAL CROP
IN THE "BOOT HEEL"
GETS THE FULL ATTENTION
OF SCIENTISTS

at the

UNIVERSITY OF MISSOURI – COLLEGE OF AGRICULTURE

AGRICULTURAL EXPERIMENT STATION

J. H. LONGWELL, Director – S. B. SHIRKY, Associate Director

COLUMBIA, MISSOURI

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Cotton In Our Long-Range Plans

Cotton is Missouri's number one cash crop in most years. Production of cotton is sufficiently great to place the state in ninth position among all states in amount produced.

The Experiment Station has conducted research with cotton for many years. The extent of the cotton research program has been enlarged during the last two years. Results of research are published regularly in annual reports, bulletins and news releases.

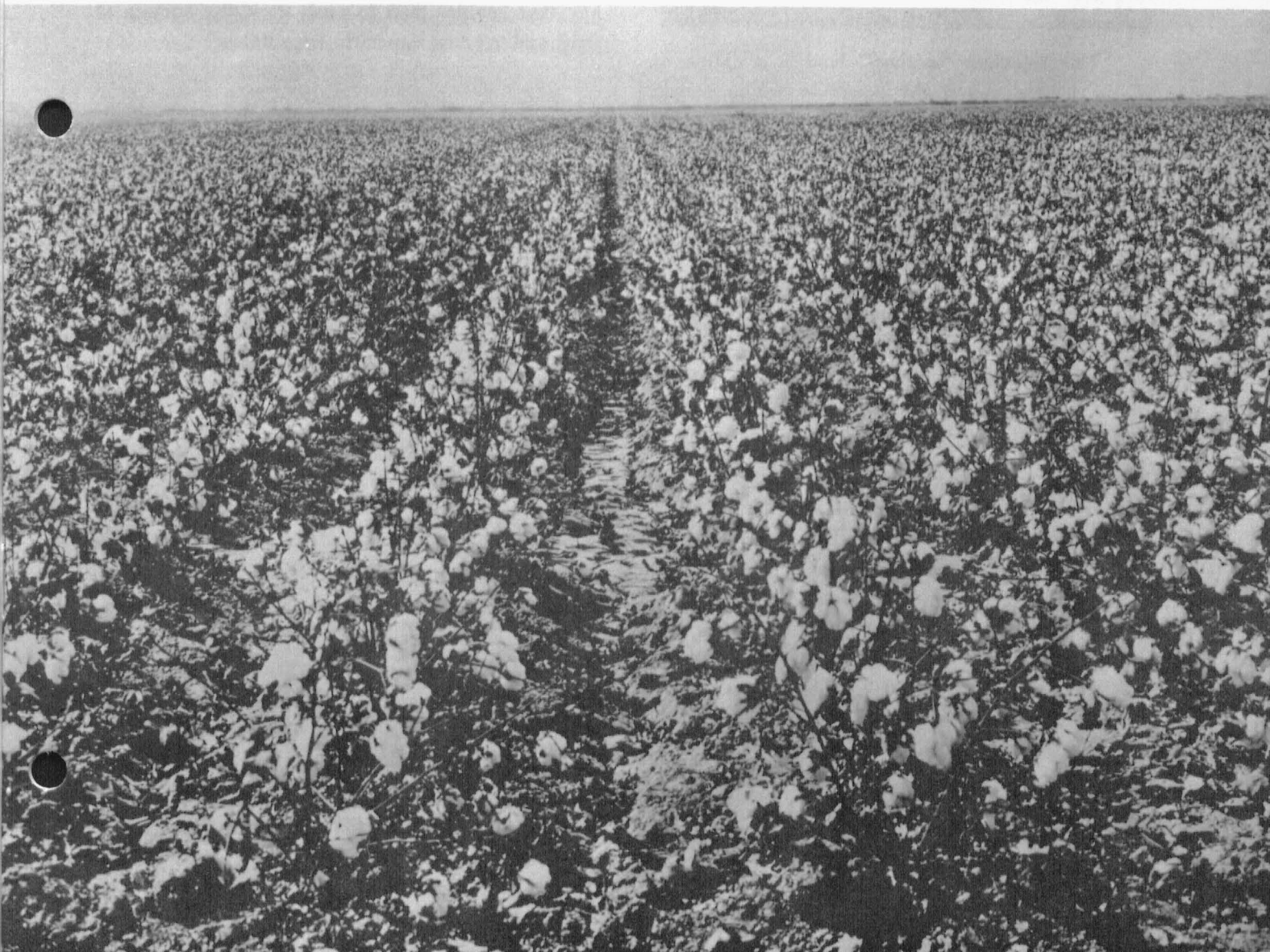
This bulletin brings together in one publication all the important cotton research results obtained by the Missouri Experiment Station. Many problems still remain for research to find answers to.

J. H. LONGWELL, *Director*

There's a Touch of Dixie in the
Fabulous "Bootheel" all because of . . .

COTTON

. . . Missouri's $75,000,000 crop!



COTTON . . . *Missouri's $75,000,000 crop!*

It's Dixie alright, this "bootheel" country "where the cotton blooms and blows." And although the aroma of the camellia and the azalea may be missing, it's the Southland alright . . . the "deep" South to-boot!

He who has breathed the distilled fragrance of the damp cotton fields, or pulled the lint from the stingy burs, or "chopped" cotton under a broiling June-time sun, until in the words of Kipling, "your bloomin' eye balls crawl," know that this is cotton country, as distinct and different from all others as honeysuckle is from haw!

This so-called "bootheel" land is a chunk of Dixie, where you might expect to see in person almost the old favorites of Southern literature. Joel Chandler Harris and his "Brer Fox," "Brer Rabbit," and "Uncle Remus," and Sidney Lanier singing, "The Song of the Chattahoochee," live here in spirit.

It's South, it's Dixie, and it's cotton country. Make no mistake about that, and you won't once you've looked at the record. In 1956 some 365,000 acres of land in this empire devoted to cotton, yielded 450,000 bales, weighing 500 pounds gross, each. Their value was placed at $75,150,000. The average cotton yield in this state was 592 pounds of lint cotton per acre, exceeding the United States' average by 184 pounds.

The United States devoted 15,651,000 acres to cotton in 1956. It yielded 13,303,000 bales, gross weight of 500 pounds of lint cotton each. The value of this vast crop, confined largely to the Southland, was two and a quarter billion dollars.

To the "bootheel", and its people, who cultivate and harvest a $75,000,000 cotton crop each year, these pages are dedicated, not in so many words but in so many deeds, by the scientists of the Missouri Agricultural Experiment Station, who "work in cotton." Those who "work in cotton" are dedicated men and women, whether they be in the "bootheel" as producers, or in the laboratories studying the problems of this plant on many fronts.

Thus to cotton, and that interesting area of this state where it as a crop is so dominant, these pages may hold much of interest. These pages are the records of research, and research in cotton as in other crops or endeavors, is the veritable golden key that enables man to push back the curtain of time, and to bring tomorrow here today.

In the "bootheel" cotton is still the great dominant crop, often referred to as "King." Through research it is the hope that this crop will ever be improved to meet the high challenge of the new day when cotton and cotton by-products, as fabric and feed, are called upon to do many jobs well.

In a world whose population is increasing at the rate of 130,000 new faces each day, cotton—as food and fiber—has an important assignment with destiny. Through research—and research alone—can cotton reach all of the goals set for it in the decades immediately ahead.

Cotton, which adds beauty to the rural Southland, our own "bootheel," or anywhere on the face of the earth where it may be grown, in fall's harvesttime, and adds two and a quarter billions of dollars in new wealth to the nation's material gains each year, deserves the considered thinking of all.

In these pages then, humbly and sincerely put together, is cotton's own story as told by only those who can tell it well—cotton's friends in research!

The "Ag. Economist" Takes A Long Look At Cotton

A crucial problem of production in today's agriculture is to determine what to produce. Not only does this decision relate to choices between products to which resources in agriculture are allocated, but also to types and qualities within products. This has become particularly true in the case of cotton in Missouri. Some of our cotton marketing research has been directed toward this problem.

By and large, production of almost all commodities in the United States has been directed by the relationship of costs and prices in our market. One important concern in agricultural research has been to improve the quality of agricultural products for consumers without corresponding increases in costs.

Sometimes the marketing process becomes so complicated that it is difficult for price differentials indicating preferences in types or qualities of product to reach the farmer in a way that makes direction of production effective.

The Department of Agricultural Economics of the University of Missouri College of Agriculture has had a continuing project studying the effectiveness of market prices in directing production and production practices of Missouri cotton growers.

Our study of one variety cotton communities discovered some of the advantages that have accrued in this respect and pointed up some of the difficulties in administration of the program. With this information, extension workers and others have improved the effectiveness of this program.

Marketing Study is Under Way

A study of the degree to which local market prices reflect premiums and discounts for quality differences in the terminal and processing markets is under way. Some practices which improve quality of farm products involve additional cost, some do not.

The fact remains that the strongest force for inducing farmers to follow these practices is a proper price differential in the market. The goal of this research work is to strengthen the incentive and guidance which price can give to farmers in improving the quality of the cotton fiber which they send to the market, both in terms of the type produced and the care given it in production, harvesting and marketing.

Vigorous cotton will produce sufficient bloom to produce 6-8 bales per acre. We do not possess sufficient knowledge of the plant's growth processes to get this many bolls to set. This experimental cotton that received treatment according to soil test produced over 2 bales per acre at one picking.

Working With Cotton In . . .

Soil Fertility and Plant Nutrition

The seven Delta counties in Missouri that produce cotton have some of the most productive, yet variable soils in the United States.

The alluvial sediments that formed these soils originated from such far away places as the Ohio Valley, the upper reaches of the Mississippi, the alkaline soils of the upper Missouri Valley, and the leached, eroded materials of the Ozark highlands.

The removal of timber and drainage were the essential practices in bringing this land into cultivation. The soil fertility and organic matter that had accumulated provided adequate nutrients for cotton and other crops when this land was first cultivated. However, under intensive cultivation at this location of high average temperature, soil organic matter has rapidly disappeared, soils have become lighter in color, soil structure has deteriorated, making it more difficult to secure stands of cotton, and despite better varieties, improved machinery, more effective fungicides, weed control methods and insecticides, crop yields have not shown the improvements that should be expected.

The failure of these practices to increase yield are now known to be largely due to the loss in capacity of these soils to deliver adequate nutrients.

Soil Treatments Correlated

Because of the wide variations in individual fields—due to past management—as well as initial differences in soils, studies have been conducted to correlate soil treatments with efficient production to eliminate soil fertility as a factor in production. Experimental work has not been designed only to increase yields.

Except for the additional costs of fertilizers and picking there is little difference is costs of production of two bales or one-half bale of lint per acre. The experimental work has shown it is possible to greatly increase total income from cotton with more efficient use of soil treatments, by reducing both acreage and total production.

Some soil fertility research has been conducted with cotton for more than 25 years. With the increase in appropriations starting in 1955, soil fertility work was conducted at 18 locations. In 1956, three new fields were established where the work was concentrated with additional studies being carried out with five cooperating farmers.

Involved 2000 Plots

This work involved more than 2000 individual plots each year. In each of the two years more than 15,000 individual cotton bolls were tagged and record of set and drop tabulated.

This work involves the following studies:

1. Correlation of field response to different amounts of plant nutrients with laboratory tests.
2. Effects of soil treatments on earliness, ginning percentage, and fiber length.
3. Influence of soil treatment on efficiency of production, both with and without supplemental irrigation.
4. Cotton response to secondary and trace element applications.
5. Influence of water solubility of phosphorus on cotton response.
6. Source of potash in cotton fertilizers.
7. Effect of plant nutrient ratios and supplemental irrigation on flower set and boll drop.
8. Source of nitrogen for cotton.
9. Influence of lime and gypsum on cotton yields.
10. Methods and time of fertilizer applications.

Studies made during the past two years show the following:

1. The efficiency of production of cotton can be increased on most soils by the use of proper fertilizer materials. The balance of these nutrients to the cotton plants and the stage of growth when available are critical in the set and bloom of plants. Much higher levels of nitrogen are required on most soils to obtain optimum yields than is generally recognized.

Nitrogen Must Be Balanced

However, it is not possible to apply this amount of nitrogen before planting without stimulating too much early vegetative growth. High levels of other nutrients are required to balance these nitrogen applications. Irrigation makes possible application of nitrogen later in the season, after some blooms have set, and still have the nitrogen absorbed by the plants. This is not possible in dry seasons without irrigation.

2. Southeast Missouri usually receives ample rainfall for cotton, but summer drouths during five of the past six years have greatly increased the efficiency of utilization of fertilizer nutrients. In one experiment at Malden in 1956—a very sandy soil—fertilizer alone without water failed to show much increase in yield. Water alone was of little benefit, but when these two production factors were com-

bined the yield was greatly increased, as shown in the following table.

EFFECT OF FERTILIZER AND WATER ON YIELD OF SEED COTTON—MALDEN, 1956

Soil Treatment	Water	
	None	Irrigated
None	1023	1088
100-100-100	1235	2636

Both adequate soil treatment and irrigation were necessary for most efficient production.

3. The use of limestone and gypsum failed to show much benefit on soil that was not irrigated. However, because of the response of fertility when soils were irrigated, additional work is required with these treatments when water is not limiting.

4. Differences in response to various sources of nitrogen were obtained at different locations. These results suggest differential responses that will require additional work in fundamental soil chemistry and plant growth processes to fully understand and explain.

5. Results point to the need for adequate levels of soil organic matter. With some of the heavier nutrient additions on irrigated high organic matter soils, yields of nearly 3 bales of lint cotton per acre were produced in 1956. On a sandy, low organic matter soil, the yield with the same water and fertilizer treatment was slightly less than two bales per acre.

6. The water solubility of phosphate and source of potash had little effect on yields.

Fertilize To Help Young Plants

7. The importance of adequate starter fertilizer to give the young plants a vigorous start was evident at all locations. The recent general practice of bedding all fertilizer to save time at planting has apparently resulted in a serious loss to many farmers. A liberal starter application of a 1-1-1 fertilizer, with additional nitrogen side dressed in July, gave the most efficient yields.

8. The counting and tagging of blooms on cotton plants receiving different soil treatments and supplemental water treatments, showed that cotton plants will produce sufficient blooms to produce yields of more than six bales per acre. Cotton receiving no soil treatment or water set about 45% of the small number of blooms produced. Where water, but no treatment was applied, the total set was increased 40% and the percent of blooms increased to 55%.

Where treatment was applied, but no water added, the percentage set was reduced, and the total number set only slightly increased. Where both soil treatment and supplemental water was added, the number of blooms produced was doubled, and with this increased number of blooms the set was nearly 50%.

These results indicate that both the fertilizer treatment and added moisture increased set; but additional factors regarding fruiting must be studied before the principles involved in this still large drop can be fully understood.

9. The increased vegetative growth from the added treatments and irrigation delayed maturity. This complicates the problems of mechanical picking and points to the need for more study on defoliation methods in order to take advantage of these factors that will produce higher yields and more efficient production.

10. Heavy applications of nitrogen have not delayed maturity when phosphorus was present in ample amounts. High amounts of soluble phosphorus, with low nitrogen levels, have speeded maturity but reduced yields.

Liberal potassium treatments have caused cotton to hold foliage longer, reduced the amount harvested at the first picking, but increased total yield. As yields have increased, there is an indication that additional sulfur and some of the trace elements may be necessary to prevent limitations in production.

Proper plant nutrition can affect both yield and maturity of cotton. This becomes more important as a larger percentage of the crop is machine picked and soil treatment and irrigation produce more foliage. A high level of phosphorus caused the cotton at left to mature earlier. Where phosphorous was omitted, at right, the bolls were slower in opening.

Missouri's Program of Cotton Variety Testing

Testing varieties provides information to growers by which the best can be selected for planting. Cotton varieties grown have come from commercial seed breeders whose developmental programs are carried on under conditions usually different from those found in Southeast Missouri. This has been the only source. Many such varieties exist.

Variety tests serve as the basis of varietal recommendations to growers. Continuous year to year testing on different soils and in different environments reveal those varieties best suited. Presently, only four varieties are recommended—*D&PL Fox* is early and yields well, *Delfos 9169* has longer staple with the highest value per acre, *Deltapine 15* is for those who desire a high lint turnout and good yields, and *Coker 100W* has resistance to fusarium wilt. Even these, however, lack certain agronomic and spinning properties that lessen their value per acre to growers in the northern-most region of the Cotton Belt.

A Never-Ending Job

Searching for and the testing of varieties is a never-ending process. New varieties are released each year. New strains from other states, commercial breeders, and our own breeding program will become available. These must be evaluated to determine their worth. It is only through this continuous testing program that the best adapted cotton varieties can be made available to cotton producers in Southeast Missouri.

Breeding to Get . . .

Locally Adapted Cotton Varieties

Cotton varieties specifically adapted to any given area can be obtained only through local breeding programs. The necessity of this is even more critical in Southeast Missouri—the northern-most limit of the Cotton Belt. With intensive use of supplemental irrigation, optimum fertilization, and mechanized methods of production an early, high yielding variety with superior spinning properties, resistance to diseases, capabilities of utilizing high levels of fertility and moisture and with other properties related to mechanized production and harvest is a

Information is sadly lacking on the fundamental growth processes in cotton. During the past two years nearly 30,000 individual cotton bolls have been tagged to study the effect of soil nutrient balance, irrigation, and climatic effects on boll set. This technician is tagging bolls on cotton that all received the same soil treatment 100-100-100 per acre. The upper picture is from non-irrigated land.

key to successful and profitable cotton production. Present commercial varieties when grown in cotton producing areas of Missouri lack most of these desired characteristics.

Preliminary phases, leading to the eventual development of a complete full scale cotton breeding program for Southeast Missouri, were begun in 1956. Problems and objectives are established. More than 500 different lines, strains, and varieties of cotton were grown in search of those possessing these needed characteristics. A few were selected to form the basis of the future breeding work.

A Look To The Future

By hybridization, selection, and testing, improved varieties will be developed for future use. These, of necessity, must be early maturing, high yielding and with a superior quality fiber. Our short growing and harvesting season will not permit use of medium or late maturing varieties. Fruiting must be rapid with maximum setting efficiency during the first forty days of flowering. This permits maximum yields of uniformly maturing crops of cotton. With good defoliation and machines the crop can thus be harvested before grade reducing late fall rains set in.

A strong fibered cotton of uniform length with superior spinning qualities is one means of stiff competition with synthetic fibers. It is added assurance of maintaining "King Cotton" as Southeast Missouri's major cash income.

Diseases of the cotton plant are major production problems. Fusarium wilt and the root knot nematode reduce cotton yields each year. In certain areas during some season verticillium wilt can result in non-profitable crops.

Greater use of sprinkler irrigation incites intensive damage by bacterial blight. Resistant varieties offer to the farmer the lowest cost means of control. Seedling diseases and "nub root" may reduce yield as much as 10% during any given season. Variety resistance combined with cold tolerance and seedling vigor would mean an early, quick establishment of uniform stands of healthy plants. This in turn greatly affects uniformity of growth and maturity and yield, weed control costs, and efficiency of mechanization.

Stiff stalked varieties capable of utilizing high levels of plant nutrients and supplemental water become more essential when greater returns per acre are necessary under acreage restriction programs.

Machine Harvesting Can Be Helped

Machine harvesting is most successful when a high picker efficiency of a well defoliated crop is obtained. "Stringy" cotton and lodged plants are wasty and picker yields low. Some degree of storm proofness in a cotton that stands well is essential to high picker efficiency and low picking costs.

These then are among the cotton farmers major production problems. These take their toll in terms

The above picture from a comparable area where supplemental water was applied.

of reduced potential farm income from cotton. Better varieties developed by intensive cotton breeding can correct these troubles.

Breeding and improving cotton varieties is a never-ending process. Changing problems promote new objectives. Perfection is never reached. Goals must be maintained at high levels. Efforts and support must be continuous in order to meet these challenges and to provide cotton producers with the best possible varieties that fulfill specific needs.

The Extension Service Has . . .

A Program For Cotton

Finding the answer is only a part of the plan for improving agriculture. Putting these answers into practice is the final pay off. Extension programs make this possible.

Specialists in crops, soils, insect control, economics, and others annually promote the findings of cotton research. Educational programs and field days are held periodically to acquaint growers and operators with the latest information about cotton production methods. Emphasis is given to mechanization, varieties, weed control, diseases, insect control, ginning and marketing. Demonstrations which can be imitated are also conducted.

The "one variety community" program sponsored by extension personnel is gaining in popularity. Benefits are apparent—maintenance of variety purity and volume sales of a consistent quality product. These pay dividends to the grower, ginner, buyer, and spinner of cotton fibers.

Work With Ginners

The cotton extension ginning program, supplying the ginner with information of new techniques and machinery, has resulted in a one-half grade increase, worth two and a half million dollars, since 1950. Missouri ginners are quick to respond to new and better ideas. Some 80 to 85% of the gins now are equipped to satisfactorily gin machine picked cotton. For the second time in Missouri history, 1956 cotton grades averaged above those for the United States.

In 1953 the average was above and in 1955 it was nearly equal to the United States average. This has

Irrigation of cotton promises to gain rapidly. This picture and the one opposite were taken of (Top) non-irrigated and (opposite) irrigated cotton on the heavy clay soil at the Bragg City Field. Both areas received the same soil treatment. The yield without water was 430 pounds of lint per acre, but where irrigated the yield was increased to 1080 pounds of lint. (1956)

come about by improved gins and ginning originally through efforts of extension programs and workers.

Cotton Water Management

The Department of Agricultural Engineering of the Missouri Agricultural Experiment Station has begun a research program under a project entitled "Cotton Water Management". This program is related to and may be considered an integral part of a program on cotton research of the station.

Money available for this work to date has been quite limited. However, a preliminary survey of the problem has been made, a program has been developed, and an experienced irrigation engineer has been employed to work in the southeast Missouri cotton-growing area. He is living at Sikeston and will give first hand attention to the problems of the region.

Objectives Are Stated

The principal objective of cotton research might be stated as the production of maximum yields of high quality cotton with minimum costs. Land leveling, grading, drainage and irrigation are basic to improvement in cotton production; and mechanization is essential to the lowering of costs of production, due to the shortage and high costs of labor.

With these thoughts in mind, beginning studies and observations were made. In addition to the station staff, there was available the services of some outstanding national authorities in irrigation to assist in the preliminary studies. Some observations and tests were made on a few irrigation wells in the area.

The beginning studies indicate that

1. Wide use of surface irrigation is entirely feasible.
2. Surface irrigation will require some land smoothing and grading. In some cases extensive land sloping and grading that may cost as much as $100 per acre will be required.
3. Drainage, even during the past few dry years, has continued to be a problem. If irrigation is adopted, drainage will be an increasing problem which must be considered in the design of irrigation systems.
4. Accurate topographic maps of fields to be irrigated will be required to plan efficient surface irrigation systems.
5. Engineering skill will be required in planning and developing drainage and irrigation systems.
6. Sprinkler irrigation will more than likely have wide use on pasture and forage crops, and on row crops where the soil and topography are not suited to surface irrigation.
7. Improvement in the design of sprinkler systems to give greater uniformity of application, and to reduce the labor requirements, can be made.
8. The capacity, drawdown, and amount of sand pumped from wells is affected by the type of

screen used and the method of developing the wells.

Drainage And Irrigation Studies

The Department of Agricultural Engineering has worked with the Departments of Soils and Field Crops in planning and constructing drainage and irrigation systems on experimental fields in the cotton-growing section of southeast Missouri.

The Department of Agricultural Engineering of the Missouri Agricultural Experiment Station has an irrigation research project, now in its second year, in cooperation with the Agricultural Research Service of the U. S. Department of Agriculture located on Mississippi river bottom land near Elsberry, Missouri.

Due to the similarity of the soils at Elsberry and much of the area in southeast Missouri, the results of these experiments should be of interest and value in the cotton section. The objectives of the studies at Elsberry are:

1. To determine the adaptability and the efficiency of surface and sprinkler irrigation of corn and alfalfa on Mississippi bottom soils, and
2. To develop design criteria for furrow irrigation, such as optimum length of furrow, best shape of furrow, slope of furrow, etc.

The major objectives of the engineering research related to cotton in southeast Missouri, which is just getting started, are:

1. To determine the most suitable and lowest cost methods of land levelling, sloping and grading to provide satisfactory and economical drainage, and for the development of good surface irrigation systems.
2. To develop design information for surface irrigation systems, most suitable length of furrows, slope of furrows, and rates of application.
3. To compare the efficiency and costs of surface and sprinkler irrigation.
4. To develop methods of reducing labor in irrigation.
5. To study the capacity, drawdown, and sand pumpage of wells as affected by the method of constructing and developing wells and the type of well screens.
6. To determine the best methods of seedbed preparation, planting, cultivation, and weed control in cotton under irrigation.
7. To determine the best practices of defoliation and machine harvesting of cotton under irrigation.
8. To determine the optimum times, rates and amounts of irrigation.

Soil organic matter is rapidly disappearing under intensive cultivation in the cotton growing area of Missouri. The use of rye and vetch is of benefit but its value is greatly over-rated. In some seasons a growing crop turned under for cotton has reduced yields through lower moisture reserves.

We Still Have Problems in the Cotton Fields as . . .

Cotton Insects Are Studied

In 1956 an intensive study of the cotton insect problems of Missouri was undertaken.

Some of the facets of the problem investigated during the year were: (1) a study of insecticidal seed treatments for the control of early season insects such as thrips, (2) a study of the usefulness of early season spray schedules in a cotton program, (3) observations of the effects of varying rates of fertilizer and irrigation on cotton insect populations, (4) testing of miticides for red spider control, (5) life history studies of the European Corn Borer on cotton, and (6) the testing of nematicides for controlling the nematode-fusarium wilt disease complex in cotton. Two members of the experiment station staff devoted their full time to these projects.

Problem More Serious Than Suspected

Early results indicate that the cotton insect problems in Missouri are often times more serious than generally realized. Observations made during the year provided further evidence that many cotton producers are often ill-advised, that they follow ill-timed control measures, and they often create more serious insect problems than they solve by following such programs.

It was also demonstrated that many farmers were able to keep their insect losses to a minimum at a small cost when they practiced the correct insect control measures. Thrips cause early stunting of the cotton plants which is considered by many growers to be a factor in reducing yields. In many other cotton growing areas, experimental work has indicated no increase in yield where thrips were controlled. Experimental work is needed in Missouri to determine whether yields will be increased by thrips control.

Proper evaluation of the situation can be a saving to farmers, either by preventing the unnecessary expense of spraying or by the application of control measures if such control measures are justified.

Routine Spraying Frowned Upon

Many cotton farmers consider routine spraying to be a sort of insurance against insect outbreaks in the fields. Such practices may create situations which invite trouble by killing the insect parasites and predators. Research work has been started on this phase of the problem.

Insects as well as plants are affected by climatic conditions such as temperature, rainfall, soil types, soil fertility and other factors. Irrigation as a practice is on the increase, as well as the use of commercial fertilizers.

Preliminary studies have indicated that insects, such as the cotton boll worm, prefer cotton plants that are growing under conditions of adequate moisture, tending to pass up fields that are in a condition of arrested growth due to drouth. Additional information on this pest as well as on other insects will be obtained as work progresses on this problem.

Red Spider Study Begun

Red spiders became one of the major problems in 1956 causing severe injury to a few cotton fields in early June. By mid-August there was severe damage to many fields. It was found that a species of red spider previously unknown in this area was present in some Missouri cotton fields. Controls previously considered satisfactory were inadequate and work was done to find a satisfactory control that could be used on cotton. Considerable progress was made toward a satisfactory answer to this problem during 1956.

The European corn borer on cotton first came to the station's attention in 1955. Cotton growers throughout the cotton belt were interested in obtaining further information regarding the possible hazard introduced by this adaptation of corn borer to cotton as a host plant. Observations during the 1956 season indicated that corn borer larvae can mature on cotton.

As cotton continues to be grown year after year in the same area the production problems become greater; the old problems often become more intense as time goes by. An example is the nematode disease complex which has been on the increase on cotton for the past few years.

In 1956 Dr. Vernon Perry, who is a federal nematologist located at Madison, Wisconsin, was invited to come to southeast Missouri to help evaluate the nematode problem of the area. After a week of surveying the area he reported that he considered the nematode problem as severe over the entire section. Preliminary research work was started on nematode control in 1956.

Course Taught At Sikeston

So that county agents, vocational agricultural teachers, farmers, and other interested persons could learn of the latest developments in cotton insect control, an eight-week course was taught at Sikeston, Missouri by Perry L. Adkisson of the staff of the

Southeast Missouri Agricultural Experiment Field.

In addition to cotton work at this station, a stored-grain insect laboratory is under construction there to help further studies of methods for controlling pests in farm stored grains.

To help farmers with their cotton insect problems, the Missouri Agricultural Extension Service trained and made available to interested farmers cotton insect scouts who weekly advised the producer of insect problems.

Six cotton insect scouts were used during the 1956 season. Four were privately employed and two were county-wide scouts hired jointly by the county and state Agricultural Extension Service.

A total of 9,794 acres of cotton was scouted on a regular weekly schedule by these six scouts. They were supervised and given technical assistance during the season by entomologists of the Missouri Agricultural Experiment Station and the Extension Service.

Research Makes Great Headway In . .

Cotton Disease Research

The estimated percentage reduction from full yield due to diseases of cotton of Missouri during 1955 and 1956 was reported as 20.1 and 19.6, respectively.

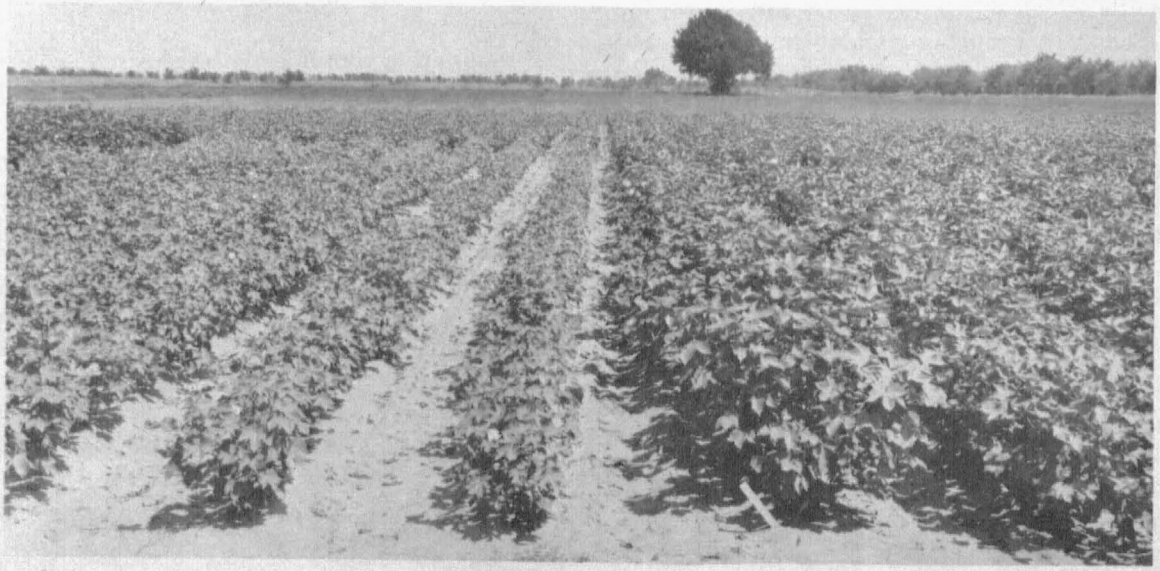
Disease	Percent Reduction 1955	1956
Seedling disease, various organisms	10.0	7.5
Fusarium wilt and root-knot nematode	3.0	4.0
Verticillium wilt		1.0
Bacterial blight	0.5	1.0
Boll rots other than bacterial blight	1.0	0.5
Ascochyta blight	0.5	0.5
Anthracnose	0.1	0.1
Others, including nutrient deficiencies	5.0	5.0
	20.1	19.6

This reported 10.0% loss in 1955 and 7.5% loss in 1956 from seedling diseases compared with 2.5% reported in 1953 and 1954 is attributed to the recognition of losses from nub root or root deficiencies of the mature plant.

Fungicide In Furrow Soil

The in-the-furrow-fungicide tests started in 1955 and continued in 1956 consisted of placement of fungicides in the furrow soil on and near the seed at planting time. Of the twelve fungicides tested one, Nabam, was found to give excellent control of damping off, five-fold stand increase over untreated plots. This stand increase was obtained on plots inoculated with the disease organisms to increase damping off potential.

Cotton seed treatment tests were started in 1956. Of the fourteen fungicides tested as seed treatments three of them gave three-fold stand increases over the check plots.



It costs little more, except for cost of fertilizer and picking to produce a yield of 2 bales as only half a bale. This cotton at left (grown on the Malden Experiment Field 1956, produced only 200 pounds of lint—not enough to meet the cost of production.) The plot to the right made over 2 bales per acre. An investment in $20.00 worth of soil treatment per acre gave a net return of over $100.00.

Soon, We Hope, We Can Hang Up Our Hoe As Scientists Battle . . .

Weeds In Cotton

Farmers who have been relying on cultural and hand hoeing methods to control weeds in cotton, have been finding themselves short of labor during the peak season of labor requirements in the cotton producing section of Missouri.

Prior to the advent of the mechanical cotton picker, there were two labor peaks in cotton production—the chopping and hoeing season and the picking season. As mechanical picking gradually replaces hand picking, the requirement for labor during the picking season is reduced.

With possibilities of employment only during the chopping and hoeing season, much of the labor that was formerly available for this period of the year has found employment in other jobs. This has brought about a great need for some other method of weed control in cotton production.

Hoeing Time Reduced

The use of six pounds per acre of CIPC as a pre-emergence herbicide for cotton has reduced the hoeing time required to remove weeds from cotton to 1/5 to 1/6 of that required for untreated cotton. It has reduced the cost of weed control, including the cost of chemical, to from ⅓ to ½ the cost without chemical treatment.

One pound per acre of diuron has also been found to be a very effective chemical treatment for cotton weed control. Although this chemical has a longer residual time in the soil than CIPC, and may present some problems if cotton has to be planted over, it is being used to a considerable extent in the cotton growing section of Missouri because it is somewhat lower in cost than the CIPC treatment.

Research work in cooperation with workers on cotton production techniques and cotton disease control is being carried out to attempt to combine chemical weed control with some method of either (1) planting cotton to a stand or (2) mechanical thinning to completely eliminate hand hoeing and chopping in cotton production.

Johnson Grass Spot Treated

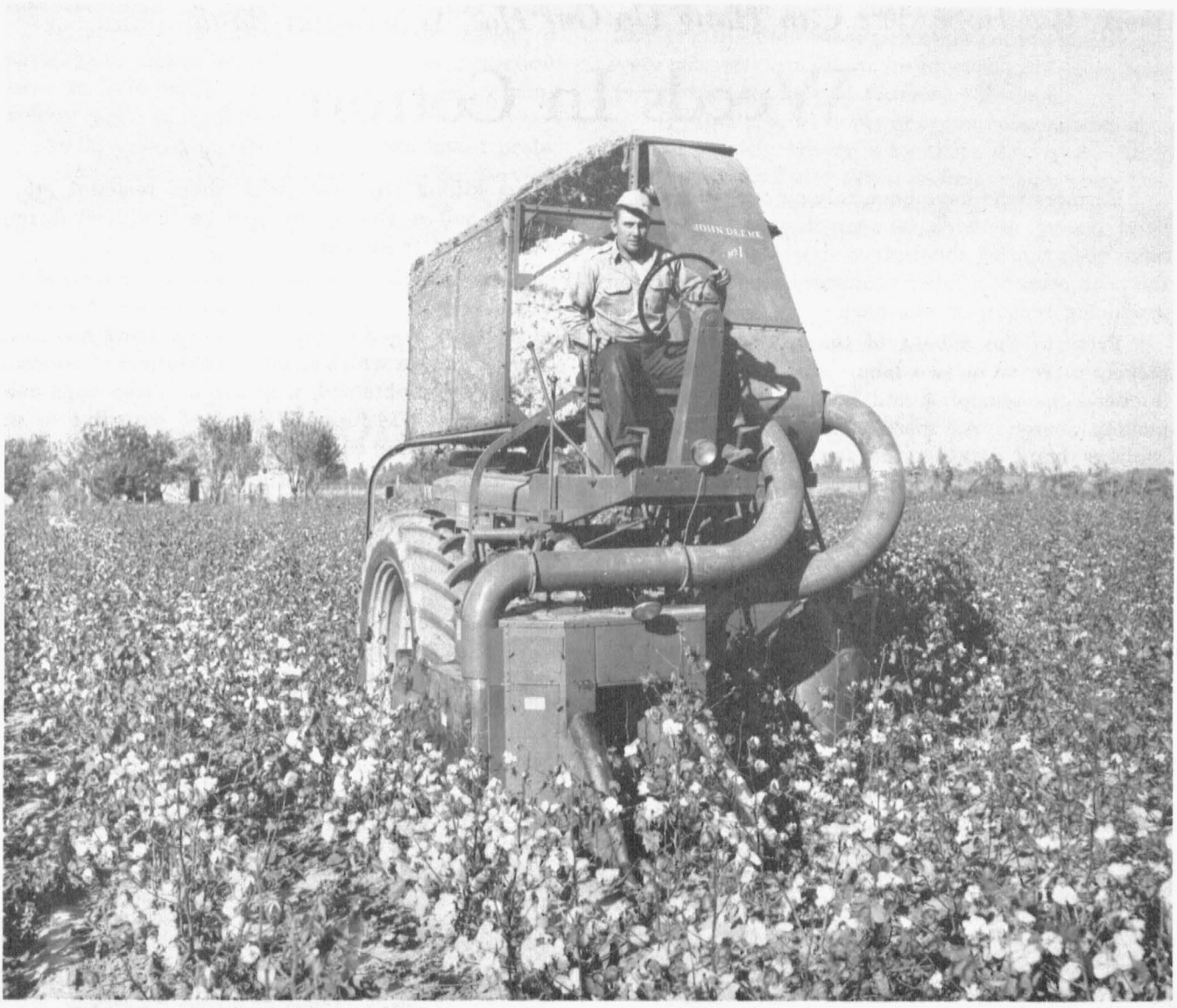
The costs of spot treatment of Johnson grass, which is a very bad weed in many cotton fields, have been reduced considerably through the use of TCA and dalapon, new grass killing chemicals. Research is being directed toward effective Johnson grass killing chemicals with short residual effect in the soil so that a crop can be produced during the year of treatment.

The search for a more economical chemical for Johnson grass control is being continued. A method of spot treating scattered plants by hand has been worked out, in which as effective control of Johnson grass can be obtained, with two or three trips over the field as was formerly obtained with five or six trips, using hand cutting methods.

This treatment consists of the use of 1/5 pound of acid equivalent of dalapon per gallon of water, sprayed on the foliage of the Johnson grass to moisten the foliage. The first treatment is applied before the Johnson grass produces seed, and it is repeated every 30 days.

Work is being started to find more efficient ways of controlling brush and other weeds along drainage and irrigation ditches in the cotton growing section of Missouri. If land forming, drainage, and irrigation continue to increase, as it is indicated they may, this phase of the weed control work will take on greater importance in the next few years.

The hand picking of cotton, long a drudgery operation, is rapidly passing from many of the cotton producing areas. Hand picking is fast being replaced by the mechanical picker of which there are several types made by national machinery manufacturers. (See back cover). Above picture, courtesy of the National Cotton Council, Memphis, Tenn.



Mechanical picking of cotton has created problems in maintaining lint quality. These problems become more complex as soil treatments and irrigation increase the size of plants and delay maturity.