Products

Missouri Needs-
TWO-BALE COTTON

J. M. Ragsdale and Fred E. Justus, Jr.

Archive version

C 760
EXTENSION DIVISION
UNIVERSITY OF MISSOURI

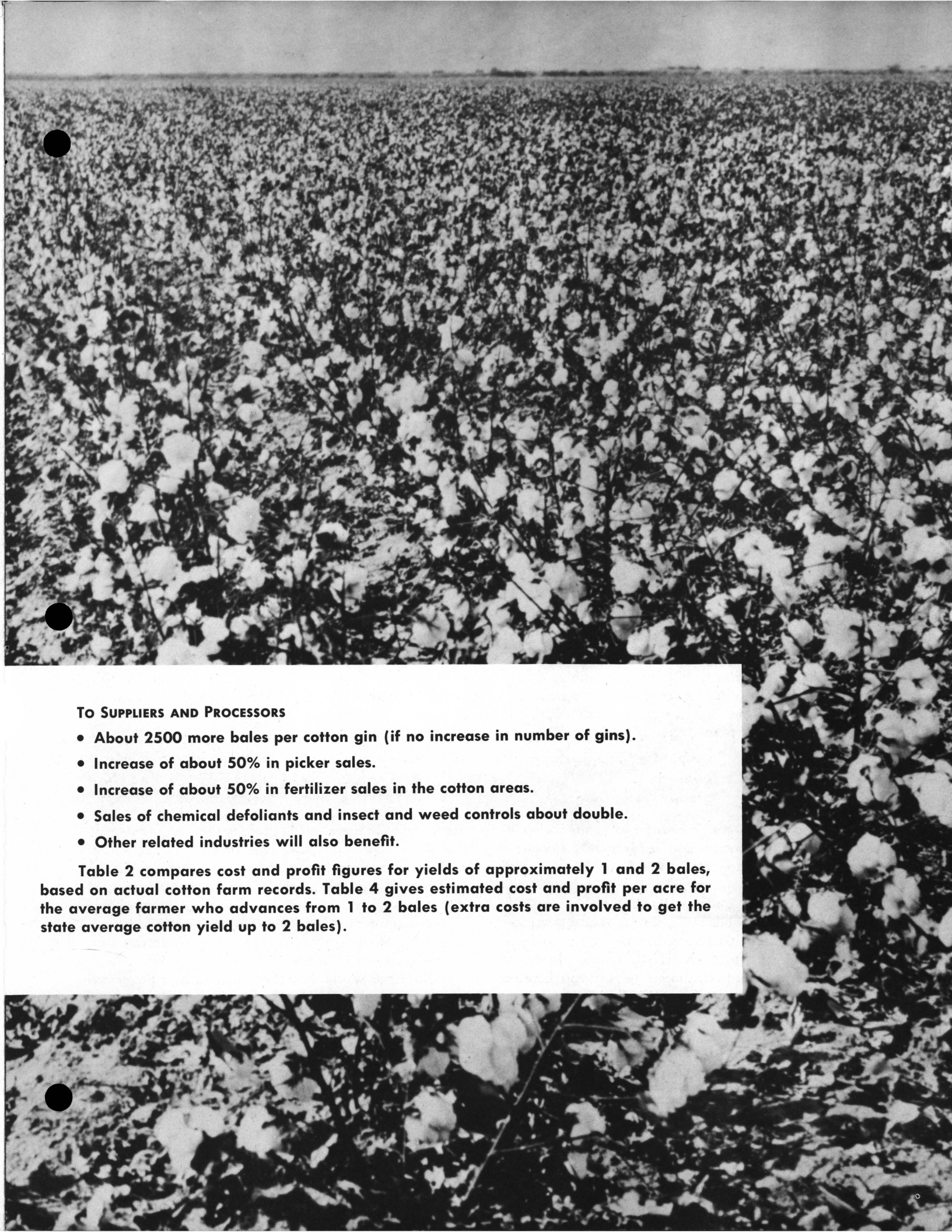
SUMMARY

This bulletin outlines known technology which, if adopted as rapidly as corn producers adopted new technology in the 1950s, will raise Missouri's cotton yield to a 2-bale per acre average by the 1970s. Following is a bird's-eye view of what this will mean to various groups connected with Missouri's cotton industry. Other groups besides farmers have a stake in this progress.

HERE'S WHAT A 2-BALE LEVEL WILL MEAN—

TO FARMERS

- **$70 more net income per acre based on 1959 to 1961 prices.**
- **Retention of a competitive advantage over other cotton areas.**



To Suppliers and Processors

- About 2500 more bales per cotton gin (if no increase in number of gins).
- Increase of about 50% in picker sales.
- Increase of about 50% in fertilizer sales in the cotton areas.
- Sales of chemical defoliants and insect and weed controls about double.
- Other related industries will also benefit.

Table 2 compares cost and profit figures for yields of approximately 1 and 2 bales, based on actual cotton farm records. Table 4 gives estimated cost and profit per acre for the average farmer who advances from 1 to 2 bales (extra costs are involved to get the state average cotton yield up to 2 bales).

Missouri Needs-

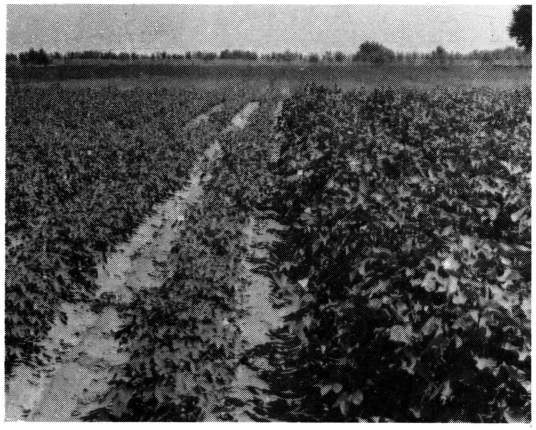
TWO-BALE COTTON

by

John M. Ragsdale, Extension Prof. of Agr. Economics

and

Fred E. Justus, Assoc. Prof. Agr. Economics



A large, heavily fruited plant is essential for high yields. A 2-bale state average would require an average of about 50 percent more fertilizer.

Cotton producers are at the doorstep of a new era.

Their position is almost like that of corn producers in 1950. The technologies and practices for 100-bushel corn were known then and some producers were reaching that mark. Other farmers began adopting the proven technology.

Today, 100-bushel corn is commonplace and the most competitive-minded farmers are aiming still higher.

Similarly in the early 1960s, the technology for 2-bale cotton is known. A number of producers are achieving this mark. Will 2-bale cotton be commonplace in Missouri by the end of this decade?

There is a saying that "A person either moves forward or backward, he can't stand still." This is true of Missouri's cotton industry. It needs to move into the 2-bale era to keep in competition with other cotton producing areas.

Note in Table 1 that where Missouri almost always led Mid-South states in average yields from 1930 to 1944, we have been surpassed in a majority of the years since World War II.

The purpose of this bulletin is to provide forward looking farmers with the information they need to enter this 2-bale era and to show the dollars and cents value of making the effort.

Our Competitive Position

The geographic position of the Missouri cotton industry has both advantages and disadvantages. Because it is situated at the extreme northern limits of the cotton belt, many of the common insects that damage the crop have trouble surviving winter temperatures.

On the other hand, warm spring planting weather arrives 2 to 3 weeks later here than in the remainder of the Mid-South cotton area. A delay in normal planting of more than 3 weeks can often mean the difference between a bumper crop and one that will barely meet production costs.

The other end of the growing season is often shortened by the arrival of cold weather, and it is not uncommon for an early freeze to chop off one-fourth to one-half of the yield of a late-planted crop. This places extreme pressure upon cotton growers to plant and harvest the crop in the shortest possible time.

Traditionally, Missouri cotton yields have been higher than those in any other state, with the exception of the three irrigated states in the far West. As pointed out, Table 1 shows that from 1930 to 1944 cotton yields were higher in Missouri than in any other state in the non-irrigated area in 13 of the 14 years.

But since World War II other states have progressed faster in increasing yields. During the period from 1945 through 1961 Missouri led the other states in yields only 5 of the 16 years.

Missouri cotton production has always been regarded as highly profitable, compared with other crops grown locally, or with cotton produced in other areas. But the

Table 1 figures show clearly that Missouri producers must make changes now if they are to hold onto this advantage.

The cotton industry is not fixed in location. Several one-time large producing areas in the U. S. have gone completely out of cotton production because of the failure of producers or others in the industry to meet the competition of other crops or other industries. Acreage allotments tend to retard the shifting of cotton production, but the industry has been moving westward, and several foreign countries have recently increased their cotton production substantially. Economic competition between areas and nations remains very keen.

Thus an area like southeast Missouri could conceivably go out of cotton production completely if producers do not adjust to new technology.

TABLE 1 - YEARLY COMPARISON OF THE MISSOURI STATE AVERAGE COTTON YIELD WITH AVERAGE YIELDS OF OTHER MID-SOUTH STATES AND THE U.S., 1930-61

☐ Boxes Indicate Years When Missouri Yields Lead (Excluding Irrigated Areas).

* State average yields higher than Missouri's

Year	Arkansas	Louisiana	Mississippi	Missouri	Tennessee	U.S.
			(Lbs. of Lint Per Acre)			
1930	119	175	169	193	160	157
1931	276	236	211	392	271	211
1932	187	173	149	362	216	173
1933	197	176	196	340	241	212
1934	192	195	216	360	255	171
1935	191	210	220	265	202	185
1936	249	260	305	360	260	199
1937	328	337	377*	346	338	269
1938	304	289	322	450	320	235
1939	319	319	299	555	305	237
1940	349	194	340	454	340	252
1941	342	148	288	549	422	231
1942	362	285	395	476	420	272
1943	291	362	354	386	327	254
1944	377	351	400	487	409	299
1945	333*	248	334*	331	379*	254
1946	361	169	226	436	395	234
1947	298	314	320*	315	341*	266
1948	412	408	441*	436	397	311
1949	303	329	261	368	338	281
1950	313*	287*	314*	278	310*	269
1951	292*	391*	329*	279	325*	269
1952	337	408*	378*	367	355	279
1953	358	407*	410*	386	354	324
1954	380	399	384	478	405	241
1955	545*	454	570*	502	523*	417
1956	500	496	483	586	488	409
1957	416*	380*	388*	281	427*	388*
1958	436	392	409	446	501*	466*
1959	566	476	509	607	620*	461
1960	485	470	486	548	545	446
1961	512*	429	493*	469	493*	438

Source: Statistics on Cotton and Related Data, Statistical Bulletin No. 99, AMS, U. S. D. A.

Two Cost Alternatives

Even a casual glance at costs of machines, materials, and labor required to produce a crop of cotton reveals that the current value of cotton leaves little room for inefficiency.

Cotton farmers have two alternatives for reducing costs. One is to be satisfied with a relatively low yield but strive to achieve that yield with the lowest cost possible. This means striving to reduce labor, machine, fertilizer and other expenses incurred in getting the same level of production.

The other method of reducing costs is to invest more in nurturing the crop to get more pounds of lint per acre but without raising expenses as much as the value of the increased output.

On many farms increased production per acre offers tremendous possibilities. While the high-yielding farms have greater expenses per acre, production costs per 100 pounds of lint usually are lowered. Net returns, consequently, are greater.

Certain production costs are fixed in total no matter what yields are obtained. Interest on investment in land, equipment, taxes, and the part of depreciation caused by obsolescence are examples of these. The ability to spread fixed costs over more bales of cotton is the major reason for lower production cost per cwt. of lint.

Much More Profit In the Second Bale

A 3-year study of cotton costs and returns on Missouri farms, completed recently by University of Missouri agricultural economists,[1] clearly shows advantages of working toward 2-bale yields. Until this study was made, little concrete evidence was available to prove this point.

Eighty-three farm records provided cost and income data for the 3-year period 1959-61 for the economists to analyze.

Some figures have been taken from this study (Table 2) to illustrate the possibilities of reducing cost per bale by stepping up to 2-bale production. The table compares the costs of 15 farmers who had about state average yields with the costs of 11 farmers who were getting close to or exceeding the 2-bale figure.

The state average production was 478 pounds lint per acre for the most recent 5-year period. The 15 farm

[1]Results of the three-year study are presented in University of Missouri Station Bulletin 790, Costs and Returns of Producing Cotton in Missouri, by Fred E. Justus, Jr.

TABLE 2 - COTTON PRODUCTION COSTS AND RETURNS ON FARMS WITH LINT YIELDS APPROXIMATELY ONE BALE AS COMPARED TO FARMS WITH LINT YIELDS APPROXIMATELY TWO BALES

Item	Farms with lint yields 440-520 lbs./A.	Farms with lint yields over 800 lbs./A*
Number of farms studied	15	11
Average lint yield	475	908
Costs Per Acre:		
Labor Costs	$ 19.05	$ 66.75
Machine Operation Costs	23.83	26.68
Machine Ownership Costs**	16.43	19.62
Total Labor & Machine Costs	59.31	113.05
Fertilizer Cost	9.67	11.09
Seed Cost	3.33	3.09
Other Materials	2.79	4.24
TOTAL MATERIALS	15.79	18.42
Ginning, Bagging, & Other Mktg. Costs	18.40	35.65
Land Charges (total)	15.40	19.58
TOTAL COSTS PER ACRE***	109.54	187.03
Costs Per Cwt. Lint Produced:		
Labor & Machine Costs (total)	12.46	12.51
Total Costs Per Cwt. Lint Produced***	22.96	20.68
Returns Per Acre:		
Lint Receipts	151.70	289.62
Total Receipts (lint plus cottonseed)	168.71	316.28
Net Returns to Management	59.17	129.25
Returns Per $100 Charged for Land, Labor, Capital	155.93	171.77
Returns Per Cwt. Lint Produced:		
Lint Receipts	31.81	31.84
Total Receipts (lint plus cottonseed)	35.38	34.78
Net Returns to Management	12.42	14.10

Source: Missouri Experiment Station Bulletin

*Top yield on individual farm in this group was 1,156 pounds per acre.

**Machine ownership costs include interest on investment, depreciation, and property taxes.

***Total cost will exceed total of individual items listed as miscellaneous costs are not shown in this table.

records selected as a measuring stick because they represented yields that were closest to the state average ranged from 440 to 520 pounds per acre and averaged 475. Costs and returns on these farms likely represent conditions on the average Missouri cotton farm very closely.

These 15 "average-yield" farms were compared with 11 that had yields of more than 800 pounds lint per acre. (A 2-bale yield would be 1000 pounds per acre but this figure was lowered to get enough records for sufficient accuracy of comparison.) The top yield in this group was 1,156 pounds and the average 908 pounds. Four of the farms produced over 2 bales per acre.

The group of 15 farms producing a yield similar to the average for the state realized a gross income of $169 per acre. After deducting average costs of $110 there was an average net income of $59.

Increasing the yield to an average of 908 pounds gave the other group 88 percent more gross income. Their costs of production increased only 71 percent. This resulted in net returns per acre of $129, which was $70 or 118 percent more than the other group averaged.

Putting this comparison another way, the farmers who achieved about 2 bales per acre received more net income from 1 acre of cotton than farmers with 1 bale per acre received from 2 acres. With cotton acreage limited due to government acreage restrictions this increased income becomes even more important.

The high average labor cost on farms producing more than 800 pounds of lint per acre (Table 2) is due to some of them being relatively small and harvesting most of their cotton by hand. Under these conditions doubling the yield will increase *labor and machine costs* more, though it doesn't double them.

Changes Needed to Achieve 2-Bale Yield

If it is possible to increase the state average to 2 bales per acre, what must we do to achieve this goal? Research scientists, University Extension personnel, and leaders of organizations and industry connected with Missouri cotton see the following as the main essentials.

A Positive Attitude

First, all people connected with the cotton industry need to recognize that the 2-bale goal is possible and that it is worth striving for because of the increase in income it will bring.

Until now we have had few reliable records to show the relationship between costs and production of 1 and 2-bale yields. With the evidence now collected, attitudes toward high yields are likely to change rapidly, not only among producers but among ginners and other segments of the industry.

Good Cotton Varieties

Most varieties grown in commercial quantities in Missouri have the necessary genetic qualities for high rates of production. Every variety grown today has at some time recorded yields of 2 to 3 bales per acre. Cotton varieties fail to express yield potential under certain conditions because yield potential is the interaction of variety with environment. If given good environmental and climatic conditions, most of the commercially adapted varieties in use will produce satisfactorily.

This does not mean that new and improved varieties are unnecessary. Quality is also an important competitive factor and better quality is needed if Missouri is to compete successfully with other areas in cotton markets. Severe competition in the spinning industry has resulted from new technology in mill machinery and spinning processes. The increase in spindle speeds from 6,000 to 13,000 rpm along with the development of new chemical finishes for cotton goods, will result in demands for improvements in fiber quality unheard of in the past.

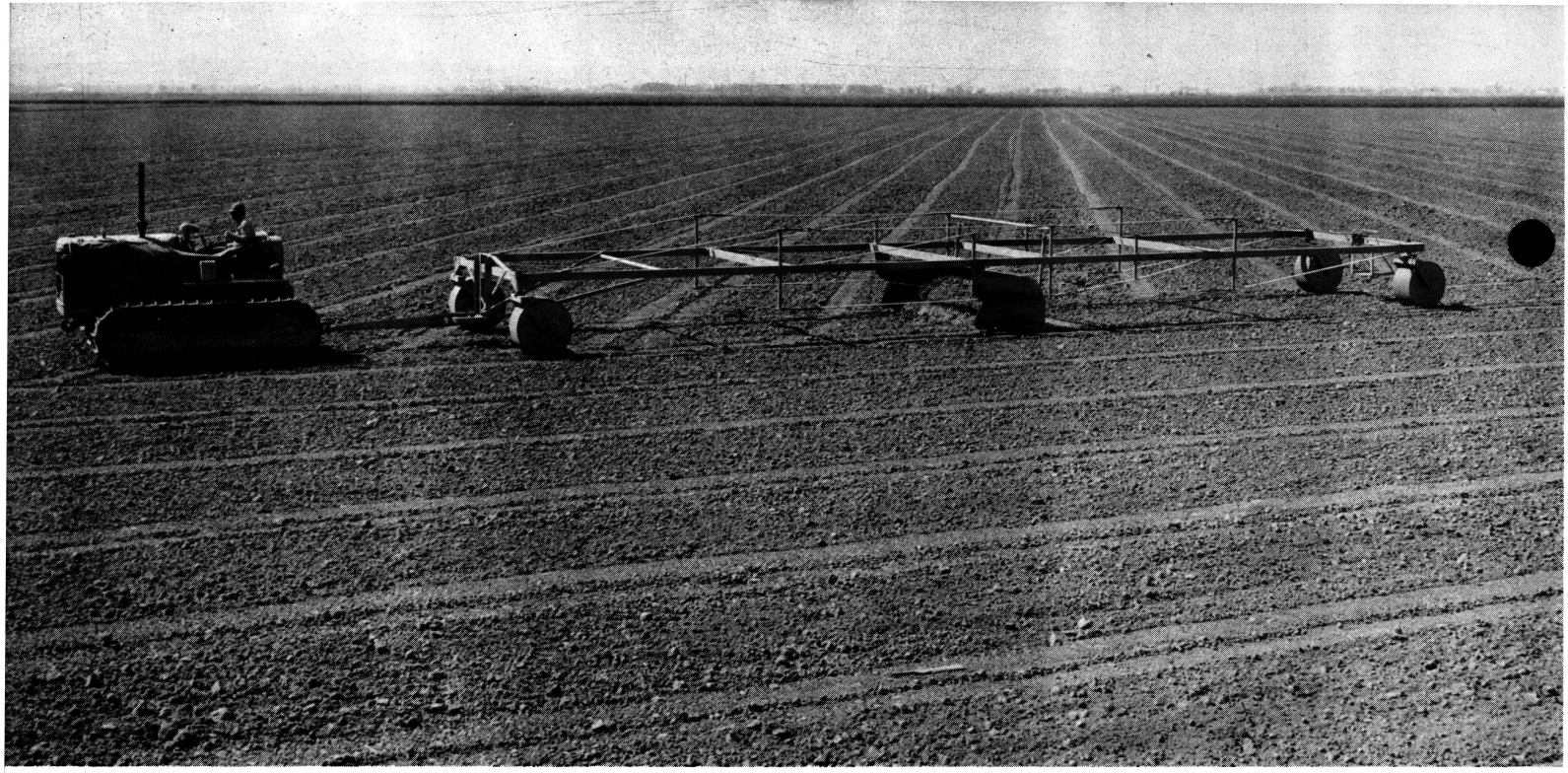
Instruments for measuring cotton qualities on the basis of strength, length, length-uniformity, and other quality factors are becoming available on a production-line basis. As these measurements grow in use mills are likely to be highly discriminatory in making cotton purchases. The areas that produce cotton with the specific characteristics desired at the mill are likely to find their product in good demand at premium prices.

However, cotton breeding to improve quality cannot be allowed to hinder high yields. Quality and yield must be improved at the same time and in the same varieties. Progress to date in the breeding of locally adapted varieties indicate that this objective is being accomplished.

Land Grading

One of the first practices to be considered for improving soil moisture conditions is land grading. Missouri's cotton authorities agree that the most serious obstacles can be overcome to a considerable extent. Land this occurs only one out of 6 to 8 years and even this obstacle can be overcome to considerable extent. Land grading and good drainage are the chief measures for offsetting effects of too much rain.

Land grading should not be limited to irrigated fields. Graded land forms a proper surface for complete mechanization of the crop. It eliminates low places which



Land grading is necessary for multi-row equipment and economical irrigation. Graded land provides better drainage which, in turn, increases earliness, reduces incidence of seedling diseases, and results in less frequent need for replanting.

retard land preparation, delay planting, increase weed problems, reduce yield, and keep mechanical harvesters idle when they should be operating.

Thus, land grading can be expected to influence the quality and the timing of each production practice from seedbed preparation to harvest. It can be expected to increase the earliness with which growers can get a stand of cotton. Planting at the optimum time is highly important in Missouri.

Grading probably will cost somewhere between $25 and $75 per acre, depending upon the lay of the land. However, when spread over several years, the charge is quite reasonable, and should be one of the first steps considered in improving the income of cotton growers. It needs to be recognized that in addition to the first cost there will be an annual maintenance expense. This should be very small after the second year.

Irrigation

Irrigation to supplement rainfall on land that has been graded, is becoming a common practice on cotton farms, even in humid areas. The cotton plant can be allowed to suffer from lack of moisture for short periods of time and still make yields that currently satisfy many producers. But no such tolerance can be permitted if yields of 2 bales per acre are to be realized.

Even a crop as drouth-resistant as cotton, requires a certain amount of water to reach its highest level of production. There is rarely a year in Missouri when cotton yields cannot be increased with timely applications of water.

Furrow irrigation is generally recommended on fields where row drainage can be obtained, except on some coarse-textured soils. This method seems to be particularly adapted to the Missouri cotton growing area. Furrow, or surface irrigation, is preferred because of low labor costs.

Grading the land for surface irrigation also meets the needs for surface drainage. Thus, getting rid of excess water in the early spring through proper drainage is a by-product of irrigation (assuming land gradings is also used) and can be as important as the additional supply of water during dry periods.

Irrigation is not a cure-all or a guarantee of success. Its use is likely to require a re-appraisal of all other practices in order to get full benefit from it. Along with irrigation will have to come high fertility levels, good insect and weed control, and above all good management of all practices that go into successful cotton production.

The cost of applying water by the furrow method will depend upon how the system is designed and upon the skill of the individual irrigator. With modern design, furrow irrigation can supply water cheaper than any other system. Surface irrigation will automatically improve drainage, allow earlier planting, reduce replanting and diseases, and eliminate wet spots.

The timing of water applications is very important. Some farmers in the past have had disappointing results because the applications were made too late.

Cotton can suffer from lack of water for a week to 10 days and still make 1 bale per acre but 2-bale production will require timely irrigation to eliminate such dry periods most years.

Fertilizers

The proper use of fertilizers is one of the very important factors affecting profitable cotton production that has not been given the needed emphasis. In many cases proper use of adequate amounts of fertilizer will make more money for farmers than increased acreage of hungry or improperly fertilized cotton.

At present there is a substantial gap between the amount of plant food that research indicates should be used on cotton and the amount actually being used. The gap is being narrowed, but much slower than desirable if cotton producers are to receive high net returns. A recent survey by Experiment Station personnel in 16 cotton-belt states, shows that on the average, farmers are now using only about 60% of the plant food needed for most efficient cotton production.[2]

Cotton is not hard on soils from the standpoint of depleting it severely of nutrients. Plant food requirements are less than for corn, and considerably less than for alfalfa.

A 1-bale yield removes about 40 pounds of nitrogen, 20 pounds of phosphoric acid, and 15 pounds of potash. To produce this one-bale yield, however, requires more total nutrients than are actually removed, as nutrients must be available for the growth of the plant itself.

Nitrogen has always been one of the major limiting factors in cotton production in Missouri. It was deficient even in virgin soils and does not build up to any great extent with fertilizer applications. Since it must be applied annually, it will continue to be one of the most important fertilizer problems.

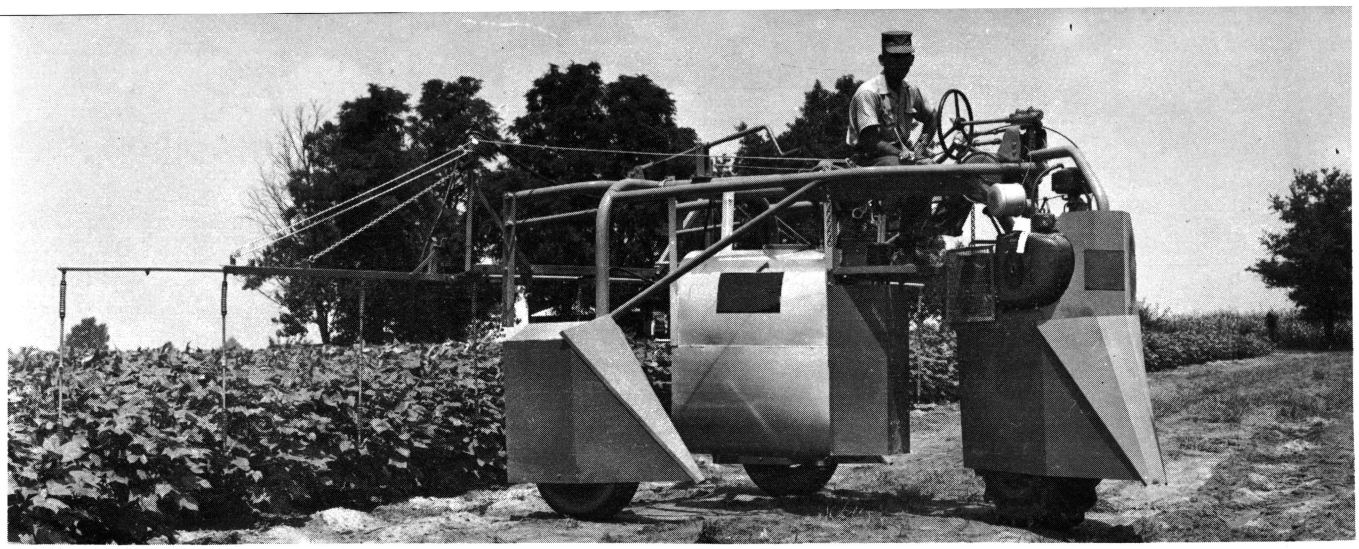
Cotton production records of the last three years indicate that probably no more than 40 pounds of nitrogen per acre are being used in Missouri. This rate must be increased to get yields above one bale per acre.

Since the native soil nitrogen usually is fairly low and the recovery of nitrogen by the plant is always poor, farmers need to apply from 50 pounds of N on sandy soils to 100 pounds N on clay soils, 50 pounds of P_2O_5, and 50 pounds of K_2O for a 2-bale yield. This increase in the use of plant food would have to be combined with other good management practices to get the most benefits from it.

There has been a traditional fear of too much nitrogen on cotton. Without the advantages of improved methods of insect control, defoliants, power machinery, and improved varieties, there would undoubtedly still be reason to stop at 60-pounds. Rates actually being used on some farms today are much higher than would have been recommended a few years ago. Experiments have shown that much higher rates can be used profitably, providing other management practices are adjusted accordingly.[3]

[2]Survey reported by M. S. Williams, National Plant Food Institute, at the Cotton Production Conference, 1958.

[3]Results of recent soil fertility research on cotton are given in the following publications: *Soil Fertility and Plant Nutrition, Soils Research in Southeast Missouri, 1960,* Missouri Agricultural Experiment Station Special Report 4, February 1961. *Soil Fertility and Plant Nutrition-Soils Research in Southeast Missouri 1961,* Missouri Agricultural Experiment Station Special Report 9, March 1962.



Two-bale cotton would not change insect control practices much but would increase the need for bottom defoliation. The same machine can be used for both purposes.

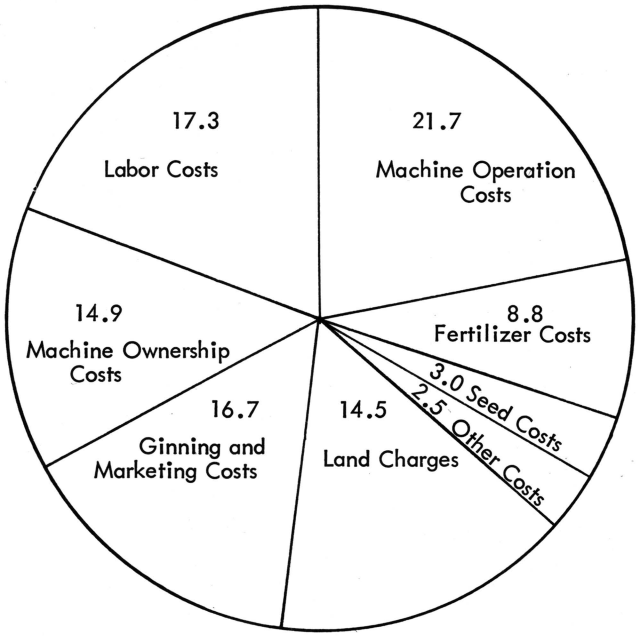


Figure 1. The Percentages Various Costs Were of Total Cost of Producing Cotton on 15 Farms with Average Yields Similar to State Average—1959-61.

Cotton Insect Control

One of the chief advantages Missouri has over other cotton producing states is that our relatively severe winters make it difficult for some of the more common cotton insects to survive. A regular spray schedule has rarely paid in Missouri. It has been the policy to watch fields carefully and to wait until insects appear in damaging numbers before using controls.

Increasing the state average yield of cotton from 1 bale to 2 bales per acre, would not affect this current procedure. However, assuming a larger plant results from increased use of fertilizers, cotton farmers might experience more trouble from certain types of insects.

The cotton bollworm has always been considered the most damaging insect in the State. It is possible that this pest would cause additional trouble on the larger, more densely foliated plants resulting from increased use of fertilizer.

In some areas, one or two additional treatments might be necessary to control bollworm. A program of insect scouting, involving some 15 trained men during the summer months is now in use in all parts of the cotton area of Missouri. The reports enable entomologists to detect outbreaks of certain insects at an early stage and to be prepared for prompt treatments as soon as numbers build up to damaging proportions.

Cotton Disease Control

Some years organisms that cause seedling diseases result in considerable damage to cotton production in Missouri. Fungicide treatments in the form of both seed and planter-box applications are being studied.

Ordinarily, losses from diseases can be expected to increase as cotton is grown continuously in a particular area. It is highly doubtful if increasing the yield to 2 bales per acre will cause any change in the total incidence or severity of cotton diseases.

Actually, a widespread effort to achieve a statewide average of 2 bales per acre might have an indirect effect of reducing seedling diseases. Most of the land would have to be leveled for irrigation. This provides better drainage, with the probability of reduced losses from seedling diseases.

There is a good possibility that the incidence and severity of losses from boll rots and bacterial blight will be increased if certain practices are adopted to reach a 2-bale per acre level of production. For example, overhead irrigation will materially increase incidence and severity of both leaf diseases and boll rots. Assuming increased use of fertilizers, it is entirely possible that the larger plant which results will make it more difficult for sunlight and air to penetrate to the bottom branches. This

makes a more favorable environment for boll rots and leaf diseases, and will make them more difficult to control in late summer and early fall. This condition may be corrected by increased use of disease resistant varieties and bottom defoliation.

Defoliation

Rapid increase in the use of mechanical pickers increases the need for better defoliants. Under favorable conditions several different materials do a good job if applied at the proper time. Under unfavorable conditions, such as the low temperatures which are quite often experienced in southeast Missouri in the fall, and extreme low moisture conditions, none of the present chemicals are completely satisfactory. Quite often it is difficult to determine the reason for success or the cause of failure. However, defoliation in most years is highly desirable to maintain a lint quality that brings good prices.

Increasing the yield of cotton to two bales or more per acre would certainly bring new problems in defoliation. No doubt bottom defoliation would have to be practiced in many fields in order to control boll rot and certain insects, and to enable cotton to open before deterioration sets in. Bottom defoliation will often work more successfully than top defoliation. However an over all defoliant would often be necessary to maintain the quality of the top crop.

Weed Control

Satisfactory methods of controlling grass and weeds are the remaining obstacles to total mechanization of the cotton enterprise. At present there is no single practice, either chemical or mechanical, or any combination of practices that will give adequate control every year. Grass and weed control is exceeded in cost only by the cost of harvest. For this reason any new technology that will reduce this expense will go a long way toward reducing the total cost of cotton production.

Most years, the cost of controlling weeds represents about $1 out of every $7 brought in by the crop. In addition to being both laborious and expensive, weed control usually requires precise timing. If weeds are not held in check during the critical period in the growing season both yield and grade are likely to be lowered. The results may well be the difference between harvesting a profitable crop or harvesting one that does not meet production costs.

The possibilities of cutting production costs by reducing or eliminating hand labor in controlling weeds are increasing. Comparatively new practices such as hill-drop planting, cross-plowing, and use of pre-emergence and post-emergence sprays are being adopted rapidly. Even if the practice does not lower total cost, the fact that it gives greater certainty that weeds can be controlled with less dependency upon transient labor is progress.

Adopting the practices necessary to reach a yield of 2 bales per acre would not increase the cost of weed control; on the contrary, better drainage and larger plant growth will actually reduce the cost.

Mechanization

Missouri has achieved greater mechanization of cotton production than any other state, except the irrigated

TABLE 3 - PERCENT OF COTTON CROP HARVESTED MECHANICALLY (PICKED & STRIPPED) BY STATES 1950-1961

State	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Ala.	--	--	1	3	2	2	3	2	1	6	8	20
Ariz.	9	26	46	54	44	39	45	54	51	63	73	75
Ark.	1	2	2	9	16	25	27	15	22	36	42	51
Calif.	34	63	59	59	62	67	66	70	71	83	87	91
Fla.	--	1	4	12	4	6	8	33	10	18	10	33
Ga.	--	2	3	6	3	3	2	2	2	4	14	32
La.	3	11	13	34	28	28	31	35	43	50	49	56
Miss.	3	7	7	13	11	23	25	17	19	38	40	48
Mo.	--	1	6	13	22	24	35	9	23	47	56	64
N.M.	1	7	13	15	10	20	21	19	38	50	64	72
N.C.	0	1	1	3	3	2	3	0	1	5	12	11
Okla.	6	13	17	19	15	20	24	49	35	53	64	65
S.C.	--	3	1	7	4	2	4	1	1	1	6	23
Tenn.	--	--	1	1	1	2	4	1	4	8	19	26
Texas	12	19	22	24	21	24	26	37	35	44	58	64
Va.	--	--	--	--	--	--	--	--	--	--	1	--

Source: "Average Charges for Ginning Upland Cotton," E.R.S. and A.M.S., U.S.D.A.

areas in the far West. The number of mechanical cotton pickers and the percentage of the crop harvested with them has increased phenomenonally since 1948. In 1961, 64 percent of the crop was harvested with machines. The percentages harvested by this method in the other states are shown in Table 3.

There is every reason to believe that total mechanization of the crop soon will become a reality. This change should lower cost of production further and make cotton more competitive with other fibers.

The importance of mechanization to cotton production can be illustrated by the influence of machine harvesting on total labor requirements on the farms studied in 1959-1961. In the 3-year period producers who picked all of their cotton by hand used an average of 94 hours of labor per acre. Those who made a partial substitution of machines for hand picking used an average of 56 hours, while those who picked all of the crop by machine used only 20 hours of labor per acre.

The National Cotton Council estimates that if today we used 1930 techniques at present wages it would cost $150 per bale of cotton lint just for the labor used.

Better Management

The speedup in new technology in recent years has made cotton production more complicated. Calibrating a sprayer to apply pre-emergence chemicals to control weeds is vastly different from hand hoeing. Four and 6-row planters and cultivators are a long way from a team of mules and a walking cultivator.

Cotton producers must do a much better management job as the level of technology increases and as yields approach the 2-bale level. The failure to use a single production practice efficiently can lower the yield to a bale or less per acre. This fact simply means that the margin of error narrows as the use of technology increases. A few years ago, the application of any analysis of fertilizer or a small increase in the quantity used showed a spectacular gain in yield. When a cotton producer is using close to the ideal amount, both the analysis and rates recommended will need to be more exact. This will certainly rule out the old practice of making general recommendations to fit a large area.

Decision making today is far more difficult than it was in the past, and will not become easier in the future. Not all of the new technology that is developed will help farmers increase their net incomes. It is not difficult to remember new things which came on the market with much fanfare only to fail miserably in use. The individual farmer must decide which technologies fit his specific size and type of operation—i.e., which will help him obtain a higher net income.

Sound management requires:

(1) The keeping of accurate financial records so that the producer knows his costs and returns.

(2) Altertness to new technologies (seed varieties, chemicals, machines, production practices, etc.) and a willingness to adopt new technologies if they appear sound.

(3) Careful study of alternatives; i.e., using a pencil and paper to do some careful figuring.

(4) Getting jobs done when they should be done and the way they should be done.

Cotton producers are operating in a fast changing, highly competitive agriculture. They must pay particular attention to these sound management requirements.

Further comment is needed on the fourth point: Next to the manager, the machine operator is the most important person in mechanized cotton production. A first class hand picker is not likely to be a good machine operator until he is trained for the job. Time must be spent in training machine operators, and care exercised in the selection of labor to handle complicated machines. Performance cannot be better than the skill with which the machine is operated. Nor can any other production practice be expected to yield results above and beyond the exactness by which it is applied.

What to Expect from High Yields

An earlier section compared costs and returns of farmers in the 1959-61 study who achieved yields of approximately 1 and 2 bales per acre. While those data are quite useful in showing the level of net income which can be expected, achievement of a 2-bale state average will require changes in practices from those found on the farms studied and some additional imputs. Land grading, for instance.

A projection of production costs and returns for a 2-bale per acre state average can provide some interesting food for thought concerning impact on the whole cotton industry in Missouri. Table 4 gives estimated costs and returns for a "typical" acre of Missouri cotton if a 2-bale per acre average is achieved. These data are based upon a careful analysis of cotton production records and on what Cotton Extension Specialists and researchers believe to be feasible.

TABLE 4 - ESTIMATED COST AND RETURNS PER ACRE FOR A TWO-BALE STATE AVERAGE YIELD.*

Costs Per Acre:	
Land Grading at $40 per A. (spread over 20 years)	$ 2.00
Well & Irrigation Pump $20 (80 acres 10 years)	2.00
Annual Pumping Costs, 6 in. water per acre at $1.50	9.00
Labor Costs, 56 hours	28.00
Machine Operation Costs	65.00
Machine Ownership Costs	20.00
Fertilizer Costs:	
100 pounds N. at 12¢ =$12	
50 pounds P_2O_5 at 8¢ =$ 4	
50 pounds K_2O at 4¢ =$ 2	18.00
Seed Costs	3.00
Chemicals:	
Defoliation (2)	4.50
Weed Control	6.00
Insect Control	2.00
Ginning and Other Marketing Costs	40.00
Land Charges (Taxes and Interest)	20.00
TOTAL COSTS PER ACRE	$219.50
Costs Per Cwt. Lint Produced (100 lbs.)	$ 22.00
Returns Per Acre:	
Lint Receipts 1,000 lbs. at 32¢	$320.00
Total Receipts (lint & cottonseed)	$356.00
Net Returns to Management	$136.50

*Estimates based on 1959-61 cotton cost and returns study and information supplied by cotton researchers and Extension Service personnel. Receipts based on an average lint price of $32 per cwt. and cottonseed price of $40 per ton. The state average prices of lint and cottonseed, 1959-61 were $32.32 and $40.70 respectively.

Influence of 2-Bale Average on Income of Producers

If a 2-bale average yield were reached in Missouri, the gross annual income from cotton and cottonseed would increase from about $82 million to approximately $142 million, assuming lint and seed prices remain the same as the average of the past three years.

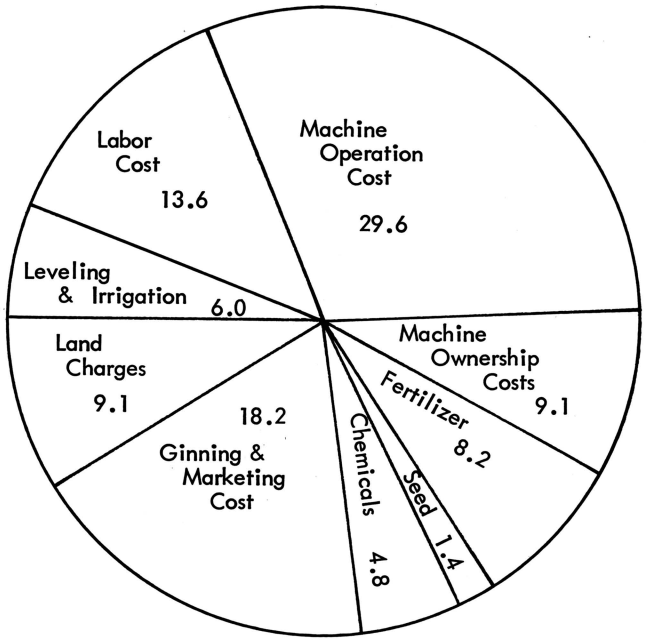


Figure 2. Percentage Various Costs are of Estimated Total Cost of Producing Two Bales Per Acre Cotton in Missouri.

With a continued acreage of 400,000 the net returns to producers' management would rise from $24 million ($59 per acre on 400,000 acres producing 1 bale per acre) to $55 million ($137 per acre on 400,000 acres producing 2 bales per acre).

Net returns on the second bale are extremely high. This is especially true where maximum substitution of machines for hand labor is made. Needless to say, the impact of 2 bales per acre on the total net income of cotton producers in Missouri would be tremendous.

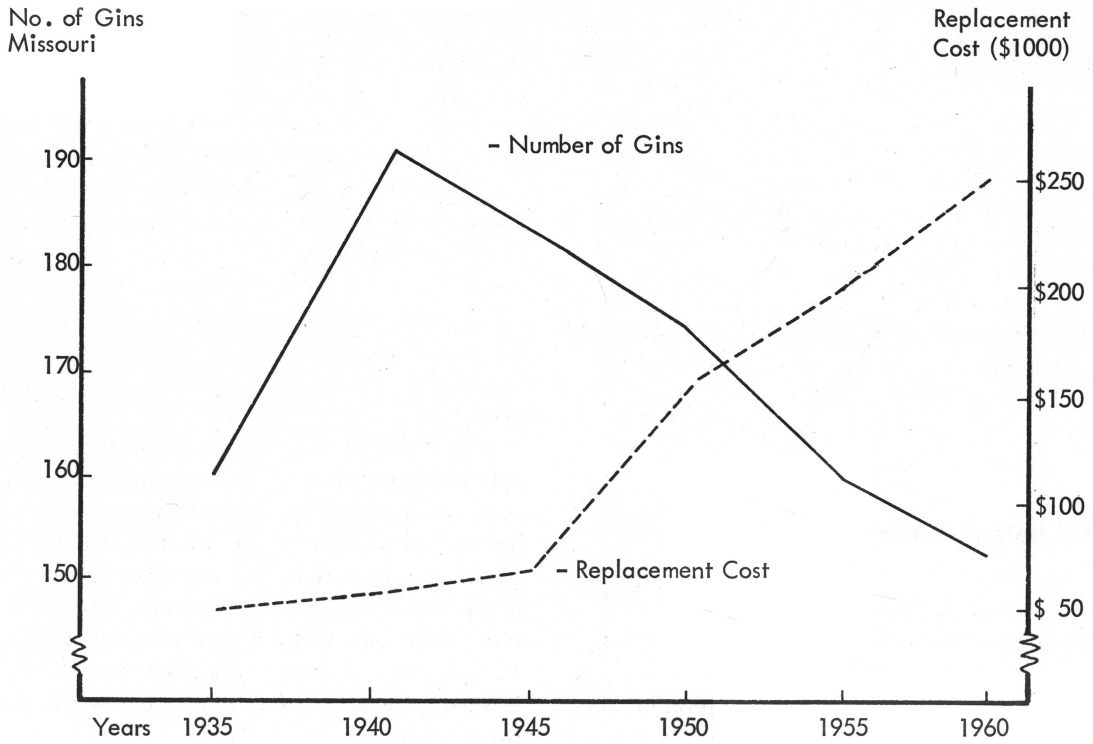
Impact on Cotton-Related Industries

Not only farmers would enjoy greater income from 2-bale cotton. Businesses related to supply and processing of cotton production have a stake in raising Missouri's average. A state average yield of 2 bales per acre would increase sale of fertilizers approximately 50 per cent in the cotton growing area. Expenditures for chemicals to control insects and weeds, and to defoliate could be expected to double.

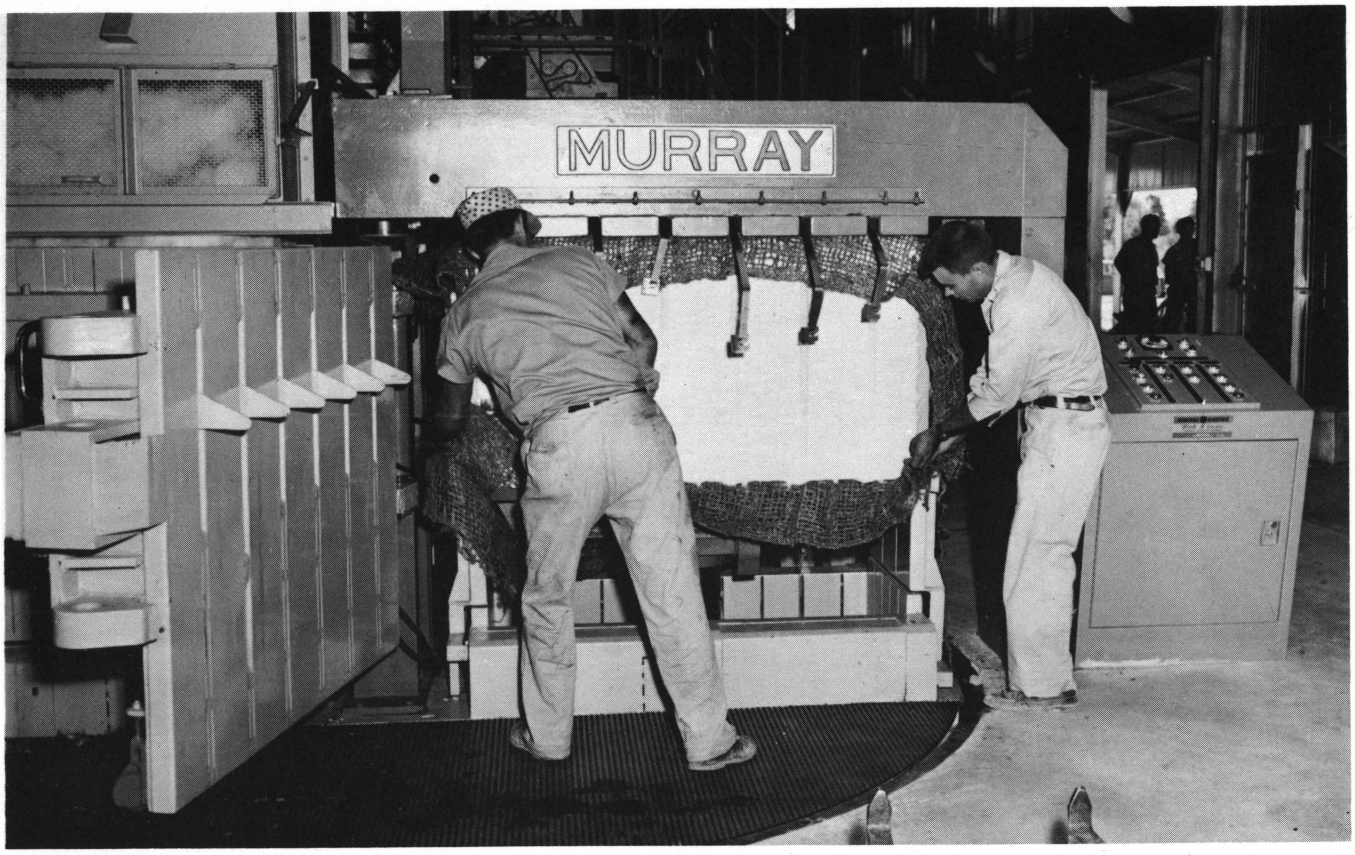
The sale of mechanical cotton pickers would probably increase in the neighborhood of 50 percent. Picking costs on many machines already in use would be lowered, because an increase in the number of bales per machine would significantly reduce the cost per bale. The data already available show that spindle type pickers operate much more efficiently in high yielding cotton. Therefore, a 2-bale per acre yield is desirable from the standpoint of lowering picking costs as well as efficient operation of the machine.

The break-even point for cotton gins has risen from a few hundred bales in the 1940s to around 3000 bales. New, complex machinery is required to process today's rough-harvested cottons.

Figure 3. Number and Replacement Cost of Cotton Gins in Missouri



Source: Bureau of Census, Department of Commerce



Automation has come to the cotton gin. High speed semi-automatic presses are required to handle large volumes that come in rapidly from the new mechanized harvesters.

The average number of bales per gin would increase from approximately 3100 to 5500—assuming no increase in the number of gins. This increase in volume would have very important financial consequences for ginners.

Mechanization of the cotton industry is evident in gins as well as on farms. A few years ago inadequate equipment in gins was considered to be the most important problem in total mechanization of cotton production. Old gins have been remodeled and many entirely new plants have been constructed in the past five years. Practically all of the cotton gins in Missouri are now equipped to dry and clean any kind of cotton.

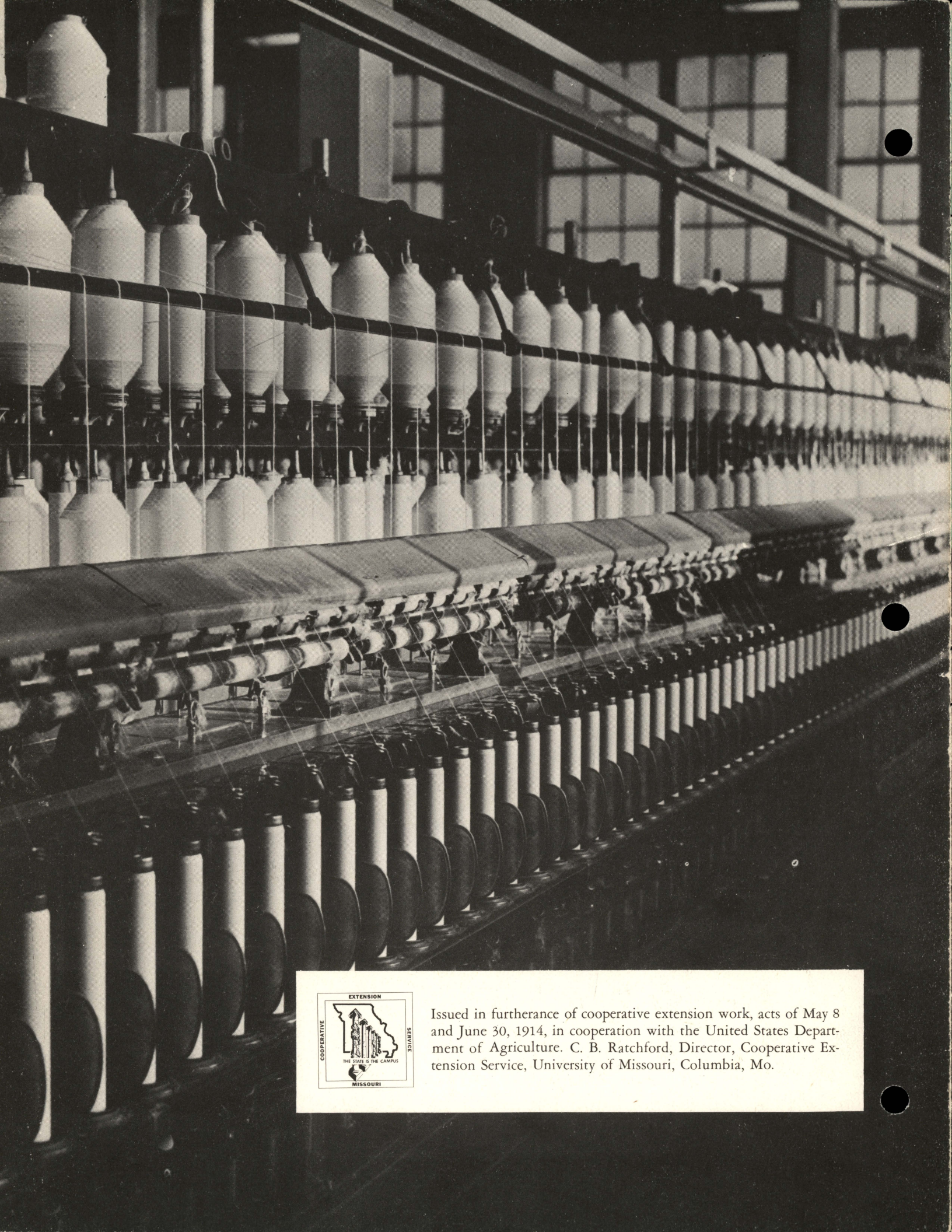
The number of gins in the State has decreased from a peak of 191 in 1940 to 154 in 1961. Accompanying this decrease has been a large increase in the cost of constructing a modern gin which will handle machine-picked cotton at a high capacity. The break-even point, has risen from 800-900 bales in 1940 to 2500-3000 bales in 1962. Several times, in recent years, the volume of cotton at the average gin has been too low for the ginner to break even. Every year some gins fail to reach a high enough volume to break even or to yield any profit for their owners.

With a high replacement cost of around $250,000 for a modern high-capacity gin, those plants which are now having trouble breaking even can expect to fall by the wayside as soon as present machinery is obsolete or the cost of repairing it becomes too great. Any program to increase yields to a 2-bale state average, would certainly enable many hard-pressed ginners to increase this volume and maintain profitable enterprises.

Thus, growers, ginners, suppliers, and cotton manufacturers are all vitally concerned with Missouri's progress toward a 2-bale average.

ACKNOWLEDGMENTS

Valuable Assistance was received from the following Cotton Scientists: Charles F. Cromwell, agricultural engineering; Oscar H. Calvert, pathology; Keith Harrendorf, entomology; Raymond Hicks, agronomy; William Sappenfield, cotton breeding; and James A. Roth, soils.



Issued in furtherance of cooperative extension work, acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. C. B. Ratchford, Director, Cooperative Extension Service, University of Missouri, Columbia, Mo.

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