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The One-Variety Cotton-Improvement Program

FROM the multitude of conflicting views on the outlook for cotton, at least two things stand out. In the first place exports are likely to be relatively small, and growers must rely primarily upon the domestic market as an outlet for their crop. But, in the second place, cotton must be produced more efficiently if it is to compete successfully in the domestic market with synthetic fibers.

For Sixth District farmers these two points have a profound significance. Over a period of many years cotton has provided a large share of their farm income. Even with a materialization of the widely advocated shift to farming systems that center around livestock, a need for a cash crop will remain. No other widely applicable crop has yet been developed for the Southeast that fulfills this requirement as well as cotton does. Although in the coastal plains of South Georgia and Alabama peanuts have partially displaced cotton as a cash crop, little additional shifting between these two crops can be expected.

It is probable that National policy will demand more efficient cotton production. For many years various legislative devices have been used in efforts to cope with the "cotton problem." Often these measures had economic assistance to Southern farmers as their primary motive and, to that end, used a cotton-price policy as a vehicle. In some instances the result was actually to encourage inefficient production. Consideration is now being given a long-range agricultural program to take the place of the legislation now in effect when it expires in December 1948. Long-range programs for agriculture cannot afford to overlook problems related to the efficient production of food and fiber. Although the search is for a program that will be suitable for several years, the plan's nature is almost certain to be influenced in no small measure by the economic environment at the time the plan is formed. If attention centers on producing the needed food and fiber at the lowest possible cost, it is likely that the program will carefully avoid any subsidization of high-cost producers. In order to obtain maximum benefits under future agricultural programs, therefore, District cotton growers may have to demonstrate far greater efficiency than they have in the past.

During the past few decades the outstanding developments for the entire cotton belt have been a large decrease in acreage and a large increase in yields. The yield increases have come about mainly from a greater use of fertilizer, a shift to higher-yielding areas, a more careful selection of land on individual farms as well as in each area, a more widespread use of improved varieties, and the planting of larger legume-crop acreages. Since these changes have affected the various

production areas differently, considerable acreage shifts have occurred among them.

District cotton-producing sections may be broadly grouped into the Piedmont; the Coastal Plains; the Delta; and the Eastern Hilly Area, which includes the Appalachian Highlands, the Black Belt, the Clay Hills, and the Brown Loam Area. Since 1928-32, the period immediately preceding the advent of the AAA programs, cotton acreage has shifted outside the District into the Delta, the High Plains, and the Irrigated Areas. Although in all the major producing sections except the Irrigated Areas it has declined, the Delta and the High Plains have increased rapidly in relative importance as cotton-producing sections. Most District cotton is produced in the Hilly Area, the Coastal Plains, and the Piedmont. Though these three still retain their relative position as producing areas, from the acreage standpoint they have lost ground as cotton producers. Except in the Brown Loam area, yields have not increased as fast as they have in either the Delta or the High Plains.

The District's decline as a cotton-producing section results partly, of course, from healthful changes in its farm economy. Economic pressure and education are two of the important forces responsible for a more-diversified farming system with less reliance on cotton as the principal source of income. It is certain that these forces will continue to exert their effects toward that end. It is equally certain, on the other hand, that cotton will remain a basic component of the District farm economy for many years longer. The relatively disadvantageous position of District cotton production, therefore, makes the need for increased efficiency even more acute than it is in some other producing areas.

During the period 1937-41 the national average cost of producing lint cotton was estimated to be about 10 cents a pound. Average costs were estimated in the same period to be 7.7 cents in the River Bottom Areas, which include the Delta; 8.9 in the Eastern Hilly Areas; 10.6 in the Piedmont; and 11.8 in the Coastal Plains. In the period 1942-44 differences between the Delta and other Southeastern areas in average production costs dwindled, but the Delta still had the decided cost advantage. That area, which has also the greatest quality advantage, yields only a small proportion of the District's cotton. Much of the production in the District, therefore, involves growing a relatively low-quality cotton at a relatively high cost.

Production practices that result in lower costs in relation to the value of the product fall into two main classes. In one class are the practices that effect labor savings, and in the other are those that increase yields per acre or the quality

of the product or both. Of all the cost-reduction means, mechanization continues to receive the most attention. Undoubtedly it will result in labor savings that will materially reduce cotton-production costs. In most District areas, however, the topography and the small size of the farms will prevent any appreciable use of the type of mechanized equipment now being developed. Since mechanization appears most likely in the relatively level areas of large farms, such as the Delta, it probably will have the effect of lowering most District cotton growers' level of production efficiency. Of course, equipment adapted for small upland farms may be developed, but, if the mechanization of cotton evolves as that of other staple crops has, the small widely adapted machines will be the last to be put to general use. For increasing their efficiency the District cotton growers' best opportunities seem to lie in improved quality and higher yields to the acre. Their progress toward these two objectives is being hastened by their increasing participation in the one-variety cotton-improvement program under sponsorship of the state agricultural extension services and the Department of Agriculture.

Origins and Growth

This plan attempts to solve problems that are an outgrowth of historical influences on cotton production. Relatively few varieties made up the early commercial plantings. Under the plantation system, with only one variety to a plantation as a rule, they could be kept reasonably pure. In many instances each plantation had its own gin, which arrangement tended to prevent the mixing of seed. The varieties grown were late-maturing highly productive types and were famous for their good quality. During the havoc caused by the spread of the boll weevil in the early 1900's, however, the growers found that a different type of variety was needed. The newer cotton strains developed to withstand this menace, and which partially succeeded in doing so, were early-maturing short-staple types that yielded lint inferior in quality to that of the older late-maturing types. In a short time almost all the better types of medium-staple cotton were lost.

Since also the special markets for the better cottons of pre-boll-weevil days were lost, a keen interest in cotton breeding developed. In general, breeders tried to produce strains with fruiting habits that would combat the boll weevil and of a quality that would meet the manufacturers' specifications. Extensive work by private breeders, experiment stations, and the Department of Agriculture resulted in many superior strains.

Unfortunately the benefits of these new varieties were often lost through a failure to keep good varieties separate from inferior ones. Different varieties or strains grown near one another crossbred readily, with the result that planting-seed in the following year was impure. The mixing of different varieties at the gin had the same effect.

Cotton growing had become largely a small-farm enterprise, and ginning had developed on a commercial basis. With the large number of varieties that had been introduced, seed could be kept pure only with the greatest difficulty. In fact many farmers could be certain of getting pure seed only by buying it from the breeder each year. Since this method was relatively expensive, most farmers continued to obtain their seed from local sources. Cotton breeders developed many superior strains, only to see them degenerate after they reached the grower's hands.

In an effort to overcome this serious hindrance to cotton improvement, a plan was proposed in 1909 for work on a community basis. In 1912 the first one-variety-cotton improvement community was established in Arizona. Although a few years afterward several state experiment stations began a plan of cotton improvement on a community basis, it was not until 1931 that the program in the Southeast got under way on an extensive scale.

As it is now practiced, the program is built around the local maintenance of pure seed in quantities sufficient for planting large acreages to a single variety. Farmers, usually in a community served by a single gin, form an association and select a variety best suited to local conditions. In making their selection they take into account not only the money value of the lint and seed but the spinning quality of the cotton. They use a seed-renewal-and-distribution plan under which certain farmers are appointed to multiply breeder seed each year. To prevent mixture with other varieties they make special arrangements with the ginner to gin only the one-variety cotton on certain days. Though the plan hinges on keeping planting seed at the highest level of purity and efficiency, it includes all the practices necessary to the production of larger yields of high-quality cotton. It furthers crop diversification by encouraging farmers to plant cotton only on land capable of producing good yields. It also includes educational efforts to improve ginning and promote soil building, good cultural practices, proper fertilization, and efficient insect-and-disease control.

Since the program's inauguration District farmers have steadily progressed in standardizing cotton production. Last year approximately 44 percent of the Six States' cotton acreage was planted to locally adopted varieties. About 175,000 growers participated in the program. Their average production ranged from six bales in Louisiana to about 11 bales in Tennessee. The Six States' production of more than 1.5 million bales in locally adopted varieties was about 48 percent of their total production.

In one-variety areas co-operation has not, however, reached the stage at which the maximum benefits can be derived. Benefits accrue in proportion to the percentage of total acreage planted to the adopted variety. To be fully effective, therefore, variety-standardization programs should enlist all the cotton growers and all of the cotton acreage in an area. In communities and wider areas in which there are large numbers of cotton farmers, usually a few of the farmers will plant varieties other than the one adopted by the association. Even so these communities are designated as one-variety-production areas.

In order that they may be accurately and uniformly listed for the protection of the cotton trade as well as that of the participating growers, therefore, standard descriptive terms are used to designate the degree of one-variety development. Communities with 10 to 50 percent of their cotton acreage in an adopted variety are considered in the initial stage, those reporting 50 to 75 percent are classified in the intermediate stage, and those reporting more than 75 percent but less than 100 percent are classified as being in the advanced stage. A community is considered to be well standardized when more than 90 percent of its cotton acreage is planted to an adopted variety and all other requirements of the program, such as pure planting seed, good culture, and clean

ginning, are complied with. Relatively few of the District one-variety communities have reached the well-standardized stage.

Financial Returns

The monetary returns to the District's participating growers, however, have been large. Last year in Georgia and Alabama, where 82 percent of the District's cotton crop was produced, the combined additional income to farmers growing locally adopted varieties was estimated to be more than 20 million dollars. This additional income was made possible by quality premiums and higher yields of lint and seed.

SIXTH DISTRICT COTTON PRODUCTION - 1946

Area	State Production (Bales)	District Production (Bales)	Percent of State Production in the District Area	Percent of District Production in State
Alabama.....	803,545	803,545	100.0	48.5
Florida.....	3,761	3,761	100.0	0.2
Georgia.....	553,322	553,322	100.0	33.4
Louisiana.....	246,722	73,250	29.7	4.4
Mississippi.....	1,034,652	171,120	16.5	10.3
Tennessee.....	509,943	53,908	10.6	3.2
Total.....	3,151,945	1,658,906

For the 38,000 Georgia growers who were members of one-variety cotton-improvement associations last year the gain was estimated at more than 15 million dollars, almost \$400 each. On an average, the individual farmer grew about 15 acres of cotton, which means that his increased income from one-variety cotton amounted to about 25 dollars an acre. In earlier years when the farmers did not get the exceptionally high prices they sold their cotton and cottonseed for last season their average gain from one-variety production was much less. In 1939, for instance, Georgia's 26,000 one-variety producers received an increase from the program estimated to be approximately \$6.50 an acre, or about 80 dollars for the average producer. Last year the program's estimated financial benefits to Alabama cotton growers averaged about \$8.50 an acre. One-variety improvement associations in that state had about 39,000 members, who received average additional returns from cotton estimated at 135 dollars each. The differences between these averages and the averages for Georgia indicates that the Alabama yield was even more conservatively estimated than the Georgia yield.

These figures are only rough approximations, but they do indicate that the growers have received good returns on their efforts to improve cotton production under the one-variety community plan. Actually the financial rewards under the program may be even greater than they are generally claimed to be. For one thing, the amount of the extra yield from adopted varieties in organized communities is very conservatively estimated at 10 percent of the state average yield. In most places it undoubtedly exceeds that amount.

Although the yield increases that farmers have obtained by standardizing their cotton production cannot be measured accurately, they may be estimated by several methods. The acreage and the number of bales produced by grower members are estimated and reported for each one-variety community, whereas total cotton acreage and production are reported for counties. The differences between these two sets of totals for given areas of comparable size are rough estimates of cotton acreage and production outside the one-variety program. Another method is to compare the average cotton yields in groups of counties that are not standardized with the average yields in groups of counties that are well standardized. A comparison of yield trends in groups of well-standardized counties with those in groups of counties not

standardized provides still another means of estimating yield increases in the first group.

In Georgia, a comparison of total acreage and production figures with adopted-variety acreage and production estimates shows, 1946 cotton yields on the adopted-variety acreage were about a third higher than those on the other acreage. This increase amounted to about 40 percent of the state's average yield per acre in that year. The yields on Alabama one-variety cotton acreage in 1946, calculated on the same basis, equaled about 30 percent of that state's average. Of course, comparisons of this sort are subject to considerable error, particularly if the two types of acreages are not fairly evenly distributed with respect to growing conditions, soil fertility and similar factors over the state.

In comparisons made on the basis of smaller, more uniform areas some possibility of this error is avoided. When the acreage and production data from the 1944 census for counties in Georgia's Piedmont region are compared with one-variety production and acreage figures for the same counties, a yield advantage for the latter amounting to about 15 percent of the state's yield per acre is obtained. A similar comparison based on 1946 census data on ginnings in the Clay Hill Area of Mississippi gives one-variety production a yield advantage approximating 40 percent of this state's yield per acre for that year. The apparent yield advantage for one-variety acreage in the Mississippi Coastal Plains, on the other hand, was so small as to be almost insignificant.

Average cotton yields in counties with proportions of less than 10 percent of their acreage planted to locally adopted varieties were compared with those in counties that had proportions of more than 75 percent. For the period 1944-46, average yields were significantly greater in the groups with the higher proportions. In the Georgia Piedmont counties the advantages averaged slightly more than 10 percent. There were marked differences from year to year within the period. The advantage in 1946, for example, was about 20 percent of the state's yield per acre.

When groups of those counties where production is fairly well standardized under the one-variety plan are compared with groups of counties in which there is no appreciable standardization only insignificant differences in yield trends are apparent. Such comparisons show that total cotton acreage, however, has declined less rapidly in those counties where the greatest progress toward standardization has been made. The more rapid rate of decline in the other counties suggests that their cotton acreage is now confined to the very best land. In comparative cotton-yield figures for two groups of counties, the results of greater land selectivity in the unstandardized-cotton planting of one would obscure the effects of the one-variety production of the other where cotton was planted on poorer land as well.

Although the various methods of comparison give varying impressions of the effect that variety standardization has on cotton yields, there is little doubt that the estimates used in computing the financial returns to growers understate the actual yield increase. Probably farmers outside the association also have benefited, because the larger quantities of pure seed made available by the one-variety organizations have no doubt improved their cotton.

Effect on Quality

Since 1931, when one-variety improvement work was begun in the District, cotton quality has improved markedly. In all the District's important cotton states the more valuable staple

lengths now make up a greater percentage of total crops. Of more importance than staple length from the quality standpoint, however, is the relationship of variety to such fiber properties as tensile strength, fineness, length uniformity, and degree of maturity.

Grade and staple length are the traditional quality measurements used by manufacturers as well as marketing agencies. The first provides an indication of probable manufacturing waste and fiber deterioration. Staple length is an indication of yarn strength and other qualities. Moreover, it has long been recognized, there are other fiber properties that also affect spinning performance. In commercial practice they are designated by the term "character."

Recently, laboratory methods and devices for measuring the principal properties that make up character have been developed. The relationships these factors bear to processing performance and to the quality of the end product have been determined within usable limits of accuracy. It has also been demonstrated that the various fiber characteristics are inherent qualities of specific varieties and growths of cotton. Variety has emerged as the single most important determinant of the spinning quality of cotton. In one study Government fiber and spinning laboratories tested samples of 16 varieties grown at 14 locations widely scattered over the Cotton Belt. The staple lengths of the samples varied from seven-eighths of an inch to longer than $1\frac{1}{8}$ inches. Despite the variations in areas of growth and in staple length, the spinning quality of the samples in any one variety was practically the same. Through their own research departments mills also are studying the effect of variety on spinning quality. As a result of their studies they are buying more cotton each year on a variety basis.

These developments have far-reaching implications for the future. As manufacturers learn more about the adaptability of certain varieties for specific uses, there will probably be increases in the amount of cotton bought for its variety as well as its grade and staple. The mills, according to a recent survey, use variety designations in addition to commercial quality designations for about 12 percent of their purchases. If future demands for large lots of cotton grown from un-mixed seed are to be met, production must be standardized in a manner that will prevent the mixing of varieties.

Because of the work that cotton breeders are doing, the manufacturers do not have to be content with the fiber characteristics typical of the present cotton varieties. Breeders are concentrating their efforts on only a few of the best varieties to effect changes in fiber characteristics that will meet the manufacturers' specifications.

Since individual plants, even within the same variety, have outstanding character differences, the breeder has a wide choice of qualities without resorting to new varieties. As an aid to his work Government laboratories make complete fiber analyses for him at cost. By using the data resulting from these analyses he can select and breed for certain fiber qualities just as he would for any other plant characteristic. The seed from one plant can be multiplied so rapidly that only a few years are required for putting a new strain into commercial use. By the time the new strain is ready for introduction, the breeder has several years' results from the fiber analyses and spinning tests. He can assure the grower, therefore, that the new strain will meet the manufacturers' requirements. The grower, of course, must keep the seed pure and follow the other practices necessary to produce a high

quality cotton. Most breeders regard the one-variety program as the most efficient plan yet devised for carrying advances in breeding on to the manufacturer.

Uniformity of fiber quality has a surprisingly important effect on processing costs. One mill representative estimates that almost two fifths of merely the labor costs in spinning result from a lack of uniformity in raw cotton. Since wage costs constitute a large proportion of spinning costs, labor savings resulting from improvements in cotton quality offer possibilities for a significant lowering of production costs. If these gains were passed along to the consumer in the form of lower prices, the cotton grower would, in turn, benefit from any ensuing expansion of consumption.

Marketing

For an extensive application of the efficiency improvements presented by the one-variety plan, cotton marketing should be modified. In most instances the one-variety communities are too small for mill buyers to obtain large even-running lots of one-variety cotton under present marketing procedures. One possibility, therefore, is to standardize varieties over larger areas. Under the program, some areas have been organized on a county basis, but there is still a real need for larger standardized-variety areas. Another proposal calls for some agency to make, during the cotton-harvest season, fiber-quality tests that could be used by mills when they are buying cotton. To be of maximum efficiency the tests would have to be more rapid than the laboratory tests now used.

For the past several years the Government laboratories have made fiber and spinning tests on samples from selected areas that produce more than 25,000 bales of one-variety cotton. That only a few of its individual areas produce one-variety cotton in such an amount limits the value of this service for the District. Its growers are faced with more difficult marketing problems, therefore, than are the growers in regions where production is more concentrated.

A development in marketing that promises to make possible a more effective use of the most recent information on cotton quality and, at the same time, aid the farmer who produces superior cotton is the lint-certification program. This plan was started in 1946 under the sponsorship of the Mississippi Seed Improvement Association. Essentially it is a means of providing mill buyers with reliable information on the variety of cotton in a bale and the locality in which it is grown. To be eligible for certification, cotton must have been ginned in a one-variety gin and produced from seed that has been certified for variety and purity. Fields are officially inspected for varietal purity. Gins, storage bins, and processing plants are also inspected before approval is given. Last year the association certified the lint from 50,000 acres of cotton and this year will certify that from approximately 90,000 acres. It is expected that lint from 150,000 acres will be certified next year, with a gradual increase from then on.

Adequate quantities of pure seed, readily available, are essential to the success of this program also. Because the one-variety-production plan centers about the multiplication of pure seed, it is vitally important to the lint-identification program.

For ready identification of the cotton as it moves through marketing channels, a tag is affixed to each bale at the gin. This tag shows the variety, the year grown, and the name and location of the grower. Mills are keenly interested in the program since it promises to facilitate their obtaining cotton that meets specific requirements.

If the tagging system is to be successful, its integrity also must be maintained at the highest level possible. In view of the mills' growing interest in cotton on a variety basis, serious consideration should be given to measures that will make the purchase of cotton by varieties, as well as by grade and staple, practicable and dependable. Past experience has shown that tags not only might become accidentally detached but might be switched by unscrupulous handlers. Under the circumstances buyers were afraid to trust the bale markings. It has been suggested that durable tags be attached to the bales in a manner that would prevent accidental loss in handling and that legislation be passed to make removal of a tag before the bale is opened unlawful.

So far lint identification has progressed most rapidly among the Delta growers who plant comparatively large acreages. The need for reliable lint identification is probably greatest, however, in the hill sections typical of the Sixth District, where the widely scattered production by many small producers particularly limits local accumulations of large even-running lots of one-variety cotton.

Like most marketing services, lint identification involves additional costs. These costs must be weighed against the probable benefits. The Mississippi association is not asking cash premiums for the certified lint. Instead it assumes that competition among the mills to obtain the quality cotton will result in the growers' receiving price increases in excess of the additional costs. Some mill representatives, in fact, take the stand that it is the grower's responsibility to properly label and identify his product. To support their view, these representatives have only to point to the synthetic-raw-material suppliers, who deliver accurately labeled packages.

Large crops greatly in excess of domestic needs offer the maximum opportunity for mills to select cotton in the quantities they want with the characteristics they want. The remainder of the crop, of course, must be exported to avoid a burdensome carryover. If exports are to be relatively small, however, it will be necessary to adjust production to domestic market needs. This adjustment primarily would require not only that total production be geared to consumption but that various kinds of cotton be produced in appropriate amounts. In order to determine what adjustments should be made a research project has been set up under the Research and Marketing Act of 1946 to collect and compare information on the types of cotton now being used and the types best suited for making various cotton products.

For successful adjustment cotton growers, instead of producing "just cotton", would have to produce a raw material adapted to the manufacture of a particular end product. In a market primarily domestic a failure by cotton growers to adjust their product to the manufacturers needs would encourage the mills to turn to synthetic raw materials.

Cotton growers, on the other hand, have a less attractive choice of alternatives. A loss of their markets would entail a painful readjustment for them under even the most favorable conditions that are likely. Despite cotton's decline in importance relative to other District farm enterprises, a rapid loss of cotton markets would have more serious repercussions on the farm economy of the Sixth District than it would on that of some other cotton-growing regions. And in areas such as the Piedmont, where the number of alternative cash crops is very limited, the loss of cotton income would be particularly serious. Since most of the District farmers have relatively small farms and relatively small amounts of land and capital they must depend on returns from their own labor

for the greater part of their income. Cotton, with its high labor requirement per acre, is the major source of productive employment on many farms. Its labor requirements are poorly distributed over the year from the standpoint of steady employment, but it returns a higher rate of pay than many alternative cash crops.

Prospects for the quality premiums and the higher yields per acre that bring increased financial returns have stimulated cotton-quality improvement under the one-variety plan. The educational work of the experiment stations; the extension service; and the Bureau of Plant Industry, Soils, and Agricultural Engineering in the Department of Agriculture has been directed toward greater farmer participation in cotton-quality improvement. In standardizing their cotton production District farmers have made great progress, but they must go much further if they are to solve the problems ahead. Though there are indications that yield increases per acre under the one-variety plan are even greater than is generally claimed, the failure of the marketing system to reward farmers for producing cotton of a superior quality undoubtedly tends to retard quality improvement. In the long run the adverse effects of a failure on the part of cotton growers to provide a raw material that will meet all competition might far overshadow any temporary shortcomings in marketing. To the individual farmer, however, the immediate monetary gains seem so important that they provide almost the only incentive for improving cotton quality.

One proposal for giving farmers an additional incentive to improve cotton quality and uniformity calls for soil-conservation benefit payments to all of them who participate in one-variety-cotton improvement. Experience with similar payments for other farm practices suggests that such a program, if adopted, should be accompanied by the most vigorous efforts to educate farmers on the value that the cotton-improvement plan has irrespective of any payments involved. In the past a failure to sell the idea on which a payment was based has often been associated with the farmer's failure to continue the practices after the payment was discontinued.

Though opinions of the best means to the end may differ, it is clear that some means of more-efficient production must be adopted if cotton is to maintain an important place in the District's farm economy. The greatest possibilities for increasing efficiency seem to lie in a further expansion of the one-variety cotton-improvement plan.

To a great degree further progress depends upon developing local leadership and community co-operation. The program offers groups of businessmen who are now sponsoring more general farm-community-improvement work the opportunity for further effective efforts. In many instances one-variety cotton-improvement associations have been formed in communities where farmers had worked together little, or not at all, in an organized way. In enlisting the farmers' support, state and Federal workers have been faced with two problems. One is to convince the growers that the cotton improvement work is necessary and advantageous for them. The other is to convince them of the necessity for working together. Local business leaders can be very effective in promoting the conscious community interest necessary to attainment of the full advantages which are possible in cotton-improvement work. As the competition between cotton-growing areas intensifies, cotton farmers will need all the help that people interested in seeing cotton maintained as an important District crop can give them.

BROWN R. RAWLINGS