

SECOND BIENNIAL REPORT

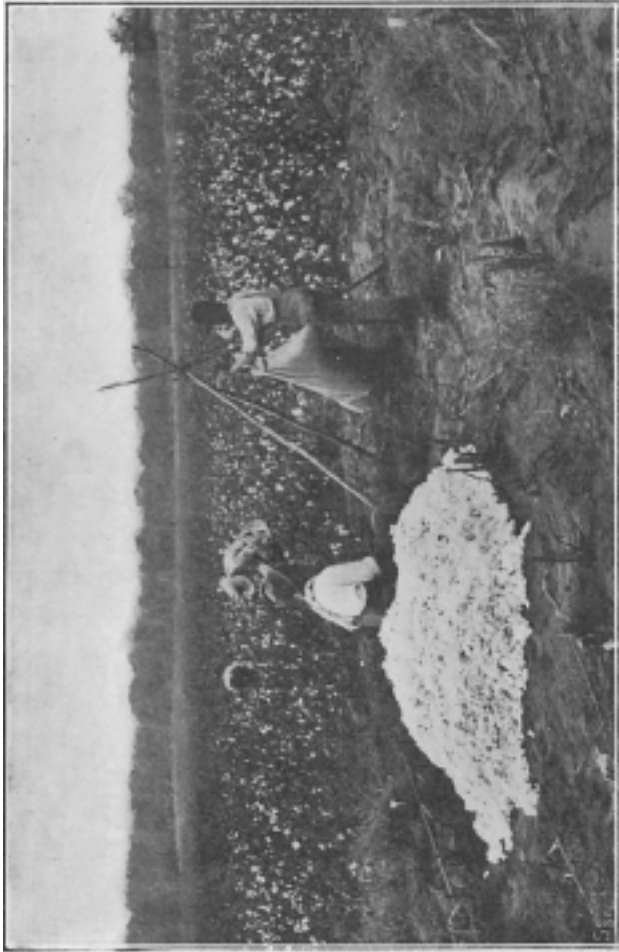
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COTTON PICKING SCENE IN OKLAHOMA.

THE BREEDING AND IMPROVEMENT OF COTTON.

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Delivered at the Short Course A. & M. College—Stillwater, Okla.,
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Can we breed cotton? This is a question which is frequently asked me as I travel here and there throughout the cotton states. I may say that the question surprises me, as it would seem that everyone familiar with the industry would understand this matter fully, and realize something of the enormous possibilities which exist in this field. There are of course, many ways and means of improving the cotton crop. Heretofore experimenters and practical men have given their attention almost wholly to the study of improved methods of manuring and cultivation, and a vast literature has grown up containing many conflicting and erroneous ideas it is true; still, as a whole, giving the general factors in a very clear and concise way, much still remains to be accomplished in this field; primarily in the devising and introduction of improved machinery for the cultivation and handling of the crops. The other field of improvement lies in the breeding of new and better varieties, and the improvement of the good old sorts by systematic pedigree selection. Recently in all crops, the question of breeding is receiving marked attention. The breeding "bug" has been hibernating for long years, but he is waking up, and the hum of his multitudinous wings can be heard all down the broad avenues of the numerous crops. His busy hum is reaching the cotton fields, and soon I expect cotton growers will get busy all over this great southland, and when this time comes, gentlemen, our cotton industry will receive a new stimulus. As I view the cotton industry, it seems to me that what is most needed is not more acres of cotton, but a better crop on the acres that we do grow. We have all seen crops produced on ordinary soils, where the yield ranged from 3-4 to 1 1-4 bales per acre, and a 500 pound bale per acre, as we all know, is not an uncommon yield. Why then should we have yields all over commonly of not more than 3-8, 1-4, or even 1-8 of a bale. These poor crops do not pay the producer the cost of their production, and there is no justification for such crops, except in seasons when the climatic conditions prevent the cultivation. Such low yields are due to lack of manuring, lack of cultivation, and poor seed. Many cotton planters think they are over fertilizing when they put on 150 pounds of fertilizer per acre, but I have found in my experience that the men that are the most successful, and are making good money as we express it,

are using regularly from 800 to 1000 pounds per acre of a high grade manure every year. I speak here primarily of conditions as they exist in the eastern cotton belt; in the Carolinas and Georgia, and not in Oklahoma. Here you are blessed with a fairly rich soil, which does not require to be manured so heavily to give good crops. I find the growers here, however, discussing methods of cultivation and manuring, and this is good: they should discuss and study these matters. The one thing that is neglected here and in the Carolinas, in Georgia, Mississippi and all over, is the character of the seed. The seed makes the crop, and there is good seed and bad seed. It isn't like the reply of the old darkey who when asked why he drank so much of that bad whiskey answered: "Why marsa, der's no bad whiskey it's all good or better." Hundreds of cotton growers, to my certain knowledge, take all of their crops to the gin without providing for planting seed, and then purchase ordinary seed at the gin for planting, taking simply any seed, not knowing the variety or where or how it was produced. They plant simply cotton seed, and that is the best you can say of it. Now gentlemen I maintain that such a policy is suicidal. The only wonder has been that under such conditions so few should fail, and it is only the inherent strength of the industry that has prevented a wholesale failure. It shows that the industry is so certain, or has been, that practically all that was necessary was to plow the land, and throw the seed at it, to watch the maturing of a profitable crop. With the increased cost of labor, living materials, land, etc., however, conditions are changing, and success in the future is going to depend more on the intelligence of the methods used.

TESTING VARIETIES.

The time is passed when the planter is justified in using simply cotton seed. He should carefully study varieties, and by experiment determine what sorts give the best results on his own farm. A study of the local adaptability of varieties is very necessary. I would advise every farmer who is planting cotton to make a variety test, running over a period of two or three years, using ten or twelve of the best varieties, or those most highly recommended. It is but little extra trouble for a grower to plant such a lot of different varieties, putting out four or five rows, two hundred feet long of each sort, and he will get considerable pleasure and profit from such an experiment. A careful study of the plants, and a measure of the products will, when continued two or three years, show pretty conclusively what variety of those tested is the best for the local soil conditions of his farm. Pure seed for such tests can be obtained through seedsmen, or from the State Experiment Stations or Department of Agriculture. Such variety tests should ordinarily precede careful breeding experiments, as the grower should be thoroughly convinced that he has the best variety for

his local conditions, before taking the time to carefully select and improve it. He wants to know, in the terms of the breeder, that he has the best available foundation stock for his purpose.

VARIATIONS IN COTTON.

The possibility of improving cotton depends upon the fact that even in the most uniform types or varieties of cotton, there is nevertheless very great differences to be discovered between different individuals. If the grower will carefully go over his best or his poorest field of cotton, he will find that every plant differs from every other plant. It is a common thing to find two plants side by side, under exactly the same conditions, where one will be short jointed and compact, and produce from forty to fifty good bolls, while the other will be long jointed and spreading and produces only ten or twelve bolls. Such differences in form of plant and yield can be found in almost every field, unless the seed used is of a pure variety, and has been very carefully selected. To get a good yield, the grower wants every hill to produce a good yielding plant. A few superior plants do not materially affect the yield. The main factors that go to increase the yield are a good stand and uniformly good plants in every hill. The problem of the breeder is thus to get seed of good vitality, that will uniformly produce good yielding plants if placed under fair conditions.

HOW FARMERS CAN BREED COTTON.

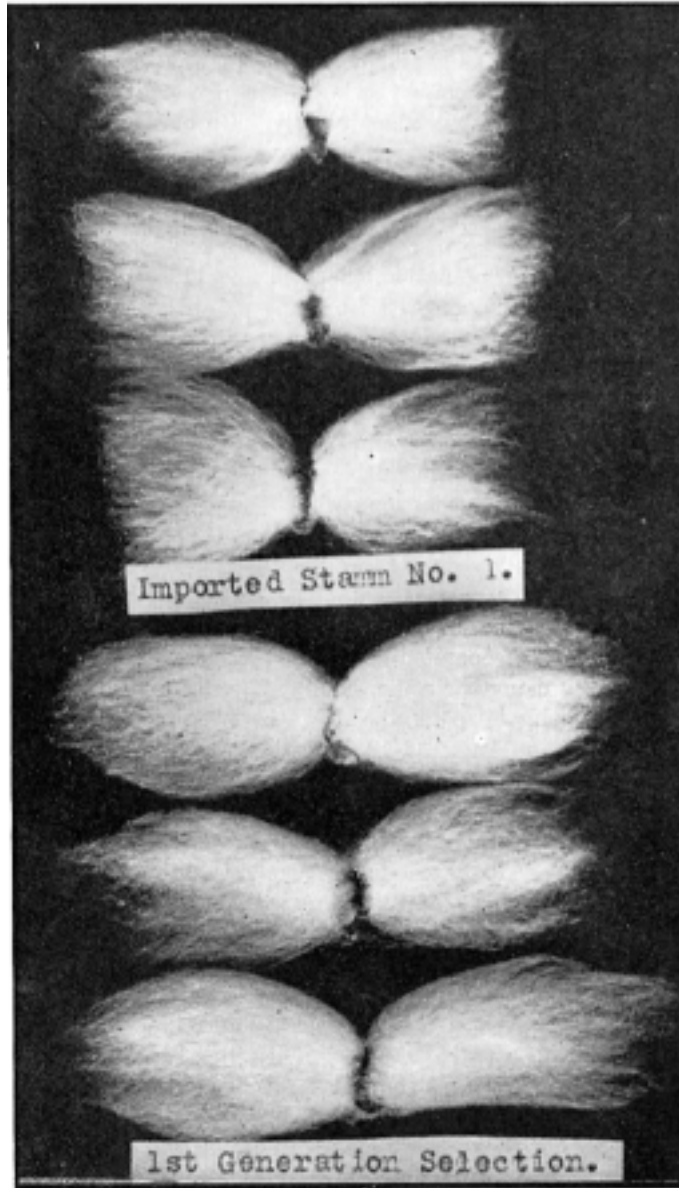
SELECTION OF TYPE.—After having tested varieties and determined in general what variety is best suited to the local conditions, grow a large field of this variety on soil which is as uniform throughout as can be selected, give this field ordinary cultivation. The next step is to determine what type of plant of this variety is the best. Every grower knows a good cotton plant, and no description is necessary. We want a plant ordinarily of medium height and stocky, with the habit of putting on numerous bolls early in the season on the lower branches. A careful observation of the plants in the field will enable the grower to easily determine the best type of plant which gives the most cotton, in general earliest in the season. Earliness in almost all cases is an important point and in sections threatened by the boll weevil and boll worm, earliness of maturity should always enter into the consideration of the type of plants selected as best.

SELECTION OF PLANTS.—After having determined the type of plant which is thought to be most desirable, the next process is to make the actual selection of plants, and this is the hard, tedious work. Still it is not so hard as plowing or hoeing, and there is a special charm and fascination about it after one gets thoroughly interested in the work. The selection should be made just before the first picking. Delay the

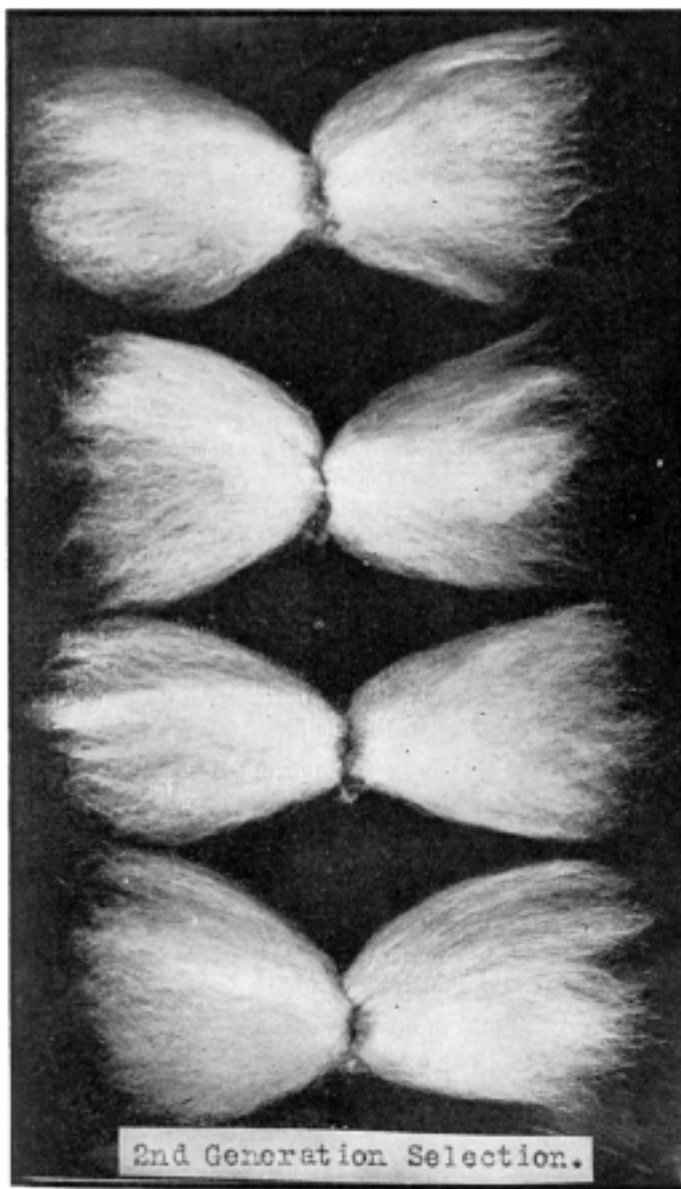
first picking until the cotton is pretty well open and needs picking rather badly. Then go over the field row by row, walking slowly along each row and letting the eye have sufficient time to size up each plant. Most plants can be thrown out at a glance. When good plants are observed, look at them carefully, and if they are up to what is considered the highest standard, mark them, by tying a strip of white rag to one of the upper limbs where it will show plainly. Go over a large field, the larger the better. It should be, at least, a ten acre field, if possible, and if it is larger, so much the better. The problem is to select from the field possibly one hundred of the best plants. In marking the plants the first time, probably two or three hundred will be marked. After this first preliminary examination, the field should be gone over a second time, and the marks removed from any plants which are not truly superior plants, reducing the total number probably to one hundred marked plants.

In this second examination, attention should be given to the amount of lint on the seed, as this in general determines the lint turned out, and is important. The breeder should be provided with a small aluminum pocket comb, about four inches long which can be used to separate and straighten out the fibers on the seed, so that the covering or amount of fibers becomes plainly visible, as well as the length of the fiber. Every cotton grower should learn this method of cotton combing, as it is essential to the careful judging of cotton. By using the fingers the cotton on the seed can be separated or parted down the middle of the seed and then carefully using the comb, holding the fibers meanwhile to prevent them from being torn off the seed, the fibers can be combed out straight as shown in Plates 11-12. In this way, the amount of lint on the seed, and the length, and uniformity of length becomes clearly visible and easy to judge. The process of combing requires some practice before it can be done successfully, but it will well repay the time spent in learning. As one goes over the plants either the first or the second time, several seeds from different bolls on each plant should be combed out, and any plants discarded in which the seeds are not well covered with lint of good length. In ordinary short staple cotton, no plant should be taken for seed which does not produce lint of at least one inch in length. In the Long Staple Uplands, which are grown to some extent in Oklahoma, the standard of length will necessarily depend on the variety being grown, as some sorts produce 1 3-8 inch lint, while others produce as high as 1 5-8 inch lint.

In going over the select plants the second time, take all these important points into consideration, and retain only those which are the very best plants, which represent the highest ideal type. These plants should be plainly labeled and numbered, and the product of each plant should be picked separately in a paper bag numbered to correspond with the number on the plant. The best paper bags to be used in picking



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and preserving separately the product of each of the selected plants is the ordinary manilla paper bags of about eight pound size, which can ordinarily be purchased in any grocery store. The first pick can be made in these numbered bags and preserved, and the same bags can be taken to the field and the second or later picks placed in them, comparing the numbers on the plants and bags each time, to see that the product of each plant is kept together.

GINNING THE SELECT PLANTS.—At the close of the season some special arrangement should be made, so that a single gin can be disconnected from the stand of gins and used to gin these select plants. The gin should be arranged so that the seed cotton of a single plant can be fed in and ginned. After the product of each plant is ginned, the seed should be carefully collected and placed back in its numbered bag. It is highly important that the seed from each select plant be kept separate and free from mixture with other seeds.

The speaker is well aware that this process of ginning individual plants is the most difficult thing about the selection work for growers ordinarily to handle, but it is the only way that systematic breeding can be conducted, and the benefit to be gained is so great that a cotton grower can well afford to go to the great trouble to have these plants ginned separately and kept pure. In sections where several growers are interested, or where growers propose regularly to pursue a system of seed selection, the speaker would urge the advisability of purchasing a small ten or fifteen saw hand gin, to use in ginning such samples. Such a hand gin, operated by a crank, can be purchased for about fifty dollars, and is a necessity to breeders in this field.

KEEPING RECORDS.—It is very important if the breeder is to know what advance is being made that records be preserved, showing the weight of seed cotton, and lint produced by each select plant. With these weights, the per cent. of lint can readily be determined, and all of the important factors thus be recorded which go to produce a heavy yield. The preservation of such notes regarding the select plants will enable a comparison to be made of plants selected in various years, and will greatly enhance the value and interest of the work.

PLANTING THE SELECTIONS.—The next year, a field should be selected for the breeding patch which has good soil, typical of the plantation, and region so far as possible. It is important that the soil throughout the patch be of uniform quality and kind, and not patchy. Do not select the richest and best land available, as this may be different from the land on which the improved variety is later to be grown. The breeding patch, if possible, should be isolated from any other cotton field, a distance of from five hundred to one thousand feet at least. This is in order to avoid crossing or mixing with different varieties and unselected stock. Such isolation is very important if we are to avoid deterioration. A good place to put the isolated patch is frequently in

the middle of a corn field, where it is surrounded for some distance on each side by corn. If an isolated patch cannot be provided, the breeding patch may as a second choice be planted in one corner of a cotton field planted with seed of the same variety from which the selections were made the preceeding year. Under no conditions place the breeding patch in close proximity to cotton of other varieties or kinds. The speaker would urge that an isolated patch be provided in all cases, as this insures that all fertilization will be by pollen from plants coming from select mothers. The seed from each individual should be planted in a single row by itself, a plant to a row by what may be termed the *PLANT TO ROW METHOD*, as each row is planted a stake with the number on it of the plant from which the seed was taken should be placed at the end of the row. Owing to the small amount of the seed from each selection, it is best to plant it in hills about eighteen to twenty inches apart in the rows, dropping from five to eight seeds in a hill. In the thinning, or chopping, the laborers should be carefully instructed to cut out all but the strongest and most vigorous plant of each hill. Give the breeding patch the same manuring and cultivation that you give your ordinary crop, but remember that in all cases this should be sufficient and thorough, to insure the best results.

EXAMINATION AND SELECTION OF PROGENIES.—When the cotton in the breeding patch is well open, and it is important that the first picking be made, go over the patch very carefully and study the progenies from the different select plants. It is important to determine which of the plants selected the first year has transmitted to its progeny in the greatest degree the good qualities of high yield, good lint, etc., for which it was selected. This is probably the most important point to be determined in all breeding work, as a select plant to be good, must have the property of transmitting its desirable qualities to its progeny. A careful comparison of the one hundred or more progenies will usually result in the breeder finding a few progenies or rows which as a whole are considerably superior to the others. When these have been found, they should be marked and the individual selections for continuing the breeding should be taken from these rows or progenies.

MAKING THE SECOND GENERATION SELECTIONS.—After the best progenies in the breeding patch have been selected, the breeder should then carefully go over these progenies, plant by plant, and select and mark those plants which are found to be the most productive, and come up to the standard set for length of lint, abundance of lint or seed, type of plant, etc. These plants selected should be numbered as in the case of the year preceeding.

A good system of numbering these plants which will show their pedigree at a glance is as follows:

If for instance, one of the best progenies is from the original selection, No. 2, label the selections in this row 2-1, 2-2, 2-3, 2-4, 2-5, etc., the second number after the dash being the number of the individual

selected in this generation while the first number, 2, is the number of the original selection. In the same way, if progeny 51 is one of the best, the selections made from this would be numbered 51-1, 51-2, 51-3, etc. When the third generation selections are made, they should be numbered in the same way, separating the generation by a dash. For example, the selections made from progeny of 51-1 would be labeled 51-1-1, 51-1-2, 51-1-3, etc.

The second generation selections should be picked separately, as in the case of the first generation selections, and ginned separately, the seed being preserved to plant a breeding patch the next or third year.

SECURING SELECT SEED FOR GENERAL PLANTING.—To secure select seed for planting a general crop, take intelligent pickers, and train them to recognize a good productive plant. Then after having selected and marked the best plants in the breeding patch, send these pickers over the breeding patch, instructing them to pick all of the seed from the productive plants that are not marked as special selects. Use this seed to plant a general crop. If this seed is not sufficient to plant your general crop, plant what you can with it in what may be termed a multiplication plot, and from this multiplication plot, have the select pickers pick sufficient seed, as above indicated, to plant a general crop the ensuing year.

CONTINUING THE SELECTION.—In the third year, the individual selections made the second year should be planted in a special breeding patch, such as described for planting the first year selections, and the planting should be made in the same manner, using the plat-to-row method. The individual selections should be made in the same way as in the first and second years, when the progenies of the second year selections have reached fruiting condition. In succeeding years, the same methods should be pursued, forming as will be seen, a continuous method of pedigree selections.

Each year also second choice seed should be taken from the breeding patch to furnish seed to plant a larger multiplication plot, from which in turn choice seed can be taken to plant a general crop.

WHAT TO DO IMMEDIATELY.

The speaker has outlined above a systematic method of selection which can be used in improving any strain or race of cotton. It is urgently recommended that every cotton grower carefully study this plan, and prepare to introduce it into actual practice in producing their cotton. If you have no gin to gin the small samples, get one, they are not expensive, or get your ginner to install a small sample gin for the use of planters in the neighborhood. It will well repay the planter and the ginner.

No subject of more importance than good seed, and methods of seed improvement is now before the growers of cotton. Don't neglect this matter; take some action. Get busy or you will regret it.