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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS.

U. S. DEPARTMENT OF AGRICULTURE
AND STATE AGRICULTURAL COLLEGES
COOPERATING.

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OFFICE OF EXTENSION WORK, SOUTH
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WASHINGTON, D. C.

METHODS OF GROWING COTTON UNDER BOLL- WEEVIL CONDITIONS.¹

The cotton-boll weevil is already a permanent insect pest over a large part of the cotton territory. No method is known by which its ravages can be controlled completely. It is, therefore, of great importance and must be considered where cotton is grown. The methods of combating the weevil outlined in this circular are born of science and experience. These methods have succeeded.

Normally the cotton-boll weevil feeds only on cotton, but, in the absence of cotton, it will feed to some extent on closely related plants, such as okra and hibiscus, but does not breed on them.

It goes into winter quarters mainly in or near the field of its depredations.

Comparatively few weevils survive the winter and emerge in the spring.

The overwintered weevil feeds upon the terminal buds of the young cotton plants until the forms or squares develop, then the female deposits her eggs in the squares, exclusively at first, but later also in the immature bolls.

The average life of the adult weevil when supplied with cotton squares as food is 50 to 60 days, its maximum life being about 100 days. If deprived of food it lives only 2 to 6 days, except in hibernation.

For a period after emergence from winter quarters the weevil is comparatively sluggish and while feeding upon the cotton plants it may be picked by hand.

Until all the squares are punctured and the female has no other place to lay her eggs the weevils remain chiefly in the field in which they locate in the early spring. Usually the period of migration begins from August 1 to 20 and continues until frost.

¹ In response to the general and insistent demand for a special circular explaining how to grow cotton under boll-weevil conditions, the following is submitted as the result of the experience of the demonstration work for the past 12 years in several of the more western cotton States.

Based upon the life history of the boll weevil as determined by the research work of the Bureau of Entomology, the following methods have been developed by the farm-demonstration work in cooperation with farmers:

(1) Under boll-weevil infestation the fields selected for cultivation should be well drained, because a successful crop will depend upon the possibility of cultivating them at the proper time. Low, poorly-drained lands should be devoted to other crops. They always have been an uncertain factor in cotton production. Cotton, however, may be produced on well-drained alluvial or bottom land as successfully as elsewhere by proper effort.

(2) The early destruction of the cotton stalks before frost and the burning of all rubbish in and about the infested field are important.

(3) Uplands or any land that does not contain a large amount of plant food should be broken as early in the fall as possible with a plow that does not turn too much subsoil to the surface. If practicable, some winter cover crop should be grown. Before planting the soil should be thoroughly pulverized and the best seed bed possible made. Rich lands should not be plowed in the fall or deeply broken at any time, as they already contain too much plant food and moisture.

(4) Care must be taken to secure seed of an early maturing variety and of the highest vitality—not necessarily a small-boll variety, for on uplands some of the large-boll varieties have been more successful.

(5) Reasonably early planting is advised, but nothing is gained by planting until danger of frost is past and the soil is warm enough to produce rapid germination and growth.

(6) Experience on the fertile soils in Mississippi and Louisiana has demonstrated that the width of row and the spacing in the row that gave best yields before the weevil came usually will give the maximum yield with the weevil present. *Spacing of rows and of plants in the rows should be regulated by the fertility of the soil and the usual growth of cotton stalks.*

(7) The use of the section harrow before planting and after planting and again just as soon as the plants are well up is advised.

(8) Intensive, shallow cultivation of the crop should be practiced and the cotton should never be "laid by" until picking commences. *Late cultivation is very important.*

(9) In case it is evident that a large number of weevils have been overwintered, *it may be advisable to hand-pick the early-appearing weevils.*

Persistent picking and destruction of all punctured squares both from the field and on the ground at least once each week for not less than a month, beginning when the infested squares first begin to drop,

is frequently highly advisable. This is a practice of varying importance, depending upon the cheapness with which the work can be done and other factors. It is not usually advisable to continue picking up squares when there occurs very hot and dry weather during June and July, but in case of continued rains or on low, moist soils it offers practically the only hope of controlling infestation. To accomplish material results, the importance of thoroughness and beginning in time can not be overemphasized. Thorough, intensive cultivation should in no event be neglected.

This battle against the weevil has two objects:

The first object is to reduce the number of weevils as much as possible so that a crop can be made.

The second object is to plant early maturing varieties and to force the cotton plant to maturity as fast as possible, and by extra cultivation and fertilization cause it to put on more forms or squares than it can mature so that the weevil can destroy only the surplus, allowing enough to mature to give a crop.

IMPORTANCE OF STALK DESTRUCTION.

The destruction of the stalks may be fatal to the weevils in the field, but its value depends considerably on when and how it is done. It should be done just as soon as the crop can be picked, and to be of material value must be accomplished a considerable time before frost. Demonstrations have been made showing that burning caused the destruction of as many as 97 per cent of the weevils if done early and properly, but if delayed as many as 45 per cent might be allowed to escape.

It is seldom practicable in the central and northern portion of the cotton belt to destroy cotton stalks long enough before frosts to be effective. In the southern part of the cotton belt it is believed the early fall destruction of the cotton stalks offers a very effective means of weevil control.

METHODS OF STALK DESTRUCTION.

The stalks may be destroyed by several methods. First, every third or fifth row may be allowed to stand and the row on each side uprooted and thrown against it. Second, all the stalks may be cut and thrown into piles of convenient size. In either case some of the adult weevils will collect in the windrows or piles and be destroyed when the stalks are burned.

Another plan practiced is to turn cattle into the fields to eat the foliage and immature bolls. This plan, however, should not be followed except by those farmers who can turn in enough cattle to clean up the field completely in a week's time.

Since the burning of the stalks destroys vegetable matter which is badly needed on most of the cotton lands, an alternative plan of cutting the stalks with a disk harrow or stalk chopper and turning them

under deeply should be followed, as the vegetable matter thus added to the soil is worth from \$2 to \$5 per acre. For this plan to be effective the stalks must be completely buried at least 4 to 6 inches deep, depending on the kind of soil. This plan will not be satisfactory unless the teams are heavy enough to do deep plowing. In dry sections or in long seasons of drought the stalks may be uprooted with a plow or cut down with a mowing machine so that the hot sun will parch the leaves and squares. The all-important thing is to destroy the growing plants after the cotton is picked. Circumstances must determine in each case the most practical and effective means of doing this.

OBJECT OF STALK DESTRUCTION.

The object in destroying the stalks is twofold: (1) To deprive the adult weevil of food and breeding places; (2) to kill the vast numbers of weevil eggs, larvæ, and pupæ contained in the squares and immature bolls at this time. To make this destruction complete the stalks should be burned as soon as possible after being cut and piled. As soon as the foliage will burn readily fire should be set to it, although the main stem and branches may not yet be dry enough to burn. All rubbish in and about the field also should be burned and the field broken immediately. If the stalks can be chopped up and turned under deeply immediately after the picking is completed, which under weevil conditions should not be later than October 15, this method of destruction should be preferred.

If this single instruction to destroy all cotton stalks in the fall while still green could be carried out by every grower, it would practically solve the weevil problem. The difficulty is that only part of the growers follow this plan. It requires early-maturing cottons and rapid gathering to get the crop out in time to do this work to the best advantage.

Here is a splendid opportunity for community cooperation in a campaign for stalk destruction. If the sentiment for cooperative effort in this essential work could be aroused sufficiently to induce every farmer in the neighborhood to agree to destroy the stalks on or before a certain date, it would go far toward insuring profitable cotton crops under almost any sort of weevil infestation.

If this work is delayed until after a heavy frost and large numbers of the weevils have escaped from the field, either to hibernate or to go elsewhere, the cutting and burning of the stalks may be of little value, and the better practice is to chop up the stalks thoroughly with a disk harrow or stalk chopper and plow them under deeply.

METHODS TO BE PURSUED AFTER CROP IS PLANTED.

The next most important step in eliminating the weevils is to be taken in the spring, when the cotton plants begin to put on squares and the infesting weevil punctures them. The grower should notice

when this occurs and at once begin to pick up carefully and burn such infested squares. In one sense this picking up of squares goes to the root of the matter more than early fall destruction of the stalk, because only a small percentage of the weevils would live through the winter in any case, while practically every square not picked up and destroyed, at least in cloudy weather, will furnish a boll weevil to infest the crop. In hundreds of instances in fields located in the best situations for weevil depredation, on bottom lands surrounded by heavy timber, with a rank growth of cotton and no previous preparation or burning of the stalks or destruction of the rubbish, a large crop has been made simply by the picking up of the squares and intensive cultivation. If care is taken that every punctured square is destroyed, a whole generation of weevils will be wiped out in two or three weeks. The old weevils will die and it will be possible to continue making the crop. Of course, in sections where the rainfall is very slight and on sandy upland soils anywhere during periods of dry and very hot weather, dependence may be placed on the heat to kill the weevil larvæ in the squares. It will seldom be safe to depend on this on alluvial soils and never on any kind of soil except during dry and hot weather.

Three points, therefore, are emphasized as of primary importance in making a successful crop of cotton: (1) *Thorough cultivation, continued until late in the season;* (2) *the early destruction of the stalks in the fall, particularly in the southern part of the cotton belt;* (3) *the picking up and burning of the squares when conditions make it advisable.* The early destruction of stalks in the fall has a double advantage. It not only kills a vast number of the weevils, but it destroys all their supply of food, so that such as are not burned will mostly perish for lack of food before winter.

PREPARATION OF THE SOIL.

The old theory that cotton would "make" sometime during the season will not work under boll-weevil conditions. The plant must grow rapidly and produce cotton early. To this end deep fall breaking on uplands is an important step. Deep breaking in the fall provides more plant food and a more uniform supply of moisture in the soil. It may also destroy many weevils and it gives the soil time to become firm before cotton planting in the spring. It is a mistake to suppose that deep breaking is good at any season of the year. The object of plowing or breaking is to pulverize the soil, and in the spring the subsoil generally is too wet to be pulverized; hence deep spring breaking is rather a disadvantage, especially for cotton.

PREPARATION OF THE SEED BED.

The best seed bed requires well-drained land and plenty of vegetable matter in the soil. In many cases where the land is poorly

drained it is impossible to get into the field to work the crop for 10 to 15 days or more at a time. Such conditions afford grass, the arch enemy of a large cotton crop, a great advantage. Besides, under weevil conditions, it permits the rapid increase of the pest. Working the soil two or three times before planting, with a section harrow, is of great advantage.

SELECTION OF VARIETIES.

After the preparation of the seed bed the next important point is the variety of cotton to be planted. The too common practice of selecting gin-run seed or any variety that comes to hand should be discontinued. The variety selected must be cotton with good lint qualities that throws out its fruit limbs close to the ground and has short joints, because the short joint can grow in less time than the long joint. A plant that produces good bolls all the way to the end of the limbs and can make a full crop of cotton on the lower half of the plant is what is desired.

Varieties producing a poor quality of lint should never be selected, however early maturing. In areas adapted to the production of long-staple varieties of cotton the utilization of new, early maturing varieties of good lint quality is advisable.

IMPORTANCE OF SEED PLAT.

If the best results are to be achieved, not only is it unwise to take gin-run seed but it is inadvisable even to depend upon seed selected in the general field. It is important that a special plat of land be set apart as a seed bed, and from this every plant which does not meet the requirements should be destroyed, leaving only the best types from which to select seed. Care must be exercised in ginning the seed that it be not mixed with inferior varieties, and careful attention should be given to storing in a dry place and in such a way that it will not heat sufficiently to weaken the germs.

It is always more satisfactory to use seed that has been selected and grown in near-by territory than to depend on seed imported from a distance. In deciding which variety is best suited to any particular locality, the State experiment station and extension authorities should be consulted.

WIDTH OF ROWS AND SPACING.

Width of rows and spacing in the rows usually should be about the same as under nonweevil conditions. Too narrow rows prevent proper cultivation; too wide rows waste space. Rows 4 feet to 4 feet 6 inches in width, according to the soil and customary growth of the cotton, usually will be most satisfactory. The bottom and the middle of the plant are all that can be depended upon to mature

cotton, and for this reason the maximum number of plants in the row that normally can be grown should be left. Intensive, shallow cultivation should be practiced except on rich or alluvial soils, where the tendency of the plant is to grow too rank. Where cotton grows rank, the cultivation should be deep and close until the cotton begins to set squares freely, after which only shallow cultivation should be practiced.

TIME OF PLANTING.

The time of planting is important. Very early planting is deprecated because the crop is likely to be injured by frost or retarded by cool weather. Planting, however, should not be delayed after all danger of frost is past and the ground is warm, when germination will be rapid and growth vigorous. The best time to plant will vary with the seasons, but is probably about the same under boll-weevil as under nonboll-weevil conditions. Extremely early and extremely late planting are equally unsafe.

If the directions herein given are followed more cotton per acre may be grown under boll-weevil conditions than is now produced where good farming methods are not used, and the boll-weevil problem practically will be solved.

It is easy to determine the causes of disaster when the boll weevil first invades a territory. In the main they are as follows:

The farmers neglect to inspect their fields, and generally, as the invasion is in the fall, they do not observe the presence of the weevil until the second season. Even then they take no preventive measures against its destructive effects, and by the end of that season the weevil is fully established and ready to do great damage. In most cases it is difficult to induce farmers to take effective measures until they have lost one or two crops. In the first year or two of the infestation, if the farmers undertake to follow instructions they mainly follow them only in part, whereas it requires an observance of all instructions in order to insure the crop. It has been noted repeatedly that it is about the third year after the demonstration work has been commenced before the farmers accept all of the instructions and try to follow them closely.

The second cause noted is the lack of confidence, first, on the part of the farmer. If a man does not believe that he can accomplish a thing his efforts are half-hearted. He loses force and energy. A second result of the loss of confidence is that the bankers and merchants withhold credit; and, since much of the cotton crop is grown upon the credit system, the planter is crippled and prevented from planting as many acres as usual. The withholding of credit compels the farm laborers to seek employment elsewhere, so that there is an immense reduction in the area of land devoted to cotton and in

the labor available to handle the crop. This condition, however, greatly encourages diversification—the production of the food supplies, and especially crops that may bring a cash income.

The actual damage done by the boll weevil is always vastly overestimated; first, because all reduction in the cotton crop frequently is charged to the weevil. Not infrequently other pests are ignored; the unfavorable season is not mentioned; and conditions that prior to the advent of the weevil frequently reduced the cotton crop 50 per cent in certain States are forgotten and the crop of one year simply compared with another and the entire reduction credited to the invasion of the weevil. In some instances this loss of confidence and the general alarm which arises are more disastrous than the pest itself.

On the other hand, it must not be considered that the invasion of the weevil is a trifling matter. To resist it requires hard, persistent work. Slipshod methods of making the crop can not be continued.

(1) The farmer must look to the drainage of his land.

(2) He must improve the preparation of his soil and practice the rotation of crops, feeding the soil by the addition of humus.

(3) He must look to the selection and preservation of seed with greater care.

(4) He must become independent and self-supporting by the production of home supplies.

(5) The system of advances must be relegated to a past era.

(6) Landowners should encourage tenants to follow the better methods. Constant supervision must be exercised, and everyone must work in accordance with a plan.

(7) On most farms the acreage per plow planted to cotton must be reduced greatly. Overplanting, especially under weevil conditions, is courting disaster. This leaves land for pastures and for food and feed crops to make the farm practically self-sustaining.

It is possible, therefore, to “make” a profitable crop of cotton, except under conditions so extraordinary that there would be a crop failure even if there were no weevils. In sections of very heavy precipitation there may be such an extraordinary amount of rainfall at the critical time in making a crop that it will not be possible to get into the field and work the crop, and hence there may be a failure. But it is rare that there is not some time during the season in which a crop can be made.

(Issued February 9, 1917.)