

BOLL WEEVIL CERTAIN TO INVADE THE ENTIRE STATE.

Report of South Carolina Commission Shows Importance of Preparing to Meet Cotton Pest Problem Soon.

The impression prevalent in South Carolina that the boll weevil will not invade the Piedmont section of the State is exploded in the complete report which has been made by the South Carolina Boll Weevil Commission. The report was carefully prepared by the commission at a meeting in Columbia several days ago. Information gained concerning the cotton pest by the commission on the recent trip of inspection through the infested areas of the South is contained in the report.

In the report, it is shown that with the arrival of the weevil South Carolina must undergo an agricultural and economic revolution. The members of the commission making the report are Governor Manning, Alan Johnston, chairman of the Board of Trustees of Clemson College; B. H. Boyd, chief of the dairy division of the United States Department of Agriculture; W. M. Riggs, president of Clemson College; J. N. Harper, director of the Clemson College experiment station; W. W. Long, director of the Clemson College extension department; A. E. Casper, State entomologist; W. D. Hunter, Bureau of Entomology, United States Department of Agriculture; J. A. Evans, assistant in charge of the United States farm demonstration work in the South; A. C. Moore, member of the faculty of the University of South Carolina; Bright Williamson, representing the South Carolina Bankers' Association; E. P. Taylor, secretary of the South Carolina Cotton Seed Crushers' Association; and Joe Sparks, secretary of the South Carolina Press Association.

The commission was organized by Clemson College "to visit the boll weevil region in order to give to the farmers of South Carolina first hand impressions of conditions and to suggest methods of preparedness." The Broadhaven report, which was the preliminary statement, has already been summarized by the commission. A brief statement of the findings by the commission was announced several days ago after the meeting of the commission in Columbia.

Louisiana was selected by the commission as the principal field for investigation because the weevil had been reported to have invaded that State in 1915. The members of the commission, Alabama and Georgia. Most of the time of the commission was spent in the open country and many individuals of all classes and parents were interviewed. The commission sought by industry and the use of every available source of information in the territory visited to arrive at conclusions as once conservative and accurate.

In the outset, it is suggested to those who are interested in a scientific study of the boll weevil that they write the United States Department of Agriculture for bulletin No. 355, entitled: "Study of the Mexican Cotton Boll Weevil in the Mississippi Valley." The report of the commission in part, follows:

The boll weevil's first invasion of the United States was in 1912, in the vicinity of Brownsville, Texas. Since that time it has advanced from year to year in practically concentric curves. There have been some interruptions, due to climatic conditions, but more than fifty miles per year has been made. After twenty years of experience and study of its habits there can be no doubt that it will include the entire State of South Carolina in its progress. As a matter of fact, the weevil has practically crossed the State of Georgia, and even now may be established in the southwestern counties of this State.

There are many people who admit that the boll weevil will reach South Carolina, but maintain that conditions in this State are different from those in which the boll weevil has done its greatest damage. Careful study would indicate that such is not the case. There may be less damage in the Piedmont sections on account of the elevation and the lower winter temperature, but over against these advantages must be put the disadvantage of the heavy soil type and the large amount of hibernating shelter furnished by terraces and woodland.

Except in the upper Piedmont section, the situation in South Carolina will approach very closely to that of Central and Northern Louisiana, where conditions show the most disastrous results.

The two most important climatic factors which affect the boll weevil are minimum winter temperature and maximum summer rainfall. Winter temperatures have the effect of controlling the number of weevil which pass through the winter. Summer rainfall has an important effect upon the reproduction of the weevils. A heavy summer rainfall is most favorable to a large hatch of the weevil

eggs laid in the squares. A hot, dry summer has the opposite effect. In Texas it is the low rainfall during spring and summer, especially in the western part of the State, which enables it to maintain its production of cotton. Such conditions do not apply in South Carolina and Louisiana.

In a map prepared by the weather bureau a line depicting minimum absolute temperatures of zero runs across South Carolina from Marlboro to Aiken county, which is practically through the center of the State. This same line passes across the State of Louisiana about two-thirds the distance from the southern boundary. It is thus evident that throughout the most important cotton zone of South Carolina the winter conditions are similar to those in that portion of Louisiana where the production of cotton has been very greatly reduced. A typical parish in this section of Louisiana showed a falling off of from 21,000 bales to 6,000 bales on account of the coming of the weevil. This reduction was due in part to the destructive effects of the insect itself, and partly to the reduction of acreage occasioned. On the score of winter temperature there is no other conclusion but that South Carolina will suffer practically as greatly as did Northern Louisiana.

The important rainfall so far as the boll weevil is concerned, is from about June 1 to July 31, this being the period of fruiting. Weather bureau figures show an average precipitation for this period in South Carolina of 16.9 inches and Louisiana 14.2 inches. The total annual precipitation in Louisiana is about 53.4 inches, as against 49.5 inches for South Carolina, but the excess in Louisiana occurs largely in winter, when it is of no special importance in the matter of weevil control. The zone throughout the State of South Carolina in which the summer precipitation is 16 inches or more comprises practically 75 per cent of the important cotton producing counties in the State. This same zone of rainfall extends over the lower third of Louisiana, passing through the neighborhood of Baton Rouge and includes parishes in which there has been a reduction of at least 75 per cent of the cotton crop on account of the weevil. Here again we find conditions in South Carolina and Louisiana similar.

There are several factors other than minimum winter temperatures and maximum summer rainfall which are important in the matter of weevil control. One of these is the number of days between the last killing frost in the spring to the first killing frost in the fall. In this respect South Carolina is similar to the northern counties of Louisiana and the southern counties of Arkansas, where the damage has been material. The obvious conclusion from the above facts is that in South Carolina there will be a condition very similar to that in Louisiana and in Mississippi, with an added difficulty, viz: that the cotton crop in South Carolina cannot be made without the use of a considerable amount of commercial fertilizers while in Louisiana little or no fertilizer need be used.

The above explanation is made in order that the people of South Carolina may not feel that there are any special conditions of soil or climate that can be expected to make the boll weevil problem in this State less serious than it has been in other States. As a matter of fact, when the fertilizer situation is considered Georgia and South Carolina are liable to suffer greater loss than any other States thus far invaded. In South Carolina an additional danger lies in the attraction which the cotton mills hold out to the family of the small farmer.

Through heat and sunshine, ants, insect parasites, birds and the crushing effects of the injured square on the eggs and larvae, nature keeps up its warfare against the boll weevil. The only artificial means of controlling the boll weevil are found in cultural methods. The weevils cannot be exterminated. The only hope lies in reducing their number to the point where injury to the cotton crop will be a minimum.

Technical investigations are still under way, but no promise can be made of methods of control more satisfactory than the cultural methods now advocated by the United States Department of Agriculture. All attempts to kill the weevil by poisons have thus far proven impracticable or unprofitable on a commercial scale.

Of the disastrous effect of the boll weevil on cotton production there can be no question. Many have cited the fact that Texas now produces more cotton than ever before to prove that the boll weevil is not really the menace that some believe it to be. However, the explanation in the case of Texas is found in the dry, hot climate, the large area of prairie land, affording little winter shelter to the weevil; the severe winters in the western and northwestern portions of the State and the gradually increasing acreage, most of which has been in that part of the State least favorable to the multiplication of the boll weevil. In 1900 Texas was plant-

ing 7,041,000 acres and producing 3,438,386 bales of cotton. In 1914 the acreage had increased to 11,921,000 acres and the crop to 4,592,112 bales. An analysis of the Texas situation by counties shows that the boll weevil seriously reduced the crop in those counties which were in cotton before the weevil appeared. In Louisiana where the acreage remained practically the same during the same fourteen years' period, the cotton production fell from a total of 705,769 bales to 449,458 bales. In East Feliciana parish, section which in elevation and summer rainfall corresponds to Central South Carolina, the production in 1902 was 29,549 bales, in 1915 2,836 bales. In the adjoining parish of East Baton Rouge the production in 1908 was 27,864 bales and in 1915 was 1,844 bales. In Madison parish the production in 1902 was 21,844 bales in 1915 3,892.

These figures prove more eloquently than can any argument the net results of the boll weevil invasion on cotton production. However, there is a bright side of this Louisiana picture, for while the cotton crop of the State was greatly reduced, the total value of all crops produced in the State greatly increased. This is shown by the following figures which are taken from Dr. Hunter's compilations. For the four years prior to the invasion by the boll weevil (1899 to 1902) the average value of all crops was \$68,394,150 per year. For the first five years of infestation (1903 to 1907, inclusive), the average value was \$88,776,272. For the next five years (1908 to 1912, inclusive), during which the effects of the weevil were most serious, the average was \$78,111,000. During 1913 and 1914 the average was \$84,884,472. These figures teach the important lesson that while the boll weevil may reduce the cotton yield of a State, it does not necessarily reduce its ability to produce equal and even greater wealth.

No industries in the State are more seriously threatened by the coming of the weevil than are the cotton oil mills and gineries. It will be interesting to note the effect of the boll weevil on these industries in several States where the boll weevil has been present for a number of years.

In 1906 there were 2,076 operating gineries in Louisiana and 149 idle. In 1915 there were only 1,086 operating gineries and 351 idle. During this period, therefore, 738 gineries entirely disappeared. Putting the average value of a ginery at \$3,500, the loss in Louisiana alone to the State of Louisiana was \$1,360,000. In 1908 there were twenty-five oil mills in operation. This year there are only fourteen, showing eleven mills either idle or abandoned. The average value of an oil mill is about \$30,000, making a total loss on gineries and oil mills \$2,299,000.

In Mississippi in 1906 there were 3,780 active gineries and 372 idle. In 1915 there were only 2,204 active gineries and 534 idle. During this same period, therefore, in Mississippi, 1,414 gineries disappeared, entailing a loss to the State of \$3,535,000. In the same State there were eighty-four oil mills before the advent of the boll weevil, and this year there are only fifty-four operating, showing thirty oil mills abandoned or destroyed. The total loss on gineries and oil mills in Mississippi was approximately \$4,435,000.

In South Carolina there are sixty oil mills, owned by local capital. These mills crush one-fourth of the seed produced in the State. The other three-fourths is bought and crushed by corporations such as the Cotton Oil Company, the Buckeye Cotton Oil Company and the Union Seed and Fertilizer Company. These corporations own large mills and can better tide over a bad situation. The small mills owned by South Carolinians do not occupy such a position.

So far as the oil mills are concerned, therefore, the matter resolves itself into the proposition of raw material. The mills are worthless unless they have something to work, and if the boll weevil materially reduces the raw material available some other seed that it is possible to work in oil mills must be provided. Otherwise, there will result the same series of failures and abandonments that have taken place in the States cited. Peanuts and especially soy beans offer the best solution. The soy bean can be grown successfully in all parts of South Carolina, especially in the coastal plain section. Peanuts can be grown on many light soils in this State. Therefore, every effort should be made to educate the farmer to begin now to grow in a small way peanuts and particularly soy beans. Such a beginning could be greatly stimulated if the cotton oil mills would offer prizes for the best acres of soy beans. These premiums should be large enough to create considerable interest in the State. A liberal buying policy should also characterize the beginning of this really important branch of agricultural production.

So far as the gineries are concerned, there must necessarily result considerable loss, inasmuch as substitute raw materials cannot be supplied as in the case of oil mills,

While it will be many years before South Carolina makes sufficient corn to supply its own needs there are many individual farmers who make a surplus of corn. Machinery for husking, shelling and sacking corn, oats and other grains, could be added to the equipment of gineries. In this way at least a part of the machinery could be utilized to some advantage.

In States invaded by the boll weevil the banks and advance merchants were among the first to realize the economic danger and among the first to suffer. The diminished value of the cotton crop as a collateral and the serious depreciation in land values, the basis of a large amount of credit, caused considerable financial demoralization and in some cases the added disaster of credit withdrawal ensued.

In the main, however, bankers have shown themselves thoroughly posted and able both to protect and assist their customers. By limiting credit, insisting on diversification and recognizing farm products other than cotton as satisfactory collateral, the situation during the first few years of boll weevil infestation has been considerably relieved.

In some cases banks suffered severe losses, but bank failures were remarkably few. Banks and other creditors who refrained from a policy of foreclosure and continued to furnish restricted credit to their customers fared best. Some who adopted the policy of foreclosure found themselves with a large amount of depreciated property, difficult to dispose of, on their hands.

During the second year of boll weevil infestation bank deposits were but slightly affected, but for the following two or three years deposits were greatly reduced. It usually took banks from five to six years after the arrival of the weevil to gain what had been lost in the way of deposits.

The first effect of the boll weevil is to increase the bankers' responsibility to the public. The entire withdrawal of credit would be much more disastrous than the effect of the weevil itself. At the same time, extravagant use of credit would be bad business for the banks and a mistaken kindness to the farmers.

The general experience of advance merchants was that they continued making advances on the cotton crop one year too long, with disastrous effects. The general testimony was that the second year of boll weevil infestation was a very lean year, with practically no advance business and only a few cash trades. In the course of two or three years the volume of business increased, and although smaller than when conducted on an advance basis, was more satisfactory, both as to collections and profits. The condition of the small farmers in those States where the advance system has practically disappeared is much better than it was before. The coming of the boll weevil will put an end to the present advance system of the cotton crop now so generously practiced in South Carolina.

It would be well if every merchant and banker would require as a fundamental to extending credit that the farmer raise first of all his living on the farm.

In Louisiana and Mississippi a large number of the young and able-bodied negroes left the State to seek employment elsewhere. This emigration was chiefly due to inability to get credit, and, therefore, inability to make a living under the tenant system of farming. There seemed to be a general lack of appreciation on the part of the white people of the importance of retaining their negro labor. With no capital and no credit on which to make another crop, nothing remained for many negro farmers but to move away and seek employment in other agricultural sections and in other lines of business.

Many went to Oklahoma and Western Texas, and carloads of them were moved north to supply the deficit in Italian laborers due to the European war. Throughout Louisiana and Mississippi labor agents, sometimes cleverly disguised, planned these movements of the negroes and furnished the necessary money to transport them.

The white people of the State should make the situation clear to the negroes, and by helpfulness and consideration seek to retain them against the enticements which will undoubtedly be offered in this State as it has been in other States.

In every section where the boll weevil has become active the value of farm lands have been greatly depressed. In many of the richest cotton sections of Louisiana the land has been sold at a low price for raising live stock. Usually the lowest level in land values is reached during the second and third years of infestation, after which there is a gradual recovery. The greatest danger is that farmers will become discouraged when unable to raise cotton successfully and dispose of their holdings. This is especially to be feared in those sections of the State where cotton mills offer remunerative work for all grown members of the family. Often after lands have changed hands a new system of agriculture, with diversification as its keynote, has restored their value. It is a sad fact that in the boll weevil section much of the land is no longer in possession of the original owners.

Our people should realize that land is the unlimited basis of value, and properly to make it valuable, regardless of the type of agriculture practiced. It is too often the case that in the transition from cotton planting to a diversified system a new owner appears to reap the benefit of the change.

Under boll weevil conditions cotton can not be produced profitably on the old basis of supplying the tenant with provisions and equipment. The serious objection to the old credit basis is that it has encouraged the tenant system and has taken away the intelligent supervisor of the landlord. As a result the soil has been deeply depleted and much of it washed away.

The most successful farmers under boll weevil conditions will raise all provisions; keep out of debt, and cultivate cotton by improved methods on a restricted area of the best lands. That the one crop system has failed in nearly every section of our country is evident by the poverty of a large per cent of our agricultural people after fifty years under such a system. Our farmers should be made to understand that intelligent diversification and proper rotation of crops is sound economy and the best remedy for boll weevil conditions. Under such conditions, it is absolutely necessary that the cotton planter establish a system of rotation that will in a large measure keep up the supply of nitrogen. Cotton should always follow a summer legume, such as cowpeas, soy beans, or velvet beans. The effect of these legumes will be to force the cotton to early fruiting, and this is essential in fighting the boll weevil.

The following rotation is recommended:

- First year. Cotton.
- Second year. Corn, with soy beans, cowpeas, or velvet beans.
- Third year. Grain; the grain to be cut off and the land to be planted in peas; the peas to be cut off for hay or turned under in the fall preparatory to a second cotton crop.

In addition to the crops mentioned in this relation, many other crops should be grown. Where the soil types and climatic conditions are favorable and where suitable markets are accessible, tobacco, soy beans, beans, sweet potatoes, Irish potatoes, tomatoes, watermelons, cantaloupes, and various other truck crops can be profitably raised. There are many sections of our State where fruit growing can be profitably engaged in.

To properly utilize all of the products produced on the farm by the proper system of diversification, it is necessary to raise live stock. The keeping of live stock, especially dairy cattle, can be made a profitable occupation for the small farmer, especially those who do all of their own work. Every farmer should raise his own mules. The raising of beef cattle is also profitable if land is cheap and suitable pasturage can be had. The same is true of sheep. In the northern section of our State where much of the land is too steep to cultivate, these side lines of farming should be found profitable.

For the small farmer no form of live stock is more profitable than hogs. Pork can be produced cheaper in the South than in the North, especially where proper grazing crops are grown.

More attention should be paid by our farmers to poultry, in the way of having better breeds and giving them more intelligent care.

The problem of cotton production under boll weevil conditions resolves itself into hastening the growth of plants so as to insure a large crop of bolls by the middle of July and certainly by the first of August. Infestation will likely be too great for any large number of squares formed after that time to survive.

It has been demonstrated conclusively that cotton can be grown with fair success under boll weevil conditions, provided improved methods are followed and favorable weather conditions prevail. It will be well for the farmers of South Carolina to practice in advance of the boll weevil's coming those principles of scientific cultivation which would represent a good investment even were no boll weevils present. The following simple directions will accomplish the best results when the boll weevil reaches South Carolina, and with the exception of those processes particularly designed to destroy the weevil, and to prevent its multiplication, should be practiced now as well as later.

Well drained sand soils and sandy loams are warmer and, therefore, preferable to clay and other heavy soil types in getting rapid growth in the early spring. The farmer should bear in mind that he is fighting against time and that no means should be neglected to give the plant a good start and keep it growing.

The land should be ploughed early in the fall or winter and the seed beds should be made early in the spring so that they will have ample time to set-

tle before planting. Cotton comes up quicker and grows off better from a firm well bed than from a loose one. Just previous to planting a weeder or harrow should be run over the crust. Quicker germination and rapid growth will be the result from the above method.

Early fruiting varieties only should be used. Weevils seldom puncture half grown bolls if there are squares available. No one variety is suitable to all soil types of the State, and each cotton planter having a good variety well suited to his soil, and giving good yields, should begin now to make selections with a view of obtaining an early maturing type. No result of plant breeding is so easy to accomplish as that of breeding cotton for early maturity.

The following are some of the early maturing varieties that have been grown successfully under boll weevil conditions: King, Simpkins, Trice, Express, Cook, Broadwell, Perry, Petway, Wonnemaker's Cleveland Big Boll etc.

The farmers of each community should decide on some one variety or type of cotton well suited to their conditions, and agree to grow this variety, so as to prevent mixing of the seed at the gins.

On wilt infested lands it will be necessary to use only those varieties immune from wilt. Early maturing types of these varieties can be developed by selection on wilt infested lands.

Location of fields: As far as practicable cotton fields should be located in the open, away from woods or other good harboring places for weevils. Cotton should not be planted two years in succession in the same field.

Planting: Cotton should be planted as early as possible after all danger of killing frost is over and the ground warm enough to insure quick germination and rapid growth. It is a distinct advantage when practicable to delint the seed, because such seed will germinate quicker under the same conditions than will undelinted seed.

Spacing: The width of row and distance between plants in the row should be regulated according to the fertility of the land. Whatever spacing now produces the best crop should usually be retained. If any change at all is made, a slight reduction of the distance between plants in the rows so as to give a greater number of plants per acre may prove advisable.

Stable manure is the best of fertilizers, but only a small amount of it is produced on the average farm in the State. A practice should be made of turning under green crops such as cowpeas, rye, etc. Under boll weevil conditions it is very necessary to maintain an ample supply of organic matter in the soil, both for its fertilizing and warming effects. A liberal application of commercial fertilizers is also necessary and this fertilizer should contain a large per cent of acid phosphate, which ingredient hastens the maturing of cotton. A liberal amount of ammonia to quicken growth should also be used. The main fertilization should be applied under the cotton, and then as soon as the young plants are up, a small amount of nitrate of soda at the rate of twenty-five to fifty pounds per acre should be applied. Nitrate of soda is highly soluble for and will cause the young plants to grow off rapidly. Another application of nitrate of soda at the rate of from seventy-five to 100 pounds per acre should be applied when the first squares appear.

From the very start cotton should be cultivated intensively so as to destroy weeds and grass and to maintain a dust mulch to prevent the loss of moisture. This dust mulch also aids materially in the destruction of the young weevils inside of the squares. These squares, when they fall on this dust mulch, especially if there is ample sunshine, soon dry out and the weevil contents die with them. Every precaution should be taken to avoid loss of the first fruit by shedding. To that end cultivation should be shallow and frequent and great care should be observed not to tear the roots of the plant. It can not be emphasized too often that the first fruit means the crop under boll weevil conditions. It is a practical certainty that the weevil will take all of the late crop.

It will be found very helpful to pick up the first infested squares which fall and even to pick off the weevil from the young cotton plants before squares appear. However, this may not always be practicable on large areas, on account of scarcity of labor. Members of the family or negro children can frequently do this work. All squares and weevil so gathered should be destroyed. If rainy weather in June and July makes it impossible to keep up intensive cultivation, an extra effort should be made to keep down weevil infestation by carefully picking the punctured squares every week during this period until cultivation can be resumed.

Remembering that the weevils which survive the winter are the parents of the destructive army of the next year, every effort should be