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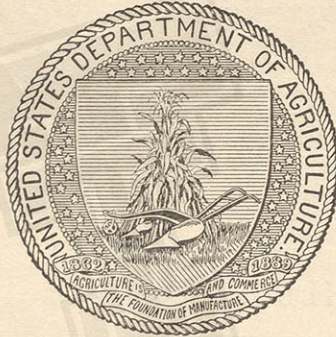
FARMERS' BULLETIN 422.

DEMONSTRATION WORK ON SOUTHERN FARMS.

BY

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., August 9, 1910.

SIR: I have the honor to transmit herewith a manuscript entitled "Demonstration Work on Southern Farms," by Dr. S. A. Knapp, Special Agent in Charge of Farmers' Cooperative Demonstration Work, and recommend that it be published as a Farmers' Bulletin to supersede Farmers' Bulletin 319.

Respectfully,

HON. JAMES WILSON,
Secretary of Agriculture.

G. H. POWELL,
Acting Chief of Bureau.

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DEMONSTRATION WORK ON SOUTHERN FARMS.

INTRODUCTION.

The Farmers' Cooperative Demonstration Work conducted by the United States Department of Agriculture through the Bureau of Plant Industry was inaugurated under authority of Congress in January, 1904, primarily because of the depredations of the Mexican cotton boll weevil in the State of Texas. By the rapid spread of this pest east and north it had then become evident that it would in time invade all of the cotton-producing States. This occasioned a general alarm among the cotton planters and in the industrial centers of the entire country. For a number of years prior to 1904 the Mexican boll weevil had been steadily encroaching upon the cotton-producing lands of Texas, until it had spread from the Rio Grande to a short distance beyond the eastern boundary of the State and threatened the entire cotton industry of the South. In sections where cotton was the sole cash crop the invasion of the weevil and the consequent loss of the cotton crop brought disaster to every interest and so completely demoralized financial conditions as to produce in some sections a panic.

The cotton crop had been generally produced upon a credit system by securing advances from merchants and bankers. Upon the advent of the boll weevil, confidence in securing a cotton crop was impaired and in some districts almost totally destroyed. The usual advances were either withheld or limited; labor became discontented and sought other sections or other States; and tenant farmers, unable to obtain advances, removed to noninfested districts, a marked decline in property values resulting.

These circumstances created a demand for immediate relief which appealed to the entire country, as the loss of the cotton crop would be a national calamity. In response to this appeal Congress made an emergency appropriation in January, 1904, which has been continued each year, thus affording opportunity for the growth and enlargement of the work.

THE TWO BRANCHES OF THE DEMONSTRATION WORK.

As at present organized and developed, the Farmers' Cooperative Demonstration Work may be said to consist of two divisions: (1) The demonstration of improved methods of agriculture in the weevil-infested districts, which is the natural outgrowth of the original plan, and (2) the extension of the same principles to other Southern States beyond the range of weevil infestation.

The territory covered by the first division of the work includes Texas, Arkansas, Oklahoma, Louisiana, Mississippi, Alabama, and Tennessee; that covered by the second division of the work includes Florida, Georgia, the two Carolinas, and Virginia. The expenses of this division of the work are defrayed by the General Education Board, which has appropriated the sum of \$113,000 for demonstration work for the fiscal year beginning October 1, 1910. The board has shown deep interest, hearty cooperation, and a very broad philanthropy in this work of reaching the rural masses and bettering farm conditions.

PLAN OF ORGANIZATION.

The Farmers' Cooperative Demonstration Work is conducted under the Bureau of Plant Industry by a special agent in charge, who reports directly to the Chief of the Bureau. A corps of field agents, classified according to territory in charge, as state, district, and county agents, is employed. The county agents are appointed mainly on the advice of local committees of prominent business men and farmers conversant with the territory to be worked. Each agent has in charge the practical work in one or more counties, strictly under such general directions as may be issued from the central office at Washington, D. C. The field agents have been selected with special reference to a thorough knowledge of improved agriculture and practical experience in farming in the sections to which appointed. District agents are expected not only to have a knowledge of scientific agriculture, but to be practical farmers and to have had considerable experience in the demonstration work. State agents are strong and capable men, who have shown their ability to successfully carry out the instructions of the central office over a large territory, and they are especially qualified for the work by the possession of the tact necessary to influence men.

The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to our instructions. This is visited by an agent as often as once a month, if possible, to see that these instructions are carried out and to give any further advice necessary.

A "cooperator" is a farmer who agrees to work a part or all of his crop according to our instructions, but a department agent only visits him in exceptional cases.

There are now in the service of this division of the work about four hundred and thirty agents, covering considerable of the territory in the States mentioned. For the fiscal year 1910-11 there will be in all, exclusive of boys' work, over sixty thousand demonstrators and cooperators.

SCOPE OF THE DEMONSTRATIONS.

The Farmers' Cooperative Demonstration Work is a system by which the simple and well-established principles of successful farming are directly taught to the men on the farms. The men who toil on the farms to produce the food that nourishes all the people, and who in a large measure provide the resources that support our civilization, are as justly entitled to a knowledge of the best that science and general experience have evolved for the increase of production and for the betterment of agricultural conditions as the youth of our country are entitled to an education that will fit them for a broader citizenship.

One of the most serious problems in the reform of agricultural methods has been how to influence the farmer to adopt improved practices. It has been found that the mere dissemination of printed information sometimes does not accomplish this result, and therefore the method of neighborhood farm demonstrations in cooperation with progressive farmers has been evolved. The effect of a field demonstration is immediate and positive, and reaches all classes.

By actual count, it is determined that the number of farmers who annually visit each demonstration farm ranges from thirty to a hundred. If the average is placed as low as thirty the total number visiting demonstration farms in one year would be something like one million.

The teaching by object lessons is more effective where it is simple, direct, and limited to a few common field crops, such as cotton, corn, cowpeas, and oats in the South, so that the comparisons may be evident and accepted at a glance. If general success can be secured with these standard crops, further diversification follows as a natural result.

Briefly stated, the salient features of the cooperative farm demonstrations are as follows:

- (1) Better drainage of the soil.
- (2) A deeper and more thoroughly pulverized seed bed; deep fall breaking (plowing) with implements that will not bring the subsoil to the surface.

(3) The use of seed of the best variety, intelligently selected and carefully stored.

(4) In cultivated crops, giving the rows and the plants in the rows a space suited to the plant, the soil, and the climate.

(5) Intensive tillage during the growing period of the crops.

(6) The importance of a high content of humus in the soil. The use of legumes, barnyard manure, farm refuse, and commercial fertilizers.

(7) The value of crop rotation and a winter cover crop on southern farms.

(8) The accomplishing of more work in a day on the farm by using more horsepower and better implements.

(9) The importance of increasing the farm stock to the extent of utilizing all the waste products and idle lands of the farm.

(10) The production of all food required for the men and animals on the farm.

(11) The keeping of an account with each farm product, in order to know from which the gain or loss arises.

THE INSTRUCTIONS.

Our instructions have the following advantages: (1) What the Department of Agriculture at Washington knows from its vast stores of information about the special crop under consideration; (2) what the state agricultural experiment stations in the South have demonstrated to be the most advantageous methods; (3) what the best farmers in the South have tested and proved to be the most successful practices upon the farms; and (4) the knowledge obtained by the traveling agents of this demonstration work, who visit and have personal knowledge of the localities in the State in which they are stationed. Even then the instructions given are along the lines of correct principles, leaving many details to the good judgment of the farmer.

In this cooperative work great stress is laid upon a more thorough preparation of the soil in the autumn, because in our southern climate the frosts do not penetrate the soils sufficiently to open them and admit air; we must therefore do by plowing in the fall and by some winter cultivation what nature does in the colder North.

In the richest soils there is but little food ready prepared for the plant, and nature's plan is that this food shall be prepared more or less daily by the action of the air, the moisture in the soils, and the sun. These three agents make active the forces that prepare the food, so the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced before the winter the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the best variety for the purpose, carefully selected early in the fall and stored in a dry place. The reasons for very frequent cultivation are the admission of air, the conservation of moisture in the soil, and the prevention of a surface crust.

Young plants require excellent cultivation, just as young animals require the best food and care.

The judicious use of commercial fertilizers is one of the most important matters in modern agriculture, for this furnishes plant food directly and indirectly to the young plants. For soil improvement we must largely depend upon barnyard manure, the compost heap, and leguminous plants, such as cowpeas.

The importance of doing more as well as better work in a day has not been sufficiently impressed upon the southern farmer. This requires the use of stronger teams and better tools. Working 3 acres in a day where one is worked now and working each acre three times as well is a problem in profit easily understood after demonstration.

HOW FARMERS ARE INFLUENCED TO ADOPT BETTER METHODS.

In the South nearly all the merchants, bankers, and lawyers in the towns and smaller cities own farms and are intensely interested in agriculture. They form an effective center of influence, easily convinced of the value of the cooperative demonstration plan by reason of their high intelligence. Meetings are called and the work inaugurated. No further argument is necessary after the demonstrations have been made. Facts do the talking. The teachers in the public schools are generally alert and render most valuable assistance. The agricultural colleges and agricultural experiment stations give hearty cooperation. Thus, general interest is aroused in these demonstrations, which leads to careful observation and study on the part of the farmers and of the community. Public meetings are held for the discussion of these plans. In the cotton-producing States the first instructions include cotton as the main cash crop, corn as the standard food for work animals and the basis for more stock on the farm, cowpeas for food and for the renovation of the soil, the growing of oats, wheat, rye, or clover and vetch as a winter cover crop, and the meadow and the pasture as the most economical source of food for farm stock. When the farmer has mastered these crops he is ready for diversification in any desired direction.

In districts where cotton is not the standard cash crop instruction is given in whatever replaces cotton as a money-earning crop. These simple lessons at the start are gradually made progressive until they

cover all information necessary to success in the agriculture of the district.

As a means of reaching thousands of farmers with whom our agents do not come in personal contact systematic use is made of the newspapers. Every bulletin or letter of instruction sent to cooperators is also furnished to about two thousand county newspapers, and by most of them published in full. The hearty cooperation of the press has been of great value to the demonstration work.

THE CULTURAL SYSTEM FOR PRODUCING COTTON UNDER BOLL-WEEVIL CONDITIONS.

PRINCIPLES UPON WHICH SUCCESS DEPENDS.

As it is evident that the cotton boll weevil will soon spread over the entire cotton-producing territory of the United States, it is a matter of general interest to know how cotton is at present produced with the weevil present.

Success in making a cotton crop under boll-weevil conditions is based upon three principles. It was found (1) that the numbers of the weevils could be limited so that they would not become totally destructive to the crop until the first and middle crops are out of danger; (2) that the cotton plant can be so bred and selected as to throw nearly its whole life forces into the lower and middle crops; and (3) that the plant can be so hastened to maturity by the application of cultural methods that most of the bolls will be developed to the safety point before the weevils are too numerous.

Guided by the principles just mentioned, the Bureau of Plant Industry has worked out a cooperative plan of producing cotton under boll-weevil conditions, which is known through the South as the "cotton-cultural system." This plan is based upon our knowledge of the cotton plant and upon the life habits of the boll weevil as ascertained by the Bureau of Entomology.^a Its chief features may be briefly mentioned, as follows:

The destruction of the weevils in the fall (1) by burning the cotton stalks early in the fall while the weevils are still upon them and (2) by burning all rubbish in and about the field which might serve for hibernating quarters.

It is so difficult to secure a general adoption by the farmers of the plan of early burning of the cotton stalks that we have allowed the stalks to be turned under, provided they are completely turned under by deep fall plowing and the region is one which has considerable winter precipitation. This will insure the destruction of hibernating weevils.

^aSee Bulletin 51, Bureau of Entomology, U. S. Dept. of Agriculture.

The following directions then should be observed:

(1) Where there is no cover crop do some shallow winter cultivation of the soil.

(2) Plant as early as the season will allow with safety to the crop.

(3) Plant early-maturing varieties of cotton.

(4) Use some fertilizers.

(5) Leave more space between the rows, and on ordinary uplands have a greater distance between plants in the row than is usually allowed. On rich or highly fertilized lands it is better to crowd the plants slightly in the rows to avoid the excessive growth of the stalks.

(6) Use the section harrow before and after planting and on the young cotton.

(7) Give intensive shallow cultivation.

(8) Agitate the stalks by means of brush attached to the cultivator.

(9) Pick up and burn the squares that fall, where practicable.

(10) Plant selected seed of the best variety.

(11) Rotate the crops and use legumes.

It will be noted that the system as outlined has a twofold object:

(1) To reduce the number of weevils and (2) to aid early maturity in order to obtain a crop in advance of the weevil.

A few remarks concerning the main features of this plan may prove of value.

DESTRUCTION OF THE WEEVILS.

One of the greatest dangers to the cotton crop is the wintering of large numbers of weevils. By a failure to destroy early in the fall the immature cotton bolls and the rubbish in the fields, enough weevils may be wintered over to jeopardize the crops the ensuing year. If the immature bolls and the field rubbish are destroyed the stalks may be safely plowed under. The rubbish in the field which may serve for hibernating quarters includes the borders and fence corners. Two methods of destroying the overwintered weevils while they are feeding on the tender terminal buds are advocated: (1) They may be hand picked and burned or (2) some may be destroyed by the judicious use of poisons.

FALL AND WINTER CULTIVATION OF THE SOIL.

Deep breaking of the soil in the fall assists in the destruction of the weevils and in the preparation of the field for successful cropping the following season. In order to air the soil and destroy grass, shallow winter cultivation of the soil should be practiced, i. e., working the land with a section harrow or a disk once every twenty or thirty days during the winter, as the weather may permit. The soil should be in excellent condition at the time of planting.

EARLY PLANTING AND THE USE OF EARLY-MATURING VARIETIES.

The object of early planting is to hasten the maturity of the crop. The Bureau of Entomology has shown that the weevils do not multiply until the squares begin to form and do not generally become numerous enough to destroy the entire crop before the last of July. In addition to this, early planting has been found generally helpful against cotton pests, such as the bollworm and the leafworm. Furthermore, the winter rains usually leave the soil with plenty of moisture, while in the spring there is liable to be a drought which may retard germination in late planting. By early planting it is not intended to convey the impression that the planting should be unusually early. It is always better to delay till all danger of frost is past and the ground is warm enough for the plants to grow rapidly.

Varieties of cotton differ in time of maturity, and the same variety may differ owing to soil, moisture, fertilization, cultivation, etc. The planting of early-maturing varieties of cotton is not only important as an aid in securing a crop, but also as a means of destroying the weevil. The early-maturing cotton can be gathered and the immature bolls destroyed before it is time for the weevils to go into winter quarters. If all growers would plant early-maturing cotton and follow the plan here outlined it would result in greatly lessening the damage of the weevil.

In advising the planting of early-maturing cotton it is not the intention to advocate the exclusive use of small-boll cotton. These varieties may be better adapted to the northern limits of the cotton belt, but in nine-tenths of the cotton-producing territory there are large-boll varieties which can be just as successfully grown under boll-weevil conditions as the small-boll cottons. They must be varieties that are generally vigorous and that put out short-jointed fruit limbs close to the ground.

USE OF FERTILIZERS.

The use of fertilizers, especially acid phosphate and potash, to hasten maturity and increase fruitage, as well as the use of cotton-seed meal when necessary to promote vigor and growth, is recommended. Soils and methods of application are fully explained in the course of the work, and it has been demonstrated that a small quantity of fertilizer properly applied accomplishes marvelous results.

SPACING BETWEEN PLANTS AND ROWS.

Planting in rows wider than usual and allowing more space in the row on light lands are advised under boll-weevil conditions. Special attention must be directed to have the rows the proper distance apart

and to thin the plants in the rows. There must be width enough for the sun's rays to reach the earth between the rows and thus aid in destroying the larvæ of the weevil in the fallen squares.

Generally speaking, more space to the plant makes a better stalk with more limbs, more bloom, and a higher grade of cotton. The spacing between the rows and in the rows must depend on the soil and the variety of cotton.

USE OF THE SECTION HARROW.

The use of the section harrow as soon as the crop comes up is of sufficient importance to warrant special mention. After early planting the germination is frequently slow and the earth may become crusted. The harrow may be used to break the crust before the plants are up and should be used soon afterwards to keep the soil loose so that the plants will take on rapid growth at once. The crop is surprisingly advanced by the judicious use of the harrow. The field should be harrowed thoroughly just before planting and immediately after planting, and again as soon as the cotton is up. The harrow should be used diagonally across the rows.

INTENSIVE CULTIVATION.

Plowing or cultivating deep the first time and shallow at all subsequent times is an important feature of good cotton production. It destroys weeds, increases the plant food, and conserves moisture, consequently hastening maturity. Under boll-weevil conditions the cotton crop should be cultivated every week. Some of our most successful cooperators have cultivated fifteen times and continued till picking commenced.

AGITATION OF STALKS.

Violent agitation of the cotton stalks when cultivating or plowing, by means of brush attached to the handles of the cultivator or plow, is recommended. The great majority of squares fall off naturally in a very few days after they become infested. Abundant testimony has come from our cooperators to show that as long as weekly cultivation of the crop with violent agitation of the stalks is continued the damage done by the boll weevil is greatly reduced.

One of the serious disadvantages in sections of considerable rainfall is a failure to have the lands sufficiently drained, because they retain moisture to an extent that prevents rapid cultivation. Hence under boll-weevil conditions it is absolutely necessary to plant cotton only on well-drained land. Of course, it may succeed on other lands occasionally, but it is an unsafe venture. This refers particularly to much of the stiff-soil back lands in the alluvial sections of Louisiana and Mississippi.

PICKING UP FALLEN SQUARES.

An important aid toward the destruction of the weevils is picking up the squares that fall. If two or three generations can thus be destroyed, it will result in retarding the increase of the weevil and in adding to the cotton crop. This reduces the rapidity with which the weevils multiply and is a great aid in saving the crop. In fact, a crop can almost always be made successfully if intensive cultivation can be carried out and the squares are picked up.

BARRING OFF OR TOPPING.

Under boll-weevil conditions the main cotton crop must be made upon the lower and middle limbs. There is no use of a tall plant. The growth of the plant should therefore be controlled by selecting the seed from plants with a tendency to somewhat low growth. Occasionally barring off or topping may be of some service if done when the plants are not too large. As soon as the plant indicates too rapid growth, bar off on each side, thus slightly root pruning and retarding upward growth. The tendency will then be to throw more vigor into the lower limbs and to put on more fruit. This method is especially valuable on rich bottom lands, where the stalks frequently grow 6 to 7 feet high. It should be noted that with the boll weevil no top crop is made; hence, more bottom crop must be secured, requiring a low, limby, vigorous plant.

SELECTING AND STORING SEED.

Scarcely any item in the cultural system is of more importance than the selection of the seed as an aid to early maturity in the following crop. The largest, best, and earliest bolls from the most vigorous short-jointed plants should be selected for seed in advance of the general picking and be stored in a dry place. The planting of early-maturing varieties and the selection of seed from the earliest and best bolls on the most vigorous and best developed stalks are fundamental principles in growing cotton irrespective of the boll weevil and can not be too closely followed.

ROTATION OF CROPS AND USE OF LEGUMES.

The Bureau of Plant Industry in all its instructions seeks to build up soil energy and to improve the mechanical condition of the soil as well. An important factor to this end is rotation of crops and the increase of humus by plowing under green plants, especially cowpeas. This builds up the soil and renders it more porous and responsive.

Some of the serious difficulties in cotton production arise from the growing of consecutive crops of cotton on the same land. This reduces fertility and hence operates against early maturity. With the best of efforts to clear fields of the weevil in the fall by burning the stalks and deep plowing, some weevils will survive, and a few soon infest the field. By planting one half of the land to corn and cowpeas and the other half to cotton, as much cotton can be produced as formerly and the land will be gradually restored to its original fertility. The corn and cowpeas will also add materially to the income of the farm, but the special reason urged for such rotation under boll-weevil infestation is that the crop of corn and peas leaves the field free from the weevil, as it feeds only upon cotton. It is evident that with the boll weevil it requires more labor to cultivate an acre of cotton; consequently, only as many acres should be planted as can be given the best attention, so as to produce a maximum crop, thus leaving more land for cereals and for meadows and pastures.

An objection sometimes urged against the rotation of crops in cotton production is that the land while in corn becomes filled with grasses and weeds, and hence it is more expensive to eliminate these in cotton production under rotation of crops than where cotton follows cotton; but if care be exercised to keep the corn free from weeds and to plant a cover crop there will be no serious difficulty arising from this cause.

DEMONSTRATION WORK ON VARIOUS FARM CROPS.

The Farmers' Cooperative Demonstration Work, as before stated, aims to cover the entire scope of the management of the standard crops in the sections where the work is conducted. In addition to the cotton-culture system, which is the main feature of the work in many localities, it may be well to give brief mention of some of the cooperative work on other crops now under way, such as corn culture, the use of soil-renovating crops, and the production of good farm seeds.

CORN CULTURE.

Corn is the main grain dependence for farm stock and can be successfully raised in most portions of the South. Any considerable increase in its annual production would have a marked effect upon the value of the unused lands for grazing purposes and would perceptibly increase the income of the farms. The importance of corn for food and for rotation with other crops gives it a rank next to cotton as a standard farm crop. Notwithstanding this, its cultivation has been singularly neglected until the average yield per acre has fallen below the profit line in many States. Even at the high value per bushel

allowed, the corn crop in many of the Southern States does not pay a living wage or a fair rent value for the land.

There is abundant proof that large and profitable crops of corn can be produced in the South by the use of the best seed and improved methods. The planting of low-grade seed in a shallow and impoverished seed bed is responsible in the main for deficient yields and quality. However, to secure the best results other reforms must be made, such as better drainage, an adjustment of distances between the rows and the stalks in the rows to meet the requirements of soil and climate, intensive cultivation of the crop, the use of cowpeas in the corn, and the following of the corn with a winter cover crop.

The Farmers' Cooperative Demonstration Work includes instruction along all of these lines, and the results have been most encourag-



FIG. 1.—Cornfield on a demonstration farm, showing a school for farmers engaged in selecting corn.

ing. Our investigations show that not even 1 per cent of the lands in the South planted to corn are plowed deeply enough at breaking, that they have not sufficient humus, and that they are not given the proper tillage to make the best crop. Seed is so generally defective that only about one-third of so-called good seed is suitable for planting if maximum yields are expected. Along these practical lines we are conducting cooperative demonstrations with the object of increasing the corn crop in the South Atlantic and Gulf States at least threefold per acre

without additional cost. A system of seed selection for improving the quality and increasing the yield and methods of storage for the preservation of vitality are outlined, detailed instructions being given on application.

Selection of Seed Corn.

The object of the average farmer in planting corn is to secure the largest crop of good corn possible under the conditions. The selection of the seed is very important.

For the best results corn should be selected in the field. The Japanese select their rice seed before the harvest.

The model ear of corn is only a small part of the problem. The

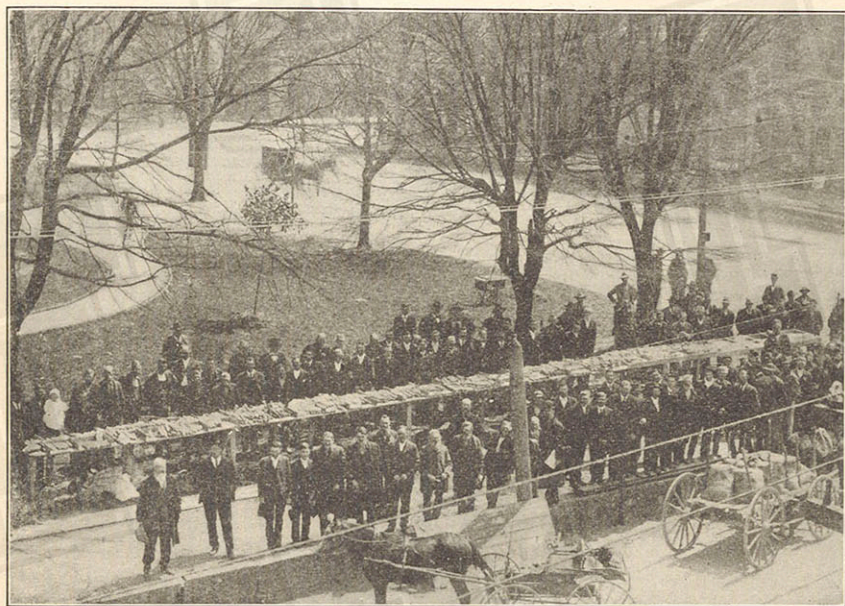


FIG. 2.—Corn day at Monroe, N. C., showing 200 farmers selecting and testing corn for planting.

stalk, the leaf, the root habits, the husk, and the environment of the plant from which the ear is taken must be considered. Most of the Southern States are subject to a shorter or longer drought during the period of growth of the corn crop, and the crop will depend largely upon the drought-resisting habits of leaf and roots. Some varieties of corn which are model in ear have so open a husk that the weevils destroy much of it while in the field. Again, the ear in the crib does not tell how many weak or bastard stalks grew in the vicinity.

COWPEAS AND OTHER SOIL-RENOVATING CROPS.

As just stated, corn requires a strong, well-tilled soil, and upon thin land, deteriorated by bad management, the yield soon drops below a remunerative average. Such lands will, however, profitably produce other crops of great value for the sustenance of farm stock, and, in addition, the growing of these crops will provide an excellent means of soil renovation. Lands that are now producing 10 bushels of corn per acre will with much less labor produce $1\frac{1}{4}$ tons of cowpea hay per acre, equal in nutritive value to 31 bushels of corn, or they will yield $1\frac{1}{4}$ tons of peanut hay per acre, equal in nutritive value to $23\frac{3}{4}$ bushels of corn, and in addition a peanut crop of 25 bushels per acre may be secured.

On rich lands that under good culture will produce 40 or more bushels of corn per acre satisfactory results can be secured by planting cowpeas between the rows of corn. Even rich bottom lands rated to yield 40 bushels of corn per acre if sown to alfalfa frequently produce 5 tons of hay per acre in a season, equal in feeding value to $105\frac{1}{2}$ bushels of corn. In addition, such crops as cowpeas, peanuts, and alfalfa rapidly enrich the soil and leave it in excellent mechanical condition for the ensuing year.

Generally speaking, poor hill lands should not be used for corn culture unless they are placed under a thorough system of renovation, or unless fertilization with stable manure or compost is practiced to a high degree.

SEED FARMS.

The good-seed problem has been a most difficult one to solve in the South. Until recently very few farmers have paid any attention to planting pure seed or keeping it pure when planted, and still fewer have tried to improve their seed by selection. Not one farm in one hundred in the South has proper storage for good seed. Through field agents prominent farmers in every county have been induced to establish seed farms, where the cultivation of the crop and the selection and storing of the seed are supervised by agents of this cooperative demonstration work under an agreement that the seed produced shall be distributed to the farmers at a moderate price. The best seeds for a given section are observed and a general interest is aroused among the farmers to plant a separate seed patch on every farm and carefully select for improvement.

BOYS' CORN CLUBS.

One of the outgrowths of the demonstration work is the boys' corn-club movement. We were in a position, through our organization and our force in the field, to perfect the corn-club idea and give the

instructions necessary to systematize it. Under our supervision every boy enrolled works a definite piece of ground under definite instructions that will give him an exact knowledge of how to work large crops. One of the strong features of the demonstration work is that it is cooperative, and in the boys' work we frequently find the other vital forces of the county—the superintendent of public education, the teachers, the business men, the newspapers, and the parents—all giving aid and support.

In Holmes County, Miss., in 1909, our boys' corn clubs produced crops averaging 76 bushels of corn per acre. The corn grown by



FIG. 3.—Members of a boys' corn club at Tyler, Tex. A real school of agriculture.

their fathers and the neighbors averaged about 16 bushels. This, with the results in other counties, was sufficient to arouse the State of Mississippi and create an overwhelming public sentiment in our favor. From a total enrollment of 10,543 during that year, the movement grew until the year 1910 recorded an enrollment in the various States of 46,225 boys.

Another feature of the work that has grown is that the boys are not rewarded solely by the crop. Public-spirited people are willing to give numerous and valuable premiums. The one that has especially influenced the boys is a free trip to Washington and a stay of one week there free of expense to the member of the boys' corn clubs

who raises the largest crop in his State, under the directions issued to the boys of the corn clubs. The boys who won this trip in 1909 were presented with a diploma by the Secretary of Agriculture, something never before in the history of agriculture presented under such circumstances.

We also have some cases where the boys of one county are challenging the boys of another county to a contest in corn production.

One of our requirements, which has had a very beneficial effect, is that the proceeds of the acre and the prizes shall go to the boy.



FIG. 4.—How to make a farmer. The boy who grew the corn shown is standing in his demonstration patch.

We have also a system which will prove equally effective for the girls of the rural schools, so that the whole school can be instructed in a practical way.

PRACTICAL RESULTS ACCOMPLISHED.

The field operations in connection with the Farmers' Cooperative Demonstration Work extend over such a vast territory that it is difficult to state results in a concrete way. The following statements give the more important items in condensed form:

Agent in charge.....	1
General assistant agents.....	5
Field agents.....	428
States partially or wholly worked.....	12
Public meetings held annually ^a	3, 800
Circulars distributed annually.....	2, 250, 000
Number of demonstration farms, 1909-10, of which exact records are kept in central office.....	20, 654
Number of cooperating farmers, 1909-10.....	47, 297
Number of farmers visiting the demonstration farms annually (conservatively estimated).....	1, 000, 000
Number of boys enrolled in the boys' corn clubs.....	46, 225

Great interest is everywhere manifested in better preparation of the soil, in planting selected seed, and in general betterment.

CONCLUSION.

It has been proved by our cooperative demonstration work that by following the instructions of the Bureau of Plant Industry a good crop of cotton can be raised in the worst-infested boll-weevil districts and despite the ravages of this pest, provided the rains are not so continuous as to render it impossible for the farmers to get into their fields during the months of June and July. Of course, under such conditions a crop can not be made, even without the presence of the boll weevil, because the grass would take the crop if the boll weevil did not. It is possible that the future may discover some better method of meeting the boll-weevil problems, but experience has shown that the method outlined is the only safe one at present. The boll weevil has now covered a large portion of Texas, Louisiana, Arkansas, Oklahoma, and about one-third of Mississippi. It is annually invading new territory with a column 600 miles long and in numbers sufficient to cover every stalk of cotton to a width of 30 miles. A cotton crop can be produced despite the boll weevil, and the sooner American farmers face the situation the better it will be for all concerned. To demonstrate the effectiveness of this theory is one object of the Farmers' Cooperative Demonstration Work.

In the foregoing pages have been mentioned only some of the lines of demonstration which have been undertaken for rural uplifting. The results have far exceeded our expectations, and the farmers have accepted the work gratefully and have cooperated to the best of their ability in every undertaking. It is along such lines as these that great economies can be practiced and valuable reforms wrought for the betterment of rural conditions and for solving the problems of the farm.

^a This number includes "field meetings" when the agent by appointment meets the cooperating farmers and interested neighbors on a demonstration farm to discuss the crop and other matters of agricultural importance.

Issued April 6, 1908.

U. S. DEPARTMENT OF AGRICULTURE.

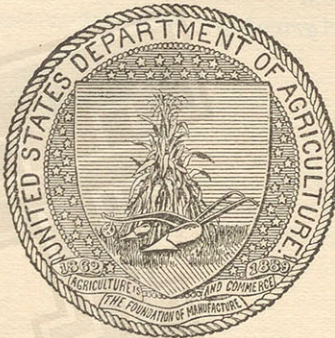
FARMERS' BULLETIN 319.

DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

BY

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*Special Agent in Charge of Farmers'
Cooperative Demonstration Work,
Bureau of Plant Industry.*



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1908.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 3, 1908.

SIR: I have the honor to transmit herewith a manuscript entitled "Demonstration Work in Cooperation with Southern Farmers," by Dr. S. A. Knapp, Special Agent in Charge of Farmers' Cooperative Demonstration Work, and recommend that it be published as a Farmers' Bulletin.

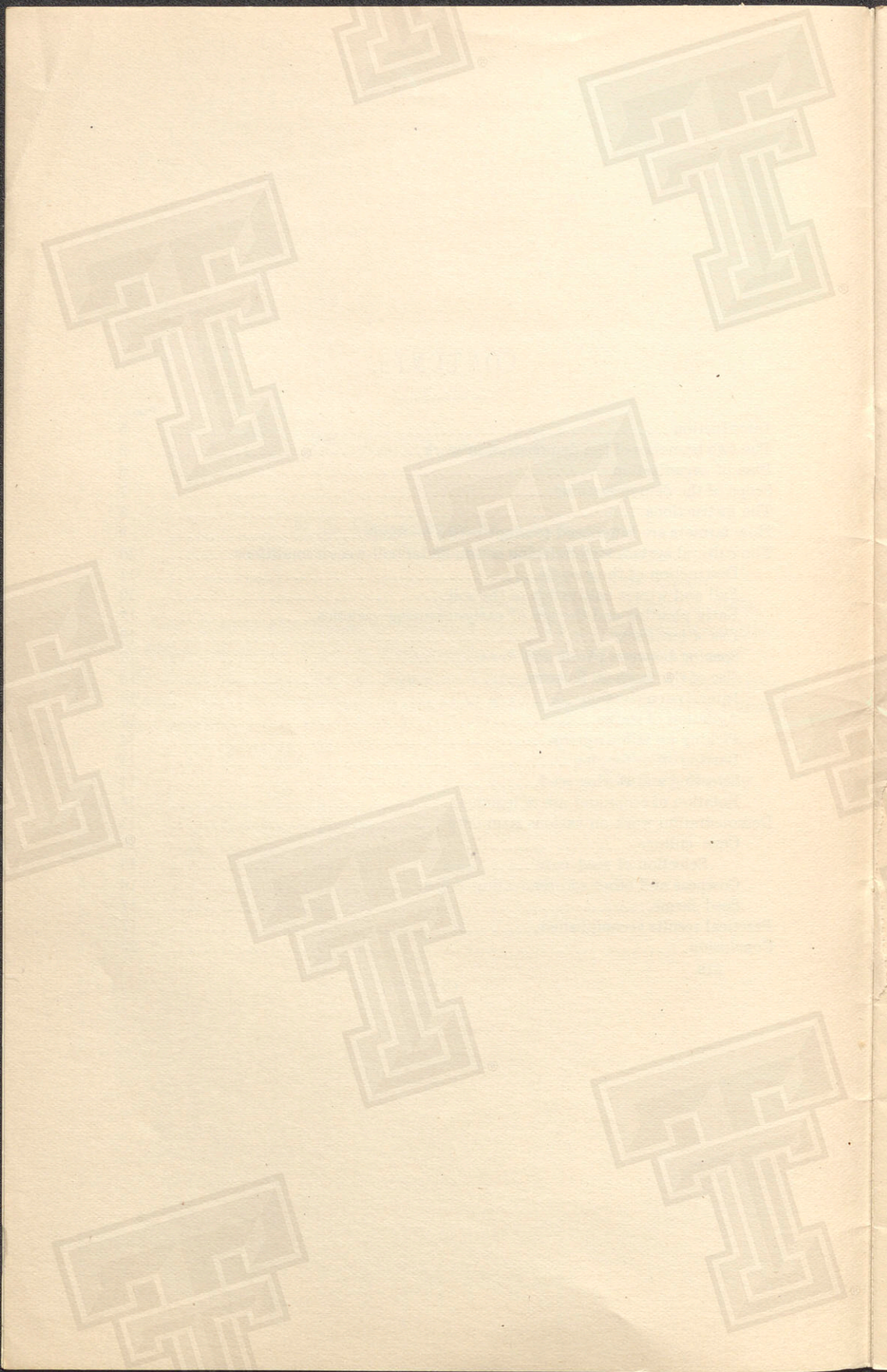
Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

INTRODUCTION.

The Farmers' Cooperative Demonstration Work conducted by the United States Department of Agriculture through the Bureau of Plant Industry was inaugurated under authority of Congress in January, 1904, primarily because of the depredations of the Mexican cotton boll weevil in the State of Texas. By the rapid spread of this pest east and north it had then become evident that it would in time invade all of the cotton-producing States. This occasioned a general alarm among the cotton planters and in the industrial centers of the entire country. For a number of years prior to 1904 the Mexican boll weevil had been steadily encroaching upon the cotton-producing lands of Texas, until it had moved from the Rio Grande to the betterment of agricultural conditions as the youth of our country are entitled to an education that will fit them for a broader citizenship.

One of the most serious problems in the reform of agricultural methods has been how to influence the farmer to adopt improved practices. It has been found that the mere dissemination of printed information sometimes does not accomplish this result, and therefore the method of neighborhood farm demonstrations in cooperation with progressive farmers has been evolved. The effect of a field demonstration is immediate and positive, and reaches all classes.

By actual count, it is determined that the number of farmers who annually visit each demonstration farm ranges from thirty to a hundred. If the average is placed as low as thirty the total number visiting 12,000 demonstration farms in one year would be 360,000. If we add the cooperating farmers, the aggregate is greatly increased.

The teaching by object lessons is more effective where it is simple, direct, and limited to a few common field crops, such as cotton, corn, cowpeas, and oats in the South, so that the comparisons may be evident and accepted at a glance. If general success can be secured with these standard crops, further diversification follows as a natural result.

THE TWO BRANCHES OF THE DEMONSTRATION WORK.

As at present organized and developed, the Farmers' Cooperative Demonstration Work may be said to consist of two divisions: (1) The demonstration of improved methods of agriculture in the weevil-infected districts, which is the natural outgrowth of the original plan, and (2) the extension of the same principles to other Southern States beyond the range of weevil infestation.

The territory covered by the first division of the work includes eastern and northern Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi. The total area thus covered is more than 300,000 square miles. The work in Arkansas, Oklahoma, and Mississippi has been broadly inaugurated only since October, 1907.

The second division of the work was commenced in Mississippi in March, 1906. In cooperation with the General Education Board of New York, this work in 1907 was conducted in a limited way in Alabama and Virginia, and has recently been extended into North Carolina, South Carolina, and Georgia. The expenses of this division of the work are defrayed by the General Education Board, which has appropriated the sum of \$69,000 for demonstration work during the year commencing October 1, 1907. The board has shown deep interest, hearty cooperation, and a very broad philanthropy in this work of reaching the rural masses and bettering farm conditions.

less daily by the action of the air, the moisture in the soils, and the sun. These three agents make active the forces that prepare the food, so the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced before the winter the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the ' During the ensuing year there will be employed in the cooperative demonstration work 59 agents paid from Government appropriations, and in the extension work 84 agents paid by the General Education Board. With this force about 12,000 demonstration farms had been established up to February 1, 1908, and 20,000 farmers had agreed to cooperate and make reports as to results.

SCOPE OF THE DEMONSTRATIONS.

The Farmers' Cooperative Demonstration Work is a system by which the simple and well-established principles of successful farming are directly taught to the men on the farms. The men who toil on the farms to produce the food that nourishes all the people, and who in a large measure provide the resources that support our civilization, are as justly entitled to a knowledge of the best that science and general experience have evolved for increase of production and for the betterment of agricultural conditions as the youth of our country are entitled to an education that will fit them for a broader citizenship.

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(4) In cultivated crops, giving the rows and the plants in the rows a space suited to the plant, the soil, and the climate.

(5) Intensive tillage during the growing period of the crops.

(6) The importance of a high content of humus in the soil. The use of legumes, barnyard manure, farm refuse, and commercial fertilizers.

(7) The value of crop rotation and a winter cover crop on southern farms.

(8) The accomplishing of more work in a day on the farm by using more horse power and better implements.

(9) The importance of increasing the farm stock to the extent of utilizing all the waste products and idle lands of the farm.

(10) The production of all food required for the men and animals on the farm.

(11) The keeping of an account with each farm product, in order to know from which the gain or loss arises.

THE INSTRUCTIONS.

Our instructions have the following advantages: (1) What the Department of Agriculture at Washington knows from its vast stores of information about the special crop under consideration; (2) what the State agricultural experiment stations in the South have demonstrated to be the most advantageous methods; (3) what the best farmers in the South have tested and proved to be the most successful practices upon the farm, and (4) the knowledge obtained by the traveling agents of this demonstration work, who visit and have personal knowledge of the localities in the State in which they are stationed. Even then the instructions given are along the lines of correct principles, leaving many details to the good judgment of the farmer.

In this cooperative work great stress is laid upon a more thorough preparation of the soil in the autumn, because in our southern climate the frosts do not penetrate the soils sufficiently to open them and admit air; we must therefore do by plowing in the fall and by some winter cultivation what Nature does in the colder North.

In the richest soils there is but little food ready prepared for the plant, and Nature's plan is that this food shall be prepared more or

less daily by the action of the air, the moisture in the soils, and the sun. These three agents make active the forces that prepare the food, so the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced before the winter the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the best variety for the purpose, carefully selected early in the fall and stored in a dry place. The reasons for very frequent cultivation are the admission of air, the conservation of moisture in the soil, and the prevention of a surface crust.

Young plants require excellent cultivation, just as young animals require the best food and care.

The judicious use of commercial fertilizers is one of the most important matters in modern agriculture, for this furnishes plant food directly and indirectly to the young plants. For soil improvement we must largely depend upon barnyard manure, the compost heap, and leguminous plants, such as cowpeas.

The importance of doing more as well as better work in a day has not been sufficiently impressed upon the southern farmer. This requires the use of stronger teams and better tools. Working 3 acres in a day where 1 is worked now and working each acre three times as well is a problem in profit easily understood after demonstration.

HOW FARMERS ARE INFLUENCED TO ADOPT BETTER METHODS.

In the South nearly all the merchants, bankers, and lawyers in the towns and smaller cities own farms and are intensely interested in agriculture. They form an effective center of influence, easily convinced of the value of the cooperative demonstration plan by reason of their high intelligence. Meetings are called and the work inaugurated. No further argument is necessary after the demonstrations have been made. Facts do the talking. The teachers in the public schools are generally alert and render most valuable assistance. The agricultural colleges and agricultural experiment stations give hearty cooperation. Thus, general interest is aroused in these demonstrations, which leads to careful observation and study on the part of the farmers and of the community. Public meetings are held for the discussion of these plans. In the cotton-producing States the first instructions include cotton as the main cash crop, corn as the standard food for work animals and the basis for more stock on the farm, cowpeas for food and for the renovation of the soil, oats or wheat as a winter cover crop, and the meadow and the pasture as the most economical source of food for farm stock. When

the farmer has mastered these crops he is ready for diversification in any desired direction.

In districts where cotton is not the standard cash crop, instruction is given in whatever replaces cotton as a money-earning crop. These simple lessons at the start are gradually made progressive until they cover all information necessary to success in the agriculture of the district.

As a means of reaching thousands of farmers with whom our agents do not come in personal contact, systematic use is made of the newspapers. Every bulletin or letter of instruction sent to cooperators is also furnished to about 2,000 county newspapers, and by most of them published in full. The hearty cooperation of the press has been of great value to the demonstration work.

THE CULTURAL SYSTEM FOR PRODUCING COTTON UNDER BOLL-WEEVIL CONDITIONS.

As it is evident that the cotton boll weevil will soon spread over the entire cotton-producing territory of the United States, it is a matter of general interest to know how cotton is at present produced with the weevil present.

Success in making a cotton crop under boll-weevil conditions is based upon three principles. It was found (1) that the numbers of the weevils could be limited so that they would not become totally destructive to the crop until the first and middle crops are out of danger; (2) that the cotton plant can be so bred and selected as to throw nearly its whole life forces into the lower and middle crops, and (3) that the plant can be so hastened to maturity by the application of cultural methods that most of the bolls will be developed to the safety point before the weevils are too numerous.

Guided by the principles just mentioned, the Bureau of Plant Industry has worked out a cooperative plan of producing cotton under boll-weevil conditions, which is known through the South as the "cotton-cultural system." This plan is based upon our knowledge of the cotton plant and upon the life habits of the boll weevil as ascertained by the Bureau of Entomology.^a Its chief features may be briefly mentioned, as follows:

(1) The destruction of the weevils in the fall (*a*) by burning the cotton stalks early in the fall while the weevils are still upon them and (*b*) by burning all rubbish in and about the field which might serve for hibernating quarters.

It is so difficult to secure a general adoption by the farmers of the plan of early burning of the cotton stalks that we have allowed the stalks to be turned under provided the immature bolls are destroyed.

^a See Bulletin No. 51 of the Bureau of Entomology.

(2) Immediately after destroying the bolls breaking (plowing) the field as deep as conditions will allow.

(3) The shallow winter cultivation of the soil.

(4) As early planting as the season will allow with safety to the crop.

(5) The planting of early-maturing varieties of cotton.

(6) The use of fertilizers.

(7) Leaving more space between the rows, and on ordinary uplands having a greater distance between plants in the row than is usually allowed. On rich or highly fertilized lands it is better to crowd the plants slightly in the rows to avoid the excessive growth of the stalks.

(8) The use of the toothed harrow before and after planting and on the young cotton.

(9) Intensive shallow cultivation.

(10) Agitation of the stalks by means of brush attached to the cultivator.

(11) Picking up and burning the squares that fall, where practicable.

(12) Controlling the growth of the plant if excessive by barring off or topping.

(13) Selecting the seed.

(14) The rotation of crops and the use of legumes.

It will be noted that the system as outlined has a twofold object:

(1) To reduce the number of weevils and (2) to aid early maturity in order to obtain a crop in advance of the weevil.

A few remarks concerning the main features of this plan may prove of value.

DESTRUCTION OF THE WEEVILS.

One of the greatest dangers to the cotton crop is the wintering of large numbers of weevils. By a failure to destroy early in the fall the immature cotton bolls and the rubbish in the fields, enough weevils may be wintered over to jeopardize the crops the ensuing year. If the immature bolls and the field rubbish are destroyed the stalks may be safely plowed under. The rubbish in the field which may serve for hibernating quarters includes the borders and fence corners.

Two methods of destroying the over-wintered weevils while they are feeding on the tender terminal buds are advocated: (1) They may be hand picked and burned or (2) some may be destroyed by the use of the harrow and brush.

FALL AND WINTER CULTIVATION OF THE SOIL.

After the destruction of the bolls in the fall, breaking (plowing) the field 1 or 2 inches deeper than usual assists in the destruction of the weevils and in the preparation of the field for successful cropping the following season. In order to air the soil and destroy grass, shallow winter cultivation of the soil should be practiced, i. e., working the land with a toothed harrow or a disk once every twenty or thirty days during the winter, as the weather may permit. The soil should be in excellent condition at the time of planting.

EARLY PLANTING AND THE USE OF EARLY-MATURING VARIETIES.

The object of early planting is to hasten the maturity of the crop. The Bureau of Entomology has shown that the weevils do not multiply until the squares begin to form and do not generally become numerous enough to destroy the entire crop before the last of July. In addition to this, early planting has been found generally helpful against cotton pests, such as the bollworm and the leafworm. Furthermore, the winter rains usually leave the soil with plenty of moisture, while in the spring there is liable to be a drought which may retard germination in late planting.

Varieties of cotton differ in time of maturity, and the same variety may differ owing to soil, moisture, fertilization, cultivation, etc. The planting of early-maturing varieties of cotton is not only important as an aid in securing a crop, but also as a means of destroying the weevil. The early-maturing cotton can be gathered and the immature bolls destroyed before it is time for the weevils to go into winter quarters. If all growers would plant early-maturing cotton and follow the plan here outlined it would result in greatly lessening the damage of the weevil.

In advising the planting of early-maturing cotton it is not the intention to advocate the exclusive use of small-boll cotton. These varieties may be better adapted to the northern limits of the cotton belt, but in nine-tenths of the cotton-producing territory there are large-boll varieties which can be just as successfully grown under boll-weevil conditions as the small-boll cottons. They must be varieties that are generally vigorous and that put out short-jointed fruit limbs close to the ground.

USE OF FERTILIZERS.

The use of fertilizers, especially acid phosphate and potash, to hasten maturity and increase fruitage, as well as the use of cotton-seed meal when necessary to promote vigor and growth, is recom-

mended. Soils and methods of application are fully explained, and it has been demonstrated that a small quantity of fertilizer properly applied accomplishes marvelous results.

SPACING BETWEEN PLANTS AND ROWS.

Planting in rows wider than usual and allowing more space in the row on light lands are advised under boll-weevil conditions. Special attention must be directed to have the rows the proper distance apart and to thin the plants in the rows. There must be width enough for the sun's rays to reach the earth between the rows and thus aid in destroying the larvæ of the weevil.

Generally speaking, more space to the plant makes a better stalk with more limbs, more bloom, and a higher grade of cotton. The spacing between the rows and in the rows must depend on the soil and the variety of cotton. More space should be given to fertilized than to unfertilized cotton. If, however, extreme space is allowed between plants in the rows and intensive cultivation is given there may be enough stimulus imparted to the growth of the plant to actually retard maturity unless the growth is controlled by barring off, as explained later; hence, on rich lands it is best to give plenty of space between the rows and to crowd the plants a little in the rows.

USE OF THE TOOTHED HARROW.

The use of the toothed harrow as soon as the crop comes up is of sufficient importance to warrant special mention. After early planting the germination is frequently slow and the earth may become crusted. The harrow may be used to break the crust before the plants are up and should be used soon afterwards to keep the soil loose so that the plants will take on rapid growth at once. The crop is surprisingly advanced by the judicious use of the harrow.

INTENSIVE CULTIVATION.

Plowing or cultivating deep the first time and shallow at all subsequent times is an important feature of good cotton production. It destroys weeds, increases the plant food, and conserves moisture, consequently hastening maturity. Under boll-weevil conditions the cotton crop should be cultivated every week. Some of our most successful cooperators have cultivated fifteen times and continued till picking commenced.

AGITATION OF STALKS.

Violent agitation of the cotton stalks when cultivating or plowing, by means of a brush attached to the cultivator or plow, is recommended. Some farmers attach a chain to the tongue and smooth

poles to the whiffletrees, and also a pole to the handles, so as to brush the stalks more than once in passing. Bundles of soft, leafy twigs are better. This knocks off the infested squares. The great majority of squares fall off naturally in a very few days after they become infested. Abundant testimony has come from our cooperators to show that as long as weekly cultivation of the crop with violent agitation of the stalks is continued the damage done by the boll weevil is greatly reduced.

PICKING UP FALLEN SQUARES.

An important aid toward the destruction of the weevils is picking up the squares that fall. If two or three generations can thus be destroyed, it will result in retarding the increase of the weevil and in adding to the cotton crop. This reduces the rapidity with which the weevils multiply and is a great aid in saving the crop.

BARRING OFF OR TOPPING.

Under boll-weevil conditions the main cotton crop must be made upon the lower and middle limbs. There is no use of a tall plant. The growth of the plant should therefore be controlled by barring off or topping. As soon as the plant indicates too rapid growth, bar off on each side, thus slightly root pruning and retarding upward growth. The tendency will then be to throw more vigor into the lower limbs and to put on more fruit. This method is especially valuable on rich bottom lands where the stalks frequently grow 6 to 7 feet high. It should be noted that with the boll weevil no top crop is made; hence, more bottom crop must be secured, requiring a low, limby, vigorous plant.

SELECTING AND STORING SEED.

Scarcely any item in the cultural system is of more importance than the selection of the seed as an aid to early maturity in the following crop. The largest, best, and earliest bolls from the most vigorous short-jointed plants should be selected for seed in advance of the general picking and be stored in a dry place. The planting of early-maturing varieties and the selection of seed from the earliest and best bolls on the most vigorous and best developed stalks are fundamental principles in growing cotton irrespective of the boll weevil and can not be too closely followed.

ROTATION OF CROPS AND USE OF LEGUMES.

The Bureau of Plant Industry in all its instructions seeks to build up soil energy and to improve the mechanical condition of the soil as well. An important factor to this end is rotation of crops and the increase of humus by plowing under green plants, especially cow-

peas. This builds up the soil and renders it more porous and responsive.

Some of the serious difficulties in cotton production arise from the growing of consecutive crops of cotton on the same land. This reduces fertility and hence operates against early maturity. With the best of efforts to clear fields of the weevil in the fall by burning the stalks and deep plowing, some weevils will survive, and a few soon infest a field. By planting one half of the land to corn and cowpeas and the other half to cotton, as much cotton can be produced as formerly and the land will be gradually restored to its original fertility. The corn and cowpeas will also add materially to the income of the farm, but the special reason urged for such rotation under boll-weevil infestation is that the crop of corn and peas leaves the field free from the weevil, as it feeds only upon cotton. It is evident that with the boll weevil it requires more labor to cultivate an acre of cotton; consequently, only as many acres should be planted as can be given the best attention, so as to produce a maximum crop, thus leaving more land for cereals and for meadows and pastures.

DEMONSTRATION WORK ON VARIOUS FARM CROPS.

The Farmers' Cooperative Demonstration Work, as before stated, aims to cover the entire scope of the management of the standard crops in the sections where the work is conducted. In addition to the cotton-culture system, which is the main feature of the work in many localities, it may be well to give brief mention of some of the cooperative work on other crops now under way, such as corn culture, the use of soil-renovating crops, and the production of good farm seeds.

CORN CULTURE.

Corn is the main grain dependence for farm stock and can be successfully raised in most portions of the South. Any considerable increase in its annual production would have a marked effect upon the value of the unused lands for grazing purposes and would perceptibly increase the income of the farms. The importance of corn for food and for rotation with other crops gives it a rank next to cotton as a standard farm crop. Notwithstanding this, its cultivation has been singularly neglected until the average yield per acre has fallen below the profit line in many States. Even at the high value per bushel allowed, the corn crop in many of the Southern States does not pay a living wage or a fair rent value for the land.

There is abundant proof that large and profitable crops of corn can be produced in the South by the use of the best seed and improved methods. The planting of low-grade seed in a shallow and impoverished seed bed is responsible in the main for deficient yields and quality. However, to secure the best results other reforms must be made,

such as better drainage, an adjustment of distances between the rows and the stalks in the rows to meet the requirements of soil and climate, intensive cultivation of the crop, the use of cowpeas in the corn, and the following of the corn with a winter cover crop.

The Farmers' Cooperative Demonstration Work includes instruction along all of these lines, and the results have been most encouraging. Our investigations show that not even 1 per cent of the lands in the South planted to corn are plowed deeply enough at breaking, that they have not sufficient humus, and that they are not given the proper tillage to make the best crop. Seed is so generally defective that only about one-third of so-called good seed is suitable for planting if maximum yields are expected. Along these practical lines we are conducting cooperative demonstrations with the object of increasing the corn crop in the South Atlantic and Gulf States at least threefold per acre without additional cost. A system of seed selection for improving the quality and increasing the yield and methods of storage for the preservation of vitality are outlined, detailed instructions being given on application.

Selection of Seed Corn.

The object of the average farmer in planting corn is to secure the largest crop of good corn possible under the conditions. The selection of the seed is very important.

For the best results corn should be selected in the field. The Japanese select their rice seed before the harvest.

The model ear of corn is only a small part of the problem. The stalk, the leaf, the root habits, the husk, and the environment of the plant from which the ear is taken must be considered. Most of the Southern States are subject to a shorter or longer drought during the period of growth of the corn crop, and the crop will depend largely upon the drought-resisting habits of leaf and roots. Some varieties of corn which are model in ear have so open a husk that the weevils destroy much of it while in the field. Again the ear in the crib does not tell how many weak or bastard stalks grew in the vicinity.

COWPEAS AND OTHER SOIL-RENOVATING CROPS.

As just stated, corn requires a strong, well-tilled soil, and upon thin land, deteriorated by bad management, the yield soon drops below a remunerative average. Such lands will, however, profitably produce other crops of great value for the sustenance of farm stock, and, in addition, the growing of these crops will provide an excellent means of soil renovation. Lands that are now producing 10 bushels of corn per acre will with much less labor produce $1\frac{1}{4}$ tons of cowpea hay per acre, equal in nutritive value to 31 bushels of corn, or they will yield $1\frac{1}{4}$ tons of peanut hay per acre, equal in nutritive value to

23 $\frac{3}{4}$ bushels of corn, and in addition a peanut crop of 25 bushels per acre may be secured.

On rich lands that under good culture will produce 40 or more bushels of corn per acre satisfactory results can be secured by planting cowpeas between the rows of corn. Even rich bottom lands rated to yield 40 bushels of corn per acre if sown to alfalfa frequently produce 5 tons of hay per acre in a season, equal in feeding value to 105 $\frac{1}{2}$ bushels of corn. In addition, such crops as cowpeas, peanuts, and alfalfa rapidly enrich the soil and leave it in excellent mechanical condition for the ensuing year.

Generally speaking, poor hill lands should not be used for corn culture unless they are placed under a thorough system of renovation, or unless fertilization with stable manure or compost is practiced to a high degree.

SEED FARMS.

The good-seed problem has been a most difficult one to solve in the South. Very few farmers have paid any attention to planting pure seed or keeping it pure when planted, and still fewer have tried to improve their seed by selection. Not one farm in one hundred in the South has proper storage for good seed. Through field agents prominent farmers in every county have been induced to establish seed farms, where the cultivation of the crop and the selection and storing of the seed are supervised by agents of this cooperative demonstration work under an agreement that the seed produced shall be distributed to the farmers at a moderate price. The best seeds for a given section are observed and a general interest is aroused among the farmers to plant a separate seed patch on every farm and carefully select for improvement.

PRACTICAL RESULTS ACCOMPLISHED.

The field operations in connection with the Farmers' Cooperative Demonstration Work extend over such a vast territory that it is difficult to state results in a concrete way. The following statements give the more important items in condensed form:

Amount available from Congressional appropriations for year 1907-8.	\$77, 739. 80
General Education Board, contribution ^a -----	69, 000. 00
Slater fund ^a -----	1, 000. 00
Voluntary local contributions (estimated) ^b -----	20, 000. 00
	<hr/> 167, 739. 80

^a The responsibility for handling these funds remains in the hands of the contributors, acting under the advice of the agent in charge.

^b Many counties ask for more demonstration farms and more improved seed than the Department of Agriculture can furnish on account of lack of funds. Some of these pledge the money necessary to thus supplement the work.

Agent in charge-----	1
General assistant agents-----	2
Field agents-----	143
States partially or wholly worked-----	10
Public meetings held annually-----	2, 750
Circulars distributed annually-----	200, 000
Number of demonstration farms, 1907-8, of which exact records are kept in central office-----	12, 000
Number of cooperating farmers, 1907-8-----	20, 000
Number of farmers visiting the demonstration farms annually (conservatively estimated)-----	360, 000

Great interest is everywhere manifested in better preparation of the soil, in planting selected seed, and in general betterment.

Thousands of prize contests have been started in cotton and corn production among farmers and also among boys on the farm.

Thousands of letters bearing testimony to the value of the work have been received, but it is impossible to present any extended digest of these within the limits of a Farmers' Bulletin.

The following extracts from letters received show the people's estimate of the value of this demonstration work:

MARSHALL, TEX., *October 10, 1907.*

We, the undersigned committee for Harrison County, Tex., make the following preliminary report on the Farmers' Cooperative Demonstration Work done the past season in this county.

On account of the ravages of the boll weevil, Harrison County, Tex., was threatened with a disaster in the loss of the cotton crop that would affect every material interest in the county. The loss of money was not the sole consideration. Our tenants and farm laborers would to a large extent leave the county, and it would thus permanently injure our Commonwealth. In this emergency we appealed to the United States Department of Agriculture through you for advice and aid. You came to our county and organized the work in February, 1907, under an arrangement by which the Department of Agriculture would furnish superintendence and the people of this county would raise enough funds to buy improved seed for the demonstration farms. The citizens of the county promptly raised and deposited in bank \$1,000 and later contributed \$700 more, making a total of \$1,700 invested in better seed. All agreements between the Department of Agriculture and the people were promptly and satisfactorily carried out. Almost without exception this was the worst season this section has ever known for producing cotton, but without reservation we wish to make the following statements:

(1) The results of the demonstration work have been in the highest degree satisfactory to our people, and they regard this movement as one of the greatest ever made for the upbuilding of our section.

(2) Our people are unanimous in asking for its continuance and would regard the discontinuance of the work as an untold disaster.

(3) Among the many good things accomplished we enumerate the following:

(a) It established over 300 demonstration farms, scattered over the entire county.

(b) It taught better culture and introduced better seed. These two items alone were worth more than \$100,000 this year to our county in actual cash, to

say nothing of future benefits. The improvement was so apparent that the observing traveler on the highways could pick out every demonstration field.

(c) This demonstration work saved a stampede of tenant farmers and laborers from the farms.

(d) It gave confidence to the merchants and bankers that a crop would be made, and thus promoted credit.

(e) It demonstrated to the farmers that a crop of cotton could be made under extremely adverse condition of weather and insect pests, and they enter upon another year with perfect confidence.

Great credit for the success of this year's work is due to the excellent supervision of W. F. Proctor, State agent for Texas, and to the untiring energy of T. O. Plunkett, local agent.

JNO. H. POPE.	M. SCULLY.
W. T. TWYMON.	H. B. MCWILLIAMS.
P. G. WHALEY.	W. L. MARTIN.

The above committeemen are well known to me and are among the most substantial and reliable citizens of Harrison County, Tex., and I also personally indorse the statements made.

H. S. LITTLETON,
County Judge, Harrison County, Tex.

PALESTINE, TEX., *January 1, 1908.*

DEAR SIR: We, the undersigned citizens of Anderson County, Tex., desire to acquaint you with the character of the work done in this county since last March through the department known as the Farmers' Cooperative Demonstration Work, and to call your attention to some of the beneficial results accomplished.

The work of the Department in this county was done on a comparatively small scale. The enterprising board of trade of the city of Palestine contributed \$600 to this work, which constituted the sum of local support the work has had in the way of money contributed. But, notwithstanding this, the result of the work accomplished has been most gratifying in many ways.

Two hundred demonstration farms have been established; improved seed has been used; improved methods of cultivation have been employed, and a fine showing has been made. Outside of these demonstration farms a conservative estimate places the average yield of cotton per acre at about 300 pounds of seed cotton, or about 1 bale to 6 acres. The record made by the demonstration farms is 608 pounds of seed cotton per acre as an average. The yield of corn per acre outside of the demonstration farms is certainly not greater than 15 bushels per acre. The demonstration farms show an average yield of 28½ bushels per acre.^a

This good showing on the cotton is still further augmented by the fact that while it formerly took about 1,700 pounds of seed cotton to make a bale, the improved seed used on the demonstration farms produces a bale with 1,400 pounds of seed cotton.

These manifest results of the work are proving very stimulating to the farming interests, and the advantages of the work of this first season are simply incalculable. We believe that one of the certain results is a general awaken-

^a The yields of cotton and corn given are unusually low because of the excessive rainfall.

ing of the farmers of this county to the need of better seeds and up-to-date methods of farming.

It must be remembered that the showing that has been made this last year has been made under the most adverse circumstances imaginable. Adverse crop conditions have existed from the very beginning of the work.

We earnestly petition that the good work be continued in this county on just as large a scale as possible, and we pledge the same our hearty cooperation and encouragement. * * *

JOHN R. HEARNE,
President, Board of Trade, and
President, Royall National Bank.

R. R. CLARIDGE,
President, Texas Div., Southern
Corn Association.

Y. L. JONES,
Merchant.

H. HORWITZ,
Merchant.

H. W. WATTS,
Ex-Sheriff, Anderson County.

DON M. BARRETT,
Ex-Tax Collector, Anderson County.
S. M. PAUL,

Farmer.

J. J. STRICKLAND,
Representative,
Thirtieth Legislature.

DENISON BOARD OF TRADE,
Denison, Tex., January 2, 1908.

DEAR SIR: Referring to your esteemed favor of recent date, beg to say that we greatly appreciate your interest and cooperation in our efforts for agricultural advancement, and we expect great good to result from the work planned next year. The work of the past year has served to thoroughly arouse our people to an understanding of the great work that your Department is doing in the interest of agricultural advancement.

Your work in this community during the past year has been of inestimable value to our people. There has been a wonderful awakening of interest among our farmers, who are now on the alert for new ideas and progressive methods. There was a time, perhaps, when farmers regarded the work of the Department of Agriculture as empty theory and spurned the advice of what they pleased to term "book farmers," but they now realize the science of agriculture and the wonderful possibilities for improvement and for increasing their earning capacity. Such an awakening is manifest on every hand in the vicinity of Denison, where wonderful progress has been made during the past year. I feel safe in the assertion that there has been more scientific and methodical work on the farms about Denison during 1907 than ever before. * * * This is evidence of real prosperity—prosperity so firmly established that our little city and the surrounding country hardly realized the existence of the financial flurry which so upset conditions throughout the country.

We regard the work in the interest of agricultural advancement as being the most productive effort of this organization, and we feel deeply indebted to you for cooperation, which has made our work much more effective than it could have been otherwise. We feel that the object lessons provided by you last year were very effective, and the establishment of the 30 demonstration and cooperative farms planned for the next year insures even greater progress. Two of the farmers who operated demonstration plats the past year under the able direction of Mr. J. L. Quicksall have sold all their Triumph seed they had to spare at \$1 per bushel.

We are especially anxious to encourage the corn growers whom we have succeeded in so thoroughly arousing during the past year. I have never known so

much interest in the improvement of corn as is in evidence here at this time.
 * * * We are anxious to render any possible service that will facilitate your work in the vicinity of Denison, believing that your continued cooperation will assist us in making this the greatest agricultural section of the Southwest.

Very truly yours,

T. W. LARKIN,
Secretary.

TAYLOR, LA., *January 5, 1908.*

DEAR SIR: Some four years ago I worked a plat of land by your cultural method, which gave me much better results than the usual methods previously used. I have been following the same instructions in part for the last three seasons, and find this method gives better results, especially the thorough preparation of the seed bed and the distance between rows and plants. I find the crop much easier worked and the yield better in quality, as well as quantity. I also have tried to help a good thing along by showing your instructions and my crop to others and by having my tenants work by same. One of the parties to whom I read the instructions and showed the crop asked me to see his crop last summer, saying he had worked it my way and had the best crop he ever raised in his life. I think he had a fine crop for the season.

Respectfully,

W. C. WALL.

CLARENDON, ARK., *December 20, 1907.*

DEAR SIR: I took up your plan of farming in 1906 in a small way with good results; in fact, was so well pleased with it that I planted and cultivated something like 400 acres this year. I followed your directions in preparation and cultivation, using 200 pounds of phosphate per acre. While we had the wettest and coldest and most backward spring I ever knew, causing me to plant the greater part of my crop over the fourth time and as late as June 9 to 12, then only getting about half a stand on most of it, and after that date only had rain enough to keep the plows out of the field a few hours until picking time, I am satisfied with the result, some of it paying me as high as \$30 per acre net rent, the lowest \$6 per acre, averaging about \$13 per acre net. I more than doubled my yield of corn. I expect to go at it more extensively next year. I have had my plows going for two weeks, preparing cotton land for 1908.

Very respectfully,

W. S. JEFFRIES.

STONEWALL, LA., *December 13, 1907.*

DEAR SIR: Having spent twenty-five years in paying for cotton lands and a cotton gin and otherwise getting in shape to grow and handle cotton to advantage, we have studied and watched with deep interest every movement which was calculated to relieve us from the ravages of the boll weevil, and now we write to thank you and Mr. Cowden (agent) for the work done in this community in the way of establishing demonstration farms this year. We feel sure this is the best manner to reach most of our people, who have grown skeptical of book farming, but are easily convinced by a practical application of your methods. We have tried your plans for two years and think it our only hope to outwit the boll weevil.

Trusting you may be able to continue your work in our parish next year,

We are, with regards, yours truly,

J. M. & M. G. NELSON.

THE BUSINESS MEN'S LEAGUE OF HELENA, ARK.,

Helena, Ark., January 11, 1908.

DEAR SIR: Our league has on foot a movement to increase the production per acre of cotton and corn in this section.

Two years ago an experiment was conducted under the immediate care of Messrs. E. D. Pillow and H. G. Stephens, one of your representatives having a general supervision of the experiment. No fertilizer was used, but the cultural methods adopted proved wonderfully beneficial and a large yield of cotton resulted. During the season just past, Mr. Stephens conducted an experiment upon his own behalf, using nitrate of soda as a fertilizer for cotton and cotton-seed meal for corn. He has made us a report which we will publish, and that, together with a letter from Mr. E. D. Pillow, will be mailed by us to about 1,000 farmers in this section. * * * We would also ask your cooperation in this matter and would like to know if it would be possible to secure the services of a representative of the Agricultural Department to make a tour of inspection at short intervals for the purpose of aiding these farmers by way of instruction and general information. The experiment would be more apt to prove profitable if some one would make the rounds and let it be known in advance that an inspection would be made.

Kindly write us fully upon this subject and tell us to what extent and in what manner you can aid us in this movement.

Yours truly,

E. C. HORNOR.

CONCLUSION.

It has been proved by our cooperative demonstration work that by following the instructions of the Bureau of Plant Industry a good crop of cotton can be raised in the worst-infested boll-weevil districts and despite the ravages of this pest. It is possible that the future may discover some better method of meeting the boll-weevil problems, but experience has shown that the method outlined is the only safe one at present. The boll weevil has now covered a large portion of Texas, Louisiana, Arkansas, Oklahoma, and several counties in Mississippi. It is annually invading new territory with a column 600 miles long and in numbers sufficient to cover every stalk of cotton to a width of 30 miles. A cotton crop can be produced despite the boll weevil, and the sooner American farmers face the situation the better it will be for all concerned. To demonstrate the truth of this theory is one object of the Farmers' Cooperative Demonstration Work.

In the foregoing pages have been mentioned only some of the lines of demonstration which have been undertaken for rural uplifting. The results have far exceeded our expectations, and the farmers have accepted the work gratefully and have cooperated to the best of their ability in every undertaking. It is along such lines as these that great economies can be practiced and valuable reforms wrought for the betterment of rural conditions and for solving the problems of the farm.

FARMERS' BULLETINS.

The following is a list, by number, of the Farmers' Bulletins available for distribution. The bulletins entitled "Experiment Station Work" give in brief the results of experiments performed by the State experiment stations. Titles of other bulletins are self-explanatory. Bulletins in this list will be sent free to any address in the United States on application to your Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C. Numbers omitted have been discontinued, being superseded by later bulletins.

22. The Feeding of Farm Animals. Pp. 40.
24. Hog Cholera and Swine Plague. Pp. 16.
27. Flax for Seed and Fiber. Pp. 16.
28. Weeds: And How to Kill Them. Pp. 30.
30. Grape Diseases on the Pacific Coast. Pp. 15.
32. Silos and Silage. Pp. 30.
33. Peach Growing for Market. Pp. 24.
34. Meats: Composition and Cooking. Pp. 31.
35. Potato Culture. Pp. 24.
36. Cotton Seed and Its Products. Pp. 16.
42. Facts About Milk. Pp. 32.
44. Commercial Fertilizers. Pp. 38.
47. Insects Affecting the Cotton Plant. Pp. 32.
48. The Manuring of Cotton. Pp. 16.
49. Sheep Feeding. Pp. 24.
51. Standard Varieties of Chickens. Pp. 48.
52. The Sugar Beet. Pp. 48.
54. Some Common Birds. Pp. 48.
56. The Dairy Herd. Pp. 30.
56. Experiment Station Work—I. Pp. 30.
58. The Soy Bean as a Forage Crop. Pp. 24.
59. Bee Keeping. Pp. 48.
60. Methods of Curing Tobacco. Pp. 24.
61. Asparagus Culture. Pp. 40.
62. Marketing Farm Produce. Pp. 31.
63. Care of Milk on the Farm. Pp. 40.
64. Ducks and Geese. Pp. 55.
65. Experiment Station Work—II. Pp. 32.
69. Experiment Station Work—III. Pp. 32.
71. Essentials in Beef Production. Pp. 24.
73. Experiment Station Work—IV. Pp. 32.
77. The Liming of Soils. Pp. 24.
78. Experiment Station Work—V. Pp. 32.
79. Experiment Station Work—VI. Pp. 27.
81. Corn Culture in the South. Pp. 24.
82. The Culture of Tobacco. Pp. 22.
83. Tobacco Soils. Pp. 23.
84. Experiment Station Work—VII. Pp. 32.
85. Fish as Food. Pp. 32.
86. Thirty Poisonous Plants. Pp. 32.
87. Experiment Station Work—VIII. Pp. 32.
88. Alkali Lands. Pp. 23.
91. Potato Diseases and Treatment. Pp. 15.
92. Experiment Station Work—IX. Pp. 30.
93. Sugar as Food. Pp. 31.
96. Raising Sheep for Mutton. Pp. 48.
97. Experiment Station Work—X. Pp. 32.
98. Suggestions to Southern Farmers. Pp. 48.
99. Insect Enemies of Shade Trees. Pp. 30.
100. Hog Raising in the South. Pp. 40.
101. Millets. Pp. 30.
103. Experiment Station Work—XI. Pp. 30.
104. Notes on Frost. Pp. 31.
105. Experiment Station Work—XII. Pp. 32.
106. Breeds of Dairy Cattle. Pp. 48.
107. Experiment Station Work—XIII. Pp. 32.
110. Rice Culture in the United States. Pp. 28.
112. Bread and Bread Making. Pp. 40.
113. The Apple and How to Grow It. Pp. 32.
114. Experiment Station Work—XIV. Pp. 28.
118. Grape Growing in the South. Pp. 32.
119. Experiment Station Work—XV. Pp. 30.
120. Insects Affecting Tobacco. Pp. 32.
121. Beans, Peas, and Other Legumes as Food. Pp. 38.
122. Experiment Station Work—XVI. Pp. 32.
124. Experiment Station Work—XVII. Pp. 32.
126. Practical Suggestions for Farm Buildings. Pp. 48.
127. Important Insecticides. Pp. 46.
128. Eggs and Their Uses as Food. Pp. 40.
131. Household Tests for Detection of Oleomargarine and Renovated Butter. Pp. 10.
132. Insect Enemies of Growing Wheat. Pp. 38.
133. Experiment Station Work—XVIII. Pp. 32.
134. Tree Planting in Rural School Grounds. Pp. 32.
135. Sorghum Sirup Manufacture. Pp. 40.
137. The Angora Goat. Pp. 48.
138. Irrigation in Field and Garden. Pp. 40.
139. Emmer: A Grain for the Semiarid Regions. Pp. 16.
140. Pineapple Growing. Pp. 48.
142. Principles of Nutrition and Nutritive Value of Food. Pp. 48.
144. Experiment Station Work—XIX. Pp. 32.
145. Carbon Bisulphid as an Insecticide. Pp. 28.
147. Winter Forage Crops for the South. Pp. 40.
149. Experiment Station Work—XX. Pp. 32.
150. Clearing New Land. Pp. 24.
152. Scabies of Cattle. Pp. 32.
154. The Home Fruit Garden: Preparation and Care. Pp. 16.
155. How Insects Affect Health in Rural Districts. Pp. 19.
156. The Home Vineyard. Pp. 22.
157. The Propagation of Plants. Pp. 24.
158. How to Build Small Irrigation Ditches. Pp. 28.
159. Scab in Sheep. Pp. 48.
162. Experiment Station Work—XXI. Pp. 32.
164. Rape as a Forage Crop. Pp. 16.
165. Silkworm Culture. Pp. 32.
166. Cheese Making on the Farm. Pp. 16.
167. Cassava. Pp. 32.
169. Experiment Station Work—XXII. Pp. 32.
170. Principles of Horse Feeding. Pp. 44.
172. Scale Insects and Mites on Citrus Trees. Pp. 43.
173. Primer of Forestry. Pp. 48.
174. Broom Corn. Pp. 30.
175. Home Manufacture and Use of Unfermented Grape Juice. Pp. 16.
176. Cranberry Culture. Pp. 20.
177. Squab Raising. Pp. 32.
178. Insects Injurious in Cranberry Culture. Pp. 32.
179. Horseshoeing. Pp. 30.
181. Pruning. Pp. 39.
182. Poultry as Food. Pp. 40.
183. Meat on the Farm: Butchering, Curing, and Keeping. Pp. 37.
185. Beautifying the Home Grounds. Pp. 24.
186. Experiment Station Work—XXIII. Pp. 32.
187. Drainage of Farm Lands. Pp. 38.
188. Weeds Used in Medicine. Pp. 45.
190. Experiment Station Work—XXIV. Pp. 32.
192. Barnyard Manure. Pp. 32.
193. Experiment Station Work—XXV. Pp. 32.
194. Alfalfa Seed. Pp. 14.
195. Annual Flowering Plants. Pp. 48.
196. Usefulness of the American Toad. Pp. 16.
197. Importation of Game Birds and Eggs for Propagation. Pp. 30.
198. Strawberries. Pp. 24.
199. Corn Growing. Pp. 32.
200. Turkeys. Pp. 40.
201. Cream Separator on Western Farms. Pp. 23.
202. Experiment Station Work—XXVI. Pp. 32.
203. Canned Fruits, Preserves, and Jellies. Pp. 32.
204. The Cultivation of Mushrooms. Pp. 24.
205. Pig Management. Pp. 45.
206. Milk Fever and Its Treatment. Pp. 16.
209. Controlling the Boll Weevil in Cotton Seed and at Ginneries. Pp. 32.
210. Experiment Station Work—XXVII. Pp. 32.
211. The Use of Paris Green in Controlling the Cotton Boll Weevil. Pp. 23.
213. Raspberries. Pp. 38.
217. Essential Steps in Securing an Early Crop of Cotton. Pp. 16.
218. The School Garden. Pp. 40.
219. Lessons from the Grain Rust Epidemic of 1904. Pp. 24.

220. Tomatoes. Pp. 32.
221. Fungous Diseases of the Cranberry. Pp. 16.
222. Experiment Station Work—XXVIII. Pp. 32.
223. Miscellaneous Cotton Insects in Texas. Pp. 24.
224. Canadian Field Peas. Pp. 16.
225. Experiment Station Work—XXIX. Pp. 32.
227. Experiment Station Work—XXX. Pp. 32.
228. Forest Planting and Farm Management. Pp. 22.
229. The Production of Good Seed Corn. Pp. 24.
231. Spraying for Cucumber and Melon Diseases. Pp. 24.
232. Okra: Its Culture and Uses. Pp. 16.
233. Experiment Station Work—XXXI. Pp. 32.
234. The Guinea Fowl. Pp. 24.
235. Preparation of Cement Concrete. Pp. 32.
236. Incubation and Incubators. Pp. 32.
237. Experiment Station Work—XXXII. Pp. 32.
238. Citrus Fruit Growing in the Gulf States. Pp. 48.
239. The Corrosion of Fence Wire. Pp. 32.
241. Butter Making on the Farm. Pp. 36.
242. An Example of Model Farming. Pp. 16.
243. Fungicides and Their Use in Preventing Diseases of Fruits. Pp. 32.
244. Experiment Station Work—XXXIII. Pp. 32.
245. Renovation of Worn-out Soils. Pp. 16.
246. Saccharine Sorghums for Forage. Pp. 37.
248. The Lawn. Pp. 20.
249. Cereal Breakfast Foods. Pp. 36.
250. The Prevention of Wheat Smut and Loose Smut of Oats. Pp. 16.
251. Experiment Station Work—XXXIV. Pp. 32.
252. Maple Sugar and Sirup. Pp. 36.
253. The Germination of Seed Corn. Pp. 16.
254. Cucumbers. Pp. 30.
255. The Home Vegetable Garden. Pp. 47.
256. Preparation of Vegetables for the Table. Pp. 48.
257. Soil Fertility. Pp. 39.
258. Texas or Tick Fever and Its Prevention. Pp. 45.
259. Experiment Station Work—XXXV. Pp. 32.
260. Seed of Red Clover and Its Impurities. Pp. 24.
261. The Cattle Tick. Pp. 22.
262. Experiment Station Work—XXXVI. Pp. 32.
263. Practical Information for Beginners in Irrigation. Pp. 40.
264. The Brown-tail Moth and How to Control It. Pp. 22.
266. Management of Soils to Conserve Moisture. Pp. 30.
267. Experiment Station Work—XXXVII. Pp. 32.
268. Industrial Alcohol: Sources and Manufacture. Pp. 45.
269. Industrial Alcohol: Uses and Statistics. Pp. 29.
270. Modern Conveniences for the Farm Home. Pp. 48.
271. Forage Crop Practices in Western Oregon and Western Washington. Pp. 39.
272. A Successful Hog and Seed-Corn Farm. Pp. 16.
273. Experiment Station Work—XXXVIII. Pp. 32.
274. Flax Culture. Pp. 36.
275. The Gipsy Moth and How to Control It. Pp. 22.
276. Experiment Station Work—XXXIX. Pp. 32.
277. The Use of Alcohol and Gasoline in Farm Engines. Pp. 40.
278. Leguminous Crops for Green Manuring. Pp. 27.
279. A Method of Eradicating Johnson Grass. Pp. 16.
280. A Profitable Tenant Dairy Farm. Pp. 16.
281. Experiment Station Work—XL. Pp. 32.
282. Celery. Pp. 36.
283. Spraying for Apple Diseases and the Codling Moth in the Ozarks. Pp. 42.
284. Insect and Fungous Enemies of the Grape East of the Rocky Mountains. Pp. 48.
285. The Advantage of Planting Heavy Cotton Seed. Pp. 16.
286. Comparative Value of Whole Cotton Seed and Cotton-seed Meal in Fertilizing Cotton. Pp. 14.
287. Poultry Management. Pp. 48.
288. Nonsaccharine Sorghums. Pp. 28.
289. Beans. Pp. 28.
290. The Cotton Bollworm. Pp. 32.
291. Evaporation of Apples. Pp. 38.
292. Cost of Filling Silos. Pp. 15.
293. Use of Fruit as Food. Pp. 38.
294. Farm Practice in the Columbia Basin Uplands. Pp. 30.
295. Potatoes and Other Root Crops as Food. Pp. 45.
296. Experiment Station Work—XLI. Pp. 32.
298. Food Value of Corn and Corn Products. Pp. 40.
299. Diversified Farming Under the Plantation System. Pp. 14.
300. Some Important Grasses and Forage Plants for the Gulf Coast Region. Pp. 15.
301. Home-grown Tea. Pp. 16.
302. Sea Island Cotton: Its Culture, Improvement, and Diseases. Pp. 48.
303. Corn Harvesting Machinery. Pp. 32.
304. Growing and Curing Hops. Pp. 39.
305. Experiment Station Work—XLII. Pp. 32.
306. Dodder in Relation to Farm Seeds. Pp. 27.
307. Roselle: Its Culture and Uses. Pp. 16.
309. Experiment Station Work—XLIII. Pp. 32.
310. A Successful Alabama Diversification Farm. Pp. 24.
311. Sand-clay and Burnt-clay Roads. Pp. 19.
312. A Successful Southern Hay Farm. Pp. 15.
313. Harvesting and Storing Corn. Pp. 29.
314. A Method of Breeding Early Cotton to Escape Boll-weevil Damage. Pp. 28.
315. Progress in Legume Inoculation. Pp. 20.
316. Experiment Station Work—XLIV. Pp. 32.
317. Experiment Station Work—XLV. Pp. 32.
318. Cowpeas. Pp. 28.
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321. The Use of the Split-log Drag on Earth Roads. Pp. 14.
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323. Clover Farming on the Sandy Jack-pine Lands of the North. Pp. 24.
324. Sweet Potatoes. Pp. 39.
325. Small Farms in the Corn Belt. Pp. 29.
326. Building Up a Run-down Cotton Plantation. Pp. 22.
327. The Conservation of Natural Resources. Pp. 12.
328. Silver Fox Farming. Pp. 22.
329. Experiment Station Work—XLVII. Pp. 32.
330. Deer Farming in the United States. Pp. 20.
331. Forage Crops for Hogs in Kansas. Pp. 24.
332. Nuts and Their Uses as Food. Pp. 28.
333. Cotton Wilt. Pp. 24.
334. Experiment Station Work—XLVIII. Pp. 32.
335. Harmful and Beneficial Mammals of the Arid Interior. Pp. 31.
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337. Cropping Systems for New England Dairy Farms. Pp. 24.
338. Macadam Roads. Pp. 39.
339. Alfalfa. Pp. 48.
340. Declaration of Governors for Conservation of Natural Resources. Pp. 8.
341. The Basket Willow. Pp. 43.
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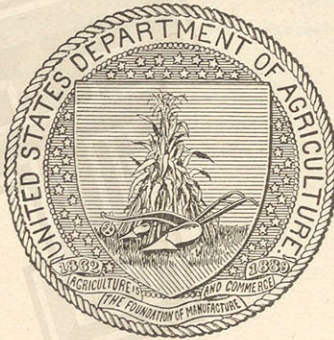
FARMERS' BULLETIN 319.

DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 3, 1908.

SIR: I have the honor to transmit herewith a manuscript entitled "Demonstration Work in Cooperation with Southern Farmers," by Dr. S. A. Knapp, Special Agent in Charge of Farmers' Cooperative Demonstration Work, and recommend that it be published as a Farmers' Bulletin.

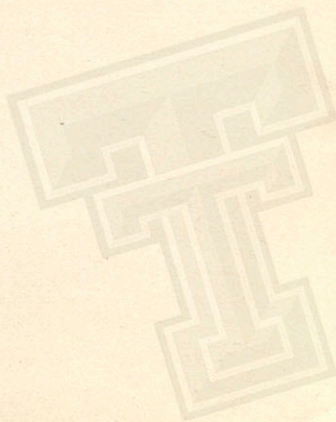
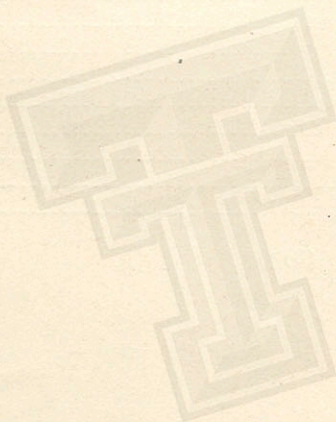
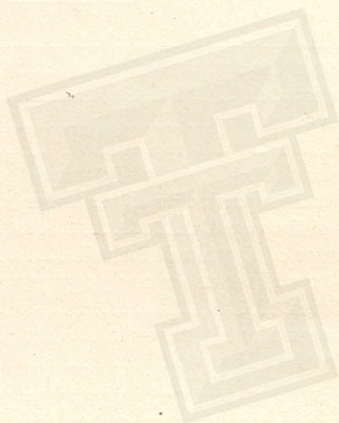
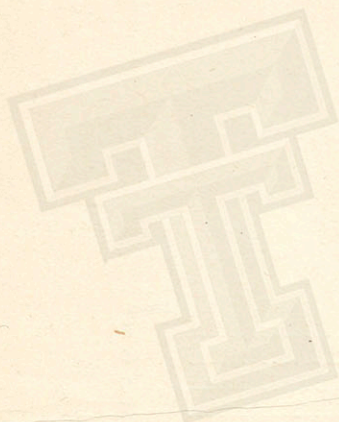
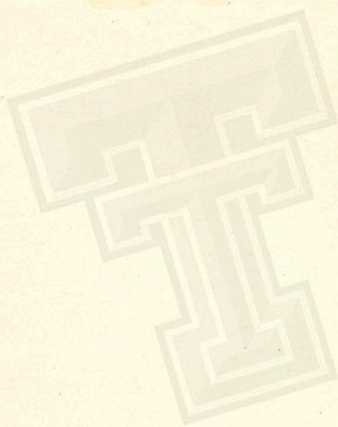
Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

INTRODUCTION.

The Farmers' Cooperative Demonstration Work conducted by the United States Department of Agriculture through the Bureau of Plant Industry was inaugurated under authority of Congress in January, 1904, primarily because of the depredations of the Mexican cotton boll weevil in the State of Texas. By the rapid spread of this pest east and north it had then become evident that it would in time invade all of the cotton-producing States. This occasioned a general alarm among the cotton planters and in the industrial centers of the entire country. For a number of years prior to 1904 the Mexican boll weevil had been steadily encroaching upon the cotton-producing lands of Texas, until it had spread from the Rio Grande to a short distance beyond the eastern boundary of the State and threatened the entire cotton industry of the South. In sections where cotton was the sole cash crop the invasion of the weevil and the consequent loss of the cotton crop brought disaster to every interest and so completely demoralized financial conditions as to produce in some sections a panic.

The cotton crop had been generally produced upon a credit system by securing advances from merchants and bankers. Upon the advent of the boll weevil, confidence in securing a cotton crop was impaired and in some districts almost totally destroyed. The usual advances were either withheld or limited; labor became discontented and sought other sections or other States, and tenant farmers unable to obtain advances removed to noninfested districts, a marked decline in property values resulting.

These circumstances created a demand for immediate relief which appealed to the entire country, as the loss of the cotton crop would be a national calamity. In response to this appeal Congress made an emergency appropriation in January, 1904, which has been continued each year, thus affording opportunity for the growth and enlargement of the work.

THE TWO BRANCHES OF THE DEMONSTRATION WORK.

As at present organized and developed, the Farmers' Cooperative Demonstration Work may be said to consist of two divisions: (1) The demonstration of improved methods of agriculture in the weevil-infected districts, which is the natural outgrowth of the original plan, and (2) the extension of the same principles to other Southern States beyond the range of weevil infestation.

The territory covered by the first division of the work includes eastern and northern Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi. The total area thus covered is more than 300,000 square miles. The work in Arkansas, Oklahoma, and Mississippi has been broadly inaugurated only since October, 1907.

The second division of the work was commenced in Mississippi in March, 1906. In cooperation with the General Education Board of New York, this work in 1907 was conducted in a limited way in Alabama and Virginia, and has recently been extended into North Carolina, South Carolina, and Georgia. The expenses of this division of the work are defrayed by the General Education Board, which has appropriated the sum of \$69,000 for demonstration work during the year commencing October 1, 1907. The board has shown deep interest, hearty cooperation, and a very broad philanthropy in this work of reaching the rural masses and bettering farm conditions.

PLAN OF ORGANIZATION.

The Farmers' Cooperative Demonstration Work is conducted by the writer as special agent in charge, who reports directly to the Chief of the Bureau of Plant Industry. A corps of field agents, classified according to territory in charge, as State, district, and county agents, is employed. The county agents are appointed mainly on the advice of local committees of prominent business men and farmers conversant with the territory to be worked. Each agent has in charge the practical work in one or more counties, strictly under such general directions as may be issued from the central office at Washington, D. C. The field agents have been selected with special reference to a thorough knowledge of improved agriculture and practical experience in farming in the sections to which appointed. District agents are expected to have not only a knowledge of scientific agriculture, but to be practical farmers and to have had considerable experience in the demonstration work. State agents are strong and capable men, who have shown their ability to successfully carry out the instructions of the central office over a large territory, and they are especially qualified for the work by the possession of the tact necessary to influence men.

The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to our instructions. This is visited by an agent as often as once a month, if possible, to see that these instructions are carried out and to give any further advice necessary.

A "cooperator" is a farmer who agrees to work a part or all of his crop according to our instructions, but a Department agent only visits him in exceptional cases.

During the ensuing year there will be employed in the cooperative demonstration work 59 agents paid from Government appropriations, and in the extension work 84 agents paid by the General Education Board. With this force about 12,000 demonstration farms had been established up to February 1, 1908, and 20,000 farmers had agreed to cooperate and make reports as to results.

SCOPE OF THE DEMONSTRATIONS.

The Farmers' Cooperative Demonstration Work is a system by which the simple and well-established principles of successful farming are directly taught to the men on the farms. The men who toil on the farms to produce the food that nourishes all the people, and who in a large measure provide the resources that support our civilization, are as justly entitled to a knowledge of the best that science and general experience have evolved for increase of production and for the betterment of agricultural conditions as the youth of our country are entitled to an education that will fit them for a broader citizenship.

One of the most serious problems in the reform of agricultural methods has been how to influence the farmer to adopt improved practices. It has been found that the mere dissemination of printed information sometimes does not accomplish this result, and therefore the method of neighborhood farm demonstrations in cooperation with progressive farmers has been evolved. The effect of a field demonstration is immediate and positive, and reaches all classes.

By actual count, it is determined that the number of farmers who annually visit each demonstration farm ranges from thirty to a hundred. If the average is placed as low as thirty the total number visiting 12,000 demonstration farms in one year would be 360,000. If we add the cooperating farmers, the aggregate is greatly increased.

The teaching by object lessons is more effective where it is simple, direct, and limited to a few common field crops, such as cotton, corn, cowpeas, and oats in the South, so that the comparisons may be evident and accepted at a glance. If general success can be secured with these standard crops, further diversification follows as a natural result.

Briefly stated, the salient features of the cooperative farm demonstrations are as follows:

- (1) Better drainage of the soil.
- (2) A deeper and more thoroughly pulverized seed bed; deep fall breaking (plowing) with implements that will not bring the subsoil to the surface.
- (3) The use of seed of the best variety, intelligently selected and carefully stored.
- (4) In cultivated crops, giving the rows and the plants in the rows a space suited to the plant, the soil, and the climate.
- (5) Intensive tillage during the growing period of the crops.
- (6) The importance of a high content of humus in the soil. The use of legumes, barnyard manure, farm refuse, and commercial fertilizers.
- (7) The value of crop rotation and a winter cover crop on southern farms.
- (8) The accomplishing of more work in a day on the farm by using more horse power and better implements.
- (9) The importance of increasing the farm stock to the extent of utilizing all the waste products and idle lands of the farm.
- (10) The production of all food required for the men and animals on the farm.
- (11) The keeping of an account with each farm product, in order to know from which the gain or loss arises.

THE INSTRUCTIONS.

Our instructions have the following advantages: (1) What the Department of Agriculture at Washington knows from its vast stores of information about the special crop under consideration; (2) what the State agricultural experiment stations in the South have demonstrated to be the most advantageous methods; (3) what the best farmers in the South have tested and proved to be the most successful practices upon the farm, and (4) the knowledge obtained by the traveling agents of this demonstration work, who visit and have personal knowledge of the localities in the State in which they are stationed. Even then the instructions given are along the lines of correct principles, leaving many details to the good judgment of the farmer.

In this cooperative work great stress is laid upon a more thorough preparation of the soil in the autumn, because in our southern climate the frosts do not penetrate the soils sufficiently to open them and admit air; we must therefore do by plowing in the fall and by some winter cultivation what Nature does in the colder North.

In the richest soils there is but little food ready prepared for the plant, and Nature's plan is that this food shall be prepared more or

less daily by the action of the air, the moisture in the soils, and the sun. These three agents make active the forces that prepare the food, so the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced before the winter the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the best variety for the purpose, carefully selected early in the fall and stored in a dry place. The reasons for very frequent cultivation are the admission of air, the conservation of moisture in the soil, and the prevention of a surface crust.

Young plants require excellent cultivation, just as young animals require the best food and care.

The judicious use of commercial fertilizers is one of the most important matters in modern agriculture, for this furnishes plant food directly and indirectly to the young plants. For soil improvement we must largely depend upon barnyard manure, the compost heap, and leguminous plants, such as cowpeas.

The importance of doing more as well as better work in a day has not been sufficiently impressed upon the southern farmer. This requires the use of stronger teams and better tools. Working 3 acres in a day where 1 is worked now and working each acre three times as well is a problem in profit easily understood after demonstration.

HOW FARMERS ARE INFLUENCED TO ADOPT BETTER METHODS.

In the South nearly all the merchants, bankers, and lawyers in the towns and smaller cities own farms and are intensely interested in agriculture. They form an effective center of influence, easily convinced of the value of the cooperative demonstration plan by reason of their high intelligence. Meetings are called and the work inaugurated. No further argument is necessary after the demonstrations have been made. Facts do the talking. The teachers in the public schools are generally alert and render most valuable assistance. The agricultural colleges and agricultural experiment stations give hearty cooperation. Thus, general interest is aroused in these demonstrations, which leads to careful observation and study on the part of the farmers and of the community. Public meetings are held for the discussion of these plans. In the cotton-producing States the first instructions include cotton as the main cash crop, corn as the standard food for work animals and the basis for more stock on the farm, cowpeas for food and for the renovation of the soil, oats or wheat as a winter cover crop, and the meadow and the pasture as the most economical source of food for farm stock. When

the farmer has mastered these crops he is ready for diversification in any desired direction.

In districts where cotton is not the standard cash crop, instruction is given in whatever replaces cotton as a money-earning crop. These simple lessons at the start are gradually made progressive until they cover all information necessary to success in the agriculture of the district.

As a means of reaching thousands of farmers with whom our agents do not come in personal contact, systematic use is made of the newspapers. Every bulletin or letter of instruction sent to coöperators is also furnished to about 2,000 county newspapers, and by most of them published in full. The hearty cooperation of the press has been of great value to the demonstration work.

THE CULTURAL SYSTEM FOR PRODUCING COTTON UNDER BOLL-WEEVIL CONDITIONS.

As it is evident that the cotton boll weevil will soon spread over the entire cotton-producing territory of the United States, it is a matter of general interest to know how cotton is at present produced with the weevil present.

Success in making a cotton crop under boll-weevil conditions is based upon three principles. It was found (1) that the numbers of the weevils could be limited so that they would not become totally destructive to the crop until the first and middle crops are out of danger; (2) that the cotton plant can be so bred and selected as to throw nearly its whole life forces into the lower and middle crops, and (3) that the plant can be so hastened to maturity by the application of cultural methods that most of the bolls will be developed to the safety point before the weevils are too numerous.

Guided by the principles just mentioned, the Bureau of Plant Industry has worked out a cooperative plan of producing cotton under boll-weevil conditions, which is known through the South as the "cotton-cultural system." This plan is based upon our knowledge of the cotton plant and upon the life habits of the boll weevil as ascertained by the Bureau of Entomology.^a Its chief features may be briefly mentioned, as follows:

(1) The destruction of the weevils in the fall (*a*) by burning the cotton stalks early in the fall while the weevils are still upon them and (*b*) by burning all rubbish in and about the field which might serve for hibernating quarters.

It is so difficult to secure a general adoption by the farmers of the plan of early burning of the cotton stalks that we have allowed the stalks to be turned under provided the immature bolls are destroyed.

^a See Bulletin No. 51 of the Bureau of Entomology.

(2) Immediately after destroying the bolls breaking (plowing) the field as deep as conditions will allow.

(3) The shallow winter cultivation of the soil.

(4) As early planting as the season will allow with safety to the crop.

(5) The planting of early-maturing varieties of cotton.

(6) The use of fertilizers.

(7) Leaving more space between the rows, and on ordinary uplands having a greater distance between plants in the row than is usually allowed. On rich or highly fertilized lands it is better to crowd the plants slightly in the rows to avoid the excessive growth of the stalks.

(8) The use of the toothed harrow before and after planting and on the young cotton.

(9) Intensive shallow cultivation.

(10) Agitation of the stalks by means of brush attached to the cultivator.

(11) Picking up and burning the squares that fall, where practicable.

(12) Controlling the growth of the plant if excessive by barring off or topping.

(13) Selecting the seed.

(14) The rotation of crops and the use of legumes.

It will be noted that the system as outlined has a twofold object:

(1) To reduce the number of weevils and (2) to aid early maturity in order to obtain a crop in advance of the weevil.

A few remarks concerning the main features of this plan may prove of value.

DESTRUCTION OF THE WEEVILS.

One of the greatest dangers to the cotton crop is the wintering of large numbers of weevils. By a failure to destroy early in the fall the immature cotton bolls and the rubbish in the fields, enough weevils may be wintered over to jeopardize the crops the ensuing year. If the immature bolls and the field rubbish are destroyed the stalks may be safely plowed under. The rubbish in the field which may serve for hibernating quarters includes the borders and fence corners.

Two methods of destroying the over-wintered weevils while they are feeding on the tender terminal buds are advocated: (1) They may be hand picked and burned or (2) some may be destroyed by the use of the harrow and brush.

FALL AND WINTER CULTIVATION OF THE SOIL.

After the destruction of the bolls in the fall, breaking (plowing) the field 1 or 2 inches deeper than usual assists in the destruction of the weevils and in the preparation of the field for successful cropping the following season. In order to air the soil and destroy grass, shallow winter cultivation of the soil should be practiced, i. e., working the land with a toothed harrow or a disk once every twenty or thirty days during the winter, as the weather may permit. The soil should be in excellent condition at the time of planting.

EARLY PLANTING AND THE USE OF EARLY-MATURING VARIETIES.

The object of early planting is to hasten the maturity of the crop. The Bureau of Entomology has shown that the weevils do not multiply until the squares begin to form and do not generally become numerous enough to destroy the entire crop before the last of July. In addition to this, early planting has been found generally helpful against cotton pests, such as the bollworm and the leafworm. Furthermore, the winter rains usually leave the soil with plenty of moisture, while in the spring there is liable to be a drought which may retard germination in late planting.

Varieties of cotton differ in time of maturity, and the same variety may differ owing to soil, moisture, fertilization, cultivation, etc. The planting of early-maturing varieties of cotton is not only important as an aid in securing a crop, but also as a means of destroying the weevil. The early-maturing cotton can be gathered and the immature bolls destroyed before it is time for the weevils to go into winter quarters. If all growers would plant early-maturing cotton and follow the plan here outlined it would result in greatly lessening the damage of the weevil.

In advising the planting of early-maturing cotton it is not the intention to advocate the exclusive use of small-boll cotton. These varieties may be better adapted to the northern limits of the cotton belt, but in nine-tenths of the cotton-producing territory there are large-boll varieties which can be just as successfully grown under boll-weevil conditions as the small-boll cottons. They must be varieties that are generally vigorous and that put out short-jointed fruit limbs close to the ground.

USE OF FERTILIZERS.

The use of fertilizers, especially acid phosphate and potash, to hasten maturity and increase fruitage, as well as the use of cotton-seed meal when necessary to promote vigor and growth, is recom-

mended. Soils and methods of application are fully explained, and it has been demonstrated that a small quantity of fertilizer properly applied accomplishes marvelous results.

SPACING BETWEEN PLANTS AND ROWS.

Planting in rows wider than usual and allowing more space in the row on light lands are advised under boll-weevil conditions. Special attention must be directed to have the rows the proper distance apart and to thin the plants in the rows. There must be width enough for the sun's rays to reach the earth between the rows and thus aid in destroying the larvæ of the weevil.

Generally speaking, more space to the plant makes a better stalk with more limbs, more bloom, and a higher grade of cotton. The spacing between the rows and in the rows must depend on the soil and the variety of cotton. More space should be given to fertilized than to unfertilized cotton. If, however, extreme space is allowed between plants in the rows and intensive cultivation is given there may be enough stimulus imparted to the growth of the plant to actually retard maturity unless the growth is controlled by barring off, as explained later; hence, on rich lands it is best to give plenty of space between the rows and to crowd the plants a little in the rows.

USE OF THE TOOTHED HARROW.

The use of the toothed harrow as soon as the crop comes up is of sufficient importance to warrant special mention. After early planting the germination is frequently slow and the earth may become crusted. The harrow may be used to break the crust before the plants are up and should be used soon afterwards to keep the soil loose so that the plants will take on rapid growth at once. The crop is surprisingly advanced by the judicious use of the harrow.

INTENSIVE CULTIVATION.

Plowing or cultivating deep the first time and shallow at all subsequent times is an important feature of good cotton production. It destroys weeds, increases the plant food, and conserves moisture, consequently hastening maturity. Under boll-weevil conditions the cotton crop should be cultivated every week. Some of our most successful cooperators have cultivated fifteen times and continued till picking commenced.

AGITATION OF STALKS.

Violent agitation of the cotton stalks when cultivating or plowing, by means of a brush attached to the cultivator or plow, is recommended. Some farmers attach a chain to the tongue and smooth

poles to the whiffletrees, and also a pole to the handles, so as to brush the stalks more than once in passing. Bundles of soft, leafy twigs are better. This knocks off the infested squares. The great majority of squares fall off naturally in a very few days after they become infested. Abundant testimony has come from our cooperators to show that as long as weekly cultivation of the crop with violent agitation of the stalks is continued the damage done by the boll weevil is greatly reduced.

PICKING UP FALLEN SQUARES.

An important aid toward the destruction of the weevils is picking up the squares that fall. If two or three generations can thus be destroyed, it will result in retarding the increase of the weevil and in adding to the cotton crop. This reduces the rapidity with which the weevils multiply and is a great aid in saving the crop.

BARRING OFF OR TOPPING.

Under boll-weevil conditions the main cotton crop must be made upon the lower and middle limbs. There is no use of a tall plant. The growth of the plant should therefore be controlled by barring off or topping. As soon as the plant indicates too rapid growth, bar off on each side, thus slightly root pruning and retarding upward growth. The tendency will then be to throw more vigor into the lower limbs and to put on more fruit. This method is especially valuable on rich bottom lands where the stalks frequently grow 6 to 7 feet high. It should be noted that with the boll weevil no top crop is made; hence, more bottom crop must be secured, requiring a low, limby, vigorous plant.

SELECTING AND STORING SEED.

Scarcely any item in the cultural system is of more importance than the selection of the seed as an aid to early maturity in the following crop. The largest, best, and earliest bolls from the most vigorous short-jointed plants should be selected for seed in advance of the general picking and be stored in a dry place. The planting of early-maturing varieties and the selection of seed from the earliest and best bolls on the most vigorous and best developed stalks are fundamental principles in growing cotton irrespective of the boll weevil and can not be too closely followed.

ROTATION OF CROPS AND USE OF LEGUMES.

The Bureau of Plant Industry in all its instructions seeks to build up soil energy and to improve the mechanical condition of the soil as well. An important factor to this end is rotation of crops and the increase of humus by plowing under green plants, especially cow-

peas. This builds up the soil and renders it more porous and responsive.

Some of the serious difficulties in cotton production arise from the growing of consecutive crops of cotton on the same land. This reduces fertility and hence operates against early maturity. With the best of efforts to clear fields of the weevil in the fall by burning the stalks and deep plowing, some weevils will survive, and a few soon infest a field. By planting one half of the land to corn and cowpeas and the other half to cotton, as much cotton can be produced as formerly and the land will be gradually restored to its original fertility. The corn and cowpeas will also add materially to the income of the farm, but the special reason urged for such rotation under boll-weevil infestation is that the crop of corn and peas leaves the field free from the weevil, as it feeds only upon cotton. It is evident that with the boll weevil it requires more labor to cultivate an acre of cotton; consequently, only as many acres should be planted as can be given the best attention, so as to produce a maximum crop, thus leaving more land for cereals and for meadows and pastures.

DEMONSTRATION WORK ON VARIOUS FARM CROPS.

The Farmers' Cooperative Demonstration Work, as before stated, aims to cover the entire scope of the management of the standard crops in the sections where the work is conducted. In addition to the cotton-culture system, which is the main feature of the work in many localities, it may be well to give brief mention of some of the cooperative work on other crops now under way, such as corn culture, the use of soil-renovating crops, and the production of good farm seeds.

CORN CULTURE.

Corn is the main grain dependence for farm stock and can be successfully raised in most portions of the South. Any considerable increase in its annual production would have a marked effect upon the value of the unused lands for grazing purposes and would perceptibly increase the income of the farms. The importance of corn for food and for rotation with other crops gives it a rank next to cotton as a standard farm crop. Notwithstanding this, its cultivation has been singularly neglected until the average yield per acre has fallen below the profit line in many States. Even at the high value per bushel allowed, the corn crop in many of the Southern States does not pay a living wage or a fair rent value for the land.

There is abundant proof that large and profitable crops of corn can be produced in the South by the use of the best seed and improved methods. The planting of low-grade seed in a shallow and impoverished seed bed is responsible in the main for deficient yields and quality. However, to secure the best results other reforms must be made,

such as better drainage, an adjustment of distances between the rows and the stalks in the rows to meet the requirements of soil and climate, intensive cultivation of the crop, the use of cowpeas in the corn, and the following of the corn with a winter cover crop.

The Farmers' Cooperative Demonstration Work includes instruction along all of these lines, and the results have been most encouraging. Our investigations show that not even 1 per cent of the lands in the South planted to corn are plowed deeply enough at breaking, that they have not sufficient humus, and that they are not given the proper tillage to make the best crop. Seed is so generally defective that only about one-third of so-called good seed is suitable for planting if maximum yields are expected. Along these practical lines we are conducting cooperative demonstrations with the object of increasing the corn crop in the South Atlantic and Gulf States at least threefold per acre without additional cost. A system of seed selection for improving the quality and increasing the yield and methods of storage for the preservation of vitality are outlined, detailed instructions being given on application.

Selection of Seed Corn.

The object of the average farmer in planting corn is to secure the largest crop of good corn possible under the conditions. The selection of the seed is very important.

For the best results corn should be selected in the field. The Japanese select their rice seed before the harvest.

The model ear of corn is only a small part of the problem. The stalk, the leaf, the root habits, the husk, and the environment of the plant from which the ear is taken must be considered. Most of the Southern States are subject to a shorter or longer drought during the period of growth of the corn crop, and the crop will depend largely upon the drought-resisting habits of leaf and roots. Some varieties of corn which are model in ear have so open a husk that the weevils destroy much of it while in the field. Again the ear in the crib does not tell how many weak or bastard stalks grew in the vicinity.

COWPEAS AND OTHER SOIL-RENOVATING CROPS.

As just stated, corn requires a strong, well-tilled soil, and upon thin land, deteriorated by bad management, the yield soon drops below a remunerative average. Such lands will, however, profitably produce other crops of great value for the sustenance of farm stock, and, in addition, the growing of these crops will provide an excellent means of soil renovation. Lands that are now producing 10 bushels of corn per acre will with much less labor produce $1\frac{1}{4}$ tons of cowpea hay per acre, equal in nutritive value to 31 bushels of corn, or they will yield $1\frac{1}{4}$ tons of peanut hay per acre, equal in nutritive value to

23 $\frac{3}{4}$ bushels of corn, and in addition a peanut crop of 25 bushels per acre may be secured.

On rich lands that under good culture will produce 40 or more bushels of corn per acre satisfactory results can be secured by planting cowpeas between the rows of corn. Even rich bottom lands rated to yield 40 bushels of corn per acre if sown to alfalfa frequently produce 5 tons of hay per acre in a season, equal in feeding value to 105 $\frac{1}{2}$ bushels of corn. In addition, such crops as cowpeas, peanuts, and alfalfa rapidly enrich the soil and leave it in excellent mechanical condition for the ensuing year.

Generally speaking, poor hill lands should not be used for corn culture unless they are placed under a thorough system of renovation, or unless fertilization with stable manure or compost is practiced to a high degree.

SEED FARMS.

The good-seed problem has been a most difficult one to solve in the South. Very few farmers have paid any attention to planting pure seed or keeping it pure when planted, and still fewer have tried to improve their seed by selection. Not one farm in one hundred in the South has proper storage for good seed. Through field agents prominent farmers in every county have been induced to establish seed farms, where the cultivation of the crop and the selection and storing of the seed are supervised by agents of this cooperative demonstration work under an agreement that the seed produced shall be distributed to the farmers at a moderate price. The best seeds for a given section are observed and a general interest is aroused among the farmers to plant a separate seed patch on every farm and carefully select for improvement.

PRACTICAL RESULTS ACCOMPLISHED.

The field operations in connection with the Farmers' Cooperative Demonstration Work extend over such a vast territory that it is difficult to state results in a concrete way. The following statements give the more important items in condensed form:

Amount available from Congressional appropriations for year 1907-8.	\$77, 739. 80
General Education Board, contribution ^a -----	69, 000. 00
Slater fund ^a -----	1, 000. 00
Voluntary local contributions (estimated) ^b -----	20, 000. 00
	<hr/> 167, 739. 80

^a The responsibility for handling these funds remains in the hands of the contributors, acting under the advice of the agent in charge.

^b Many counties ask for more demonstration farms and more improved seed than the Department of Agriculture can furnish on account of lack of funds. Some of these pledge the money necessary to thus supplement the work.

Agent in charge.....	1
General assistant agents.....	2
Field agents.....	143
States partially or wholly worked.....	10
Public meetings held annually.....	2, 750
Circulars distributed annually.....	200, 000
Number of demonstration farms, 1907-8, of which exact records are kept in central office.....	12, 000
Number of cooperating farmers, 1907-8.....	20, 000
Number of farmers visiting the demonstration farms annually (conservatively estimated)	360, 000

Great interest is everywhere manifested in better preparation of the soil, in planting selected seed, and in general betterment.

Thousands of prize contests have been started in cotton and corn production among farmers and also among boys on the farm.

Thousands of letters bearing testimony to the value of the work have been received, but it is impossible to present any extended digest of these within the limits of a Farmers' Bulletin.

The following extracts from letters received show the people's estimate of the value of this demonstration work:

MARSHALL, TEX., *October 10, 1907.*

We, the undersigned committee for Harrison County, Tex., make the following preliminary report on the Farmers' Cooperative Demonstration Work done the past season in this county.

On account of the ravages of the boll weevil, Harrison County, Tex., was threatened with a disaster in the loss of the cotton crop that would affect every material interest in the county. The loss of money was not the sole consideration. Our tenants and farm laborers would to a large extent leave the county, and it would thus permanently injure our Commonwealth. In this emergency we appealed to the United States Department of Agriculture through you for advice and aid. You came to our county and organized the work in February, 1907, under an arrangement by which the Department of Agriculture would furnish superintendence and the people of this county would raise enough funds to buy improved seed for the demonstration farms. The citizens of the county promptly raised and deposited in bank \$1,000 and later contributed \$700 more, making a total of \$1,700 invested in better seed. All agreements between the Department of Agriculture and the people were promptly and satisfactorily carried out. Almost without exception this was the worst season this section has ever known for producing cotton, but without reservation we wish to make the following statements:

(1) The results of the demonstration work have been in the highest degree satisfactory to our people, and they regard this movement as one of the greatest ever made for the upbuilding of our section.

(2) Our people are unanimous in asking for its continuance and would regard the discontinuance of the work as an untold disaster.

(3) Among the many good things accomplished we enumerate the following:

(a) It established over 300 demonstration farms, scattered over the entire county.

(b) It taught better culture and introduced better seed. These two items alone were worth more than \$100,000 this year to our county in actual cash, to

say nothing of future benefits. The improvement was so apparent that the observing traveler on the highways could pick out every demonstration field.

(c) This demonstration work saved a stampede of tenant farmers and laborers from the farms.

(d) It gave confidence to the merchants and bankers that a crop would be made, and thus promoted credit.

(e) It demonstrated to the farmers that a crop of cotton could be made under extremely adverse condition of weather and insect pests, and they enter upon another year with perfect confidence.

Great credit for the success of this year's work is due to the excellent supervision of W. F. Proctor, State agent for Texas, and to the untiring energy of T. O. Plunkett, local agent.

JNO. H. POPE.	M. SCULLY.
W. T. TWYMON.	H. B. MCWILLIAMS.
P. G. WHALEY.	W. L. MARTIN.

The above committeemen are well known to me and are among the most substantial and reliable citizens of Harrison County, Tex., and I also personally indorse the statements made.

H. S. LYTLETON,
County Judge, Harrison County, Tex.

PALESTINE, TEX., *January 1, 1908.*

DEAR SIR: We, the undersigned citizens of Anderson County, Tex., desire to acquaint you with the character of the work done in this county since last March through the department known as the Farmers' Cooperative Demonstration Work, and to call your attention to some of the beneficial results accomplished.

The work of the Department in this county was done on a comparatively small scale. The enterprising board of trade of the city of Palestine contributed \$600 to this work, which constituted the sum of local support the work has had in the way of money contributed. But, notwithstanding this, the result of the work accomplished has been most gratifying in many ways.

Two hundred demonstration farms have been established; improved seed has been used; improved methods of cultivation have been employed, and a fine showing has been made. Outside of these demonstration farms a conservative estimate places the average yield of cotton per acre at about 300 pounds of seed cotton, or about 1 bale to 6 acres. The record made by the demonstration farms is 608 pounds of seed cotton per acre as an average. The yield of corn per acre outside of the demonstration farms is certainly not greater than 15 bushels per acre. The demonstration farms show an average yield of 28½ bushels per acre.^a

This good showing on the cotton is still further augmented by the fact that while it formerly took about 1,700 pounds of seed cotton to make a bale, the improved seed used on the demonstration farms produces a bale with 1,400 pounds of seed cotton.

These manifest results of the work are proving very stimulating to the farming interests, and the advantages of the work of this first season are simply incalculable. We believe that one of the certain results is a general awaken-

^a The yields of cotton and corn given are unusually low because of the excessive rainfall.

ing of the farmers of this county to the need of better seeds and up-to-date methods of farming.

It must be remembered that the showing that has been made this last year has been made under the most adverse circumstances imaginable. Adverse crop conditions have existed from the very beginning of the work.

We earnestly petition that the good work be continued in this county on just as large a scale as possible, and we pledge the same our hearty cooperation and encouragement. * * *

JOHN R. HEARNE,
President, Board of Trade, and
President, Royall National Bank.

R. R. CLARIDGE,
President, Texas Div., Southern
Corn Association.

Y. L. JONES,
Merchant.

H. HORWITZ,
Merchant.

H. W. WATTS,
Ex-Sheriff, Anderson County.

DON M. BARRETT,
Ex-Tax Collector, Anderson County.

S. M. PAUL,
Farmer.

J. J. STRICKLAND,
Representative,
Thirtieth Legislature.

DENISON BOARD OF TRADE,
Denison, Tex., January 2, 1908.

DEAR SIR: Referring to your esteemed favor of recent date, beg to say that we greatly appreciate your interest and cooperation in our efforts for agricultural advancement, and we expect great good to result from the work planned next year. The work of the past year has served to thoroughly arouse our people to an understanding of the great work that your Department is doing in the interest of agricultural advancement.

Your work in this community during the past year has been of inestimable value to our people. There has been a wonderful awakening of interest among our farmers, who are now on the alert for new ideas and progressive methods. There was a time, perhaps, when farmers regarded the work of the Department of Agriculture as empty theory and spurned the advice of what they pleased to term "book farmers," but they now realize the science of agriculture and the wonderful possibilities for improvement and for increasing their earning capacity. Such an awakening is manifest on every hand in the vicinity of Denison, where wonderful progress has been made during the past year. I feel safe in the assertion that there has been more scientific and methodical work on the farms about Denison during 1907 than ever before. * * * This is evidence of real prosperity—prosperity so firmly established that our little city and the surrounding country hardly realized the existence of the financial flurry which so upset conditions throughout the country.

We regard the work in the interest of agricultural advancement as being the most productive effort of this organization, and we feel deeply indebted to you for cooperation, which has made our work much more effective than it could have been otherwise. We feel that the object lessons provided by you last year were very effective, and the establishment of the 30 demonstration and cooperative farms planned for the next year insures even greater progress. Two of the farmers who operated demonstration plats the past year under the able direction of Mr. J. L. Quicksall have sold all their Triumph seed they had to spare at \$1 per bushel.

We are especially anxious to encourage the corn growers whom we have succeeded in so thoroughly arousing during the past year. I have never known so

much interest in the improvement of corn as is in evidence here at this time.
 * * * We are anxious to render any possible service that will facilitate your work in the vicinity of Denison, believing that your continued cooperation will assist us in making this the greatest agricultural section of the Southwest.

Very truly yours,

T. W. LARKIN,
Secretary.

TAYLOR, LA., *January 5, 1908.*

DEAR SIR: Some four years ago I worked a plat of land by your cultural method, which gave me much better results than the usual methods previously used. I have been following the same instructions in part for the last three seasons, and find this method gives better results, especially the thorough preparation of the seed bed and the distance between rows and plants. I find the crop much easier worked and the yield better in quality, as well as quantity. I also have tried to help a good thing along by showing your instructions and my crop to others and by having my tenants work by same. One of the parties to whom I read the instructions and showed the crop asked me to see his crop last summer, saying he had worked it my way and had the best crop he ever raised in his life. I think he had a fine crop for the season.

Respectfully,

W. C. WALL.

CLARENDON, ARK., *December 20, 1907.*

DEAR SIR: I took up your plan of farming in 1906 in a small way with good results; in fact, was so well pleased with it that I planted and cultivated something like 400 acres this year. I followed your directions in preparation and cultivation, using 200 pounds of phosphate per acre. While we had the wettest and coldest and most backward spring I ever knew, causing me to plant the greater part of my crop over the fourth time and as late as June 9 to 12, then only getting about half a stand on most of it, and after that date only had rain enough to keep the plows out of the field a few hours until picking time, I am satisfied with the result, some of it paying me as high as \$30 per acre net rent, the lowest \$6 per acre, averaging about \$13 per acre net. I more than doubled my yield of corn. I expect to go at it more extensively next year. I have had my plows going for two weeks, preparing cotton land for 1908.

Very respectfully,

W. S. JEFFRIES.

STONEWALL, LA., *December 13, 1907.*

DEAR SIR: Having spent twenty-five years in paying for cotton lands and a cotton gin and otherwise getting in shape to grow and handle cotton to advantage, we have studied and watched with deep interest every movement which was calculated to relieve us from the ravages of the boll weevil, and now we write to thank you and Mr. Cowden (agent) for the work done in this community in the way of establishing demonstration farms this year. We feel sure this is the best manner to reach most of our people, who have grown skeptical of book farming, but are easily convinced by a practical application of your methods. We have tried your plans for two years and think it our only hope to outwit the boll weevil.

Trusting you may be able to continue your work in our parish next year,

We are, with regards, yours truly,

J. M. & M. G. NELSON.

THE BUSINESS MEN'S LEAGUE OF HELENA, ARK.,

Helena, Ark., January 11, 1908.

DEAR SIR: Our league has on foot a movement to increase the production per acre of cotton and corn in this section.

Two years ago an experiment was conducted under the immediate care of Messrs. E. D. Pillow and H. G. Stephens, one of your representatives having a general supervision of the experiment. No fertilizer was used, but the cultural methods adopted proved wonderfully beneficial and a large yield of cotton resulted. During the season just past, Mr. Stephens conducted an experiment upon his own behalf, using nitrate of soda as a fertilizer for cotton and cotton-seed meal for corn. He has made us a report which we will publish, and that, together with a letter from Mr. E. D. Pillow, will be mailed by us to about 1,000 farmers in this section. * * * We would also ask your cooperation in this matter and would like to know if it would be possible to secure the services of a representative of the Agricultural Department to make a tour of inspection at short intervals for the purpose of aiding these farmers by way of instruction and general information. The experiment would be more apt to prove profitable if some one would make the rounds and let it be known in advance that an inspection would be made.

Kindly write us fully upon this subject and tell us to what extent and in what manner you can aid us in this movement.

Yours truly,

E. C. HONOR.

CONCLUSION.

It has been proved by our cooperative demonstration work that by following the instructions of the Bureau of Plant Industry a good crop of cotton can be raised in the worst-infested boll-weevil districts and despite the ravages of this pest. It is possible that the future may discover some better method of meeting the boll-weevil problems, but experience has shown that the method outlined is the only safe one at present. The boll weevil has now covered a large portion of Texas, Louisiana, Arkansas, Oklahoma, and several counties in Mississippi. It is annually invading new territory with a column 600 miles long and in numbers sufficient to cover every stalk of cotton to a width of 30 miles. A cotton crop can be produced despite the boll weevil, and the sooner American farmers face the situation the better it will be for all concerned. To demonstrate the truth of this theory is one object of the Farmers' Cooperative Demonstration Work.

In the foregoing pages have been mentioned only some of the lines of demonstration which have been undertaken for rural uplifting. The results have far exceeded our expectations, and the farmers have accepted the work gratefully and have cooperated to the best of their ability in every undertaking. It is along such lines as these that great economies can be practiced and valuable reforms wrought for the betterment of rural conditions and for solving the problems of the farm.

FARMERS' BULLETINS.

The following is a list, by number, of the Farmers' Bulletins available for distribution. The bulletins entitled "Experiment Station Work" give in brief the results of experiments performed by the State experiment stations. Titles of other bulletins are self-explanatory. Bulletins in this list will be sent free to any address in the United States on application to a Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C. Numbers omitted have been discontinued, being superseded by later bulletins.

22. The Feeding of Farm Animals. Pp. 40.
24. Hog Cholera and Swine Plague. Pp. 16.
25. Peanuts: Culture and Uses. Pp. 24.
27. Flax for Seed and Fiber. Pp. 16.
28. Weeds: And How to Kill Them. Pp. 30.
29. Souring and Other Changes in Milk. Pp. 22.
30. Grape Diseases on the Pacific Coast. Pp. 15.
32. Silos and Silage. Pp. 30.
33. Peach Growing for Market. Pp. 24.
34. Meats: Composition and Cooking. Pp. 31.
35. Potato Culture. Pp. 24.
36. Cotton Seed and Its Products. Pp. 16.
42. Facts about Milk. Pp. 32.
44. Commercial Fertilizers. Pp. 38.
47. Insects Affecting the Cotton Plant. Pp. 32.
48. The Manuring of Cotton. Pp. 16.
51. Standard Varieties of Chickens. Pp. 48.
52. The Sugar Beet. Pp. 48.
54. Some Common Birds. Pp. 48.
55. The Dairy Herd. Pp. 30.
56. Experiment Station Work—I. Pp. 30.
58. The Soy Bean as a Forage Crop. Pp. 24.
59. Bee Keeping. Pp. 48.
60. Methods of Curing Tobacco. Pp. 24.
61. Asparagus Culture. Pp. 40.
62. Marketing Farm Produce. Pp. 31.
63. Care of Milk on the Farm. Pp. 40.
64. Ducks and Geese. Pp. 55.
65. Experiment Station Work—II. Pp. 32.
66. Meadows and Pastures. Pp. 30.
69. Experiment Station Work—III. Pp. 32.
71. Essentials in Beef Production. Pp. 24.
72. Cattle Ranges of the Southwest. Pp. 32.
73. Experiment Station Work—IV. Pp. 32.
74. Milk as Food. Pp. 39.
77. The Liming of Soils. Pp. 24.
78. Experiment Station Work—V. Pp. 32.
79. Experiment Station Work—VI. Pp. 27.
80. The Peach Twig-Borer. Pp. 16.
81. Corn Culture in the South. Pp. 24.
82. The Culture of Tobacco. Pp. 22.
83. Tobacco Soils. Pp. 23.
84. Experiment Station Work—VII. Pp. 32.
85. Fish as Food. Pp. 32.
86. Thirty Poisonous Plants. Pp. 32.
87. Experiment Station Work—VIII. Pp. 32.
88. Alkali Lands. Pp. 23.
91. Potato Diseases and Treatment. Pp. 15.
92. Experiment Station Work—IX. Pp. 30.
93. Sugar as Food. Pp. 31.
95. Good Roads for Farmers. Pp. 46.
97. Experiment Station Work—X. Pp. 32.
98. Suggestions to Southern Farmers. Pp. 48.
99. Insect Enemies of Shade Trees. Pp. 30.
100. Hog Raising in the South. Pp. 40.
101. Millets. Pp. 30.
102. Southern Forage Plants. Pp. 48.
103. Experiment Station Work—XI. Pp. 30.
104. Notes on Frost. Pp. 24.
105. Experiment Station Work—XII. Pp. 32.
106. Breeds of Dairy Cattle. Pp. 48.
107. Experiment Station Work—XIII. Pp. 32.
108. Saltbushes. Pp. 20.
110. Rice Culture in the United States. Pp. 28.
111. Farmers' Interest in Good Seed. Pp. 24.
112. Bread and Bread Making. Pp. 40.
113. The Apple and How to Grow It. Pp. 32.
114. Experiment Station Work—XIV. Pp. 28.
116. Irrigation in Fruit Growing. Pp. 48.
118. Grape Growing in the South. Pp. 32.
119. Experiment Station Work—XV. Pp. 30.
120. Insects Affecting Tobacco. Pp. 32.
121. Beans, Peas, and Other Legumes as Food. Pp. 38.
122. Experiment Station Work—XVI. Pp. 32.
124. Experiment Station Work—XVII. Pp. 32.
125. Protection of Food Products from Injurious Temperatures. Pp. 24.
126. Practical Suggestions for Farm Buildings. Pp. 48.
127. Important Insecticides. Pp. 46.
128. Eggs and Their Uses as Food. Pp. 40.
129. Sweet Potatoes. Pp. 40.
131. Household Tests for Detection of Oleomargarine and Renovated Butter. Pp. 10.
132. Insect Enemies of Growing Wheat. Pp. 38.
133. Experiment Station Work—XVIII. Pp. 32.
134. Tree Planting in Rural School Grounds. Pp. 32.
135. Sorghum Sirup Manufacture. Pp. 40.
137. The Angora Goat. Pp. 48.
138. Irrigation in Field and Garden. Pp. 40.
139. Emmer: A Grain for the Semiarid Regions. Pp. 16.
140. Pineapple Growing. Pp. 48.
142. Principles of Nutrition and Nutritive Value of Food. Pp. 48.
144. Experiment Station Work—XIX. Pp. 32.
145. Carbon Bisulphid as an Insecticide. Pp. 28.
147. Winter Forage Crops for the South. Pp. 40.
149. Experiment Station Work—XX. Pp. 32.
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151. Dairying in the South. Pp. 48.
152. Scabies in Cattle. Pp. 32.
153. Orchard Enemies in the Pacific Northwest. Pp. 39.
154. The Home Fruit Garden: Preparation and Care. Pp. 16.
155. How Insects Affect Health in Rural Districts. Pp. 19.
156. The Home Vineyard. Pp. 22.
157. The Propagation of Plants. Pp. 24.
158. How to Build Small Irrigation Ditches. Pp. 28.
159. Scab in Sheep. Pp. 43.
161. Practical Suggestions for Fruit Growers. Pp. 30.
162. Experiment Station Work—XXI. Pp. 32.
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165. Silkworm Culture. Pp. 32.
166. Cheese Making on the Farm. Pp. 16.
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168. Pearl Millet. Pp. 16.
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172. Scale Insects and Mites on Citrus Trees. Pp. 43.
173. Primer of Forestry. Pp. 48.
174. Broom Corn. Pp. 30.
175. Home Manufacture and Use of Unfermented Grape Juice. Pp. 16.
176. Cranberry Culture. Pp. 20.
177. Squab Raising. Pp. 32.
178. Insects Injurious in Cranberry Culture. Pp. 32.
179. Horseshoeing. Pp. 30.
181. Pruning. Pp. 39.
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183. Meat on the Farm: Butchering, Curing, and Keeping. Pp. 37.
185. Beautifying the Home Grounds. Pp. 24.
186. Experiment Station Work—XXIII. Pp. 32.
187. Drainage of Farm Lands. Pp. 38.
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190. Experiment Station Work—XXIV. Pp. 32.
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193. Experiment Station Work—XXV. Pp. 32.
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209. Controlling the Boll Weevil in Cotton Seed and at Gineries. Pp. 32.
210. Experiment Station Work—XXVII. Pp. 32.
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213. Raspberries. Pp. 38.
215. Alfalfa Growing. Pp. 40.
217. Essential Steps in Securing an Early Crop of Cotton. Pp. 16.
218. The School Garden. Pp. 40.
219. Lessons from the Grain Rust Epidemic of 1904. Pp. 24.
220. Tomatoes. Pp. 32.
221. Fungous Diseases of the Cranberry. Pp. 16.
222. Experiment Station Work—XXVIII. Pp. 32.
223. Miscellaneous Cotton Insects in Texas. Pp. 24.
224. Canadian Field Peas. Pp. 16.
225. Experiment Station Work—XXIX. Pp. 32.
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261. The Cattle Tick. Pp. 22.
262. Experiment Station Work—XXXVI. Pp. 32.
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293. Use of Fruit as Food. Pp. 38.
294. Farm Practice in the Columbia Basin Uplands. Pp. 30.
295. Potatoes and Other Root Crops as Food. Pp. 45.
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U. S. DEPARTMENT OF AGRICULTURE.

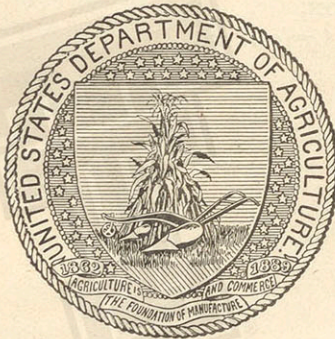
FARMERS' BULLETIN 319.

DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 3, 1908.

SIR: I have the honor to transmit herewith a manuscript entitled "Demonstration Work in Cooperation with Southern Farmers," by Dr. S. A. Knapp, Special Agent in Charge of Farmers' Cooperative Demonstration Work, and recommend that it be published as a Farmers' Bulletin.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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DEMONSTRATION WORK IN COOPERATION WITH SOUTHERN FARMERS.

INTRODUCTION.

The Farmers' Cooperative Demonstration Work conducted by the United States Department of Agriculture through the Bureau of Plant Industry was inaugurated under authority of Congress in January, 1904, primarily because of the depredations of the Mexican cotton boll weevil in the State of Texas. By the rapid spread of this pest east and north it had then become evident that it would in time invade all of the cotton-producing States. This occasioned a general alarm among the cotton planters and in the industrial centers of the entire country. For a number of years prior to 1904 the Mexican boll weevil had been steadily encroaching upon the cotton-producing lands of Texas, until it had spread from the Rio Grande to a short distance beyond the eastern boundary of the State and threatened the entire cotton industry of the South. In sections where cotton was the sole cash crop the invasion of the weevil and the consequent loss of the cotton crop brought disaster to every interest and so completely demoralized financial conditions as to produce in some sections a panic.

The cotton crop had been generally produced upon a credit system by securing advances from merchants and bankers. Upon the advent of the boll weevil, confidence in securing a cotton crop was impaired and in some districts almost totally destroyed. The usual advances were either withheld or limited; labor became discontented and sought other sections or other States, and tenant farmers unable to obtain advances removed to noninfested districts, a marked decline in property values resulting.

These circumstances created a demand for immediate relief which appealed to the entire country, as the loss of the cotton crop would be a national calamity. In response to this appeal Congress made an emergency appropriation in January, 1904, which has been continued each year, thus affording opportunity for the growth and enlargement of the work.

THE TWO BRANCHES OF THE DEMONSTRATION WORK.

As at present organized and developed, the Farmers' Cooperative Demonstration Work may be said to consist of two divisions: (1) The demonstration of improved methods of agriculture in the weevil-infected districts, which is the natural outgrowth of the original plan, and (2) the extension of the same principles to other Southern States beyond the range of weevil infestation.

The territory covered by the first division of the work includes eastern and northern Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi. The total area thus covered is more than 300,000 square miles. The work in Arkansas, Oklahoma, and Mississippi has been broadly inaugurated only since October, 1907.

The second division of the work was commenced in Mississippi in March, 1906. In cooperation with the General Education Board of New York, this work in 1907 was conducted in a limited way in Alabama and Virginia, and has recently been extended into North Carolina, South Carolina, and Georgia. The expenses of this division of the work are defrayed by the General Education Board, which has appropriated the sum of \$69,000 for demonstration work during the year commencing October 1, 1907. The board has shown deep interest, hearty cooperation, and a very broad philanthropy in this work of reaching the rural masses and bettering farm conditions.

PLAN OF ORGANIZATION.

The Farmers' Cooperative Demonstration Work is conducted by the writer as special agent in charge, who reports directly to the Chief of the Bureau of Plant Industry. A corps of field agents, classified according to territory in charge, as State, district, and county agents, is employed. The county agents are appointed mainly on the advice of local committees of prominent business men and farmers conversant with the territory to be worked. Each agent has in charge the practical work in one or more counties, strictly under such general directions as may be issued from the central office at Washington, D. C. The field agents have been selected with special reference to a thorough knowledge of improved agriculture and practical experience in farming in the sections to which appointed. District agents are expected to have not only a knowledge of scientific agriculture, but to be practical farmers and to have had considerable experience in the demonstration work. State agents are strong and capable men, who have shown their ability to successfully carry out the instructions of the central office over a large territory, and they are especially qualified for the work by the possession of the tact necessary to influence men.

The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to our instructions. This is visited by an agent as often as once a month, if possible, to see that these instructions are carried out and to give any further advice necessary.

A "cooperator" is a farmer who agrees to work a part or all of his crop according to our instructions, but a Department agent only visits him in exceptional cases.

During the ensuing year there will be employed in the cooperative demonstration work 59 agents paid from Government appropriations, and in the extension work 84 agents paid by the General Education Board. With this force about 12,000 demonstration farms had been established up to February 1, 1908, and 20,000 farmers had agreed to cooperate and make reports as to results.

SCOPE OF THE DEMONSTRATIONS.

The Farmers' Cooperative Demonstration Work is a system by which the simple and well-established principles of successful farming are directly taught to the men on the farms. The men who toil on the farms to produce the food that nourishes all the people, and who in a large measure provide the resources that support our civilization, are as justly entitled to a knowledge of the best that science and general experience have evolved for increase of production and for the betterment of agricultural conditions as the youth of our country are entitled to an education that will fit them for a broader citizenship.

One of the most serious problems in the reform of agricultural methods has been how to influence the farmer to adopt improved practices. It has been found that the mere dissemination of printed information sometimes does not accomplish this result, and therefore the method of neighborhood farm demonstrations in cooperation with progressive farmers has been evolved. The effect of a field demonstration is immediate and positive, and reaches all classes.

By actual count, it is determined that the number of farmers who annually visit each demonstration farm ranges from thirty to a hundred. If the average is placed as low as thirty the total number visiting 12,000 demonstration farms in one year would be 360,000. If we add the cooperating farmers, the aggregate is greatly increased.

The teaching by object lessons is more effective where it is simple, direct, and limited to a few common field crops, such as cotton, corn, cowpeas, and oats in the South, so that the comparisons may be evident and accepted at a glance. If general success can be secured with these standard crops, further diversification follows as a natural result.

Briefly stated, the salient features of the cooperative farm demonstrations are as follows:

- (1) Better drainage of the soil.
- (2) A deeper and more thoroughly pulverized seed bed; deep fall breaking (plowing) with implements that will not bring the subsoil to the surface.
- (3) The use of seed of the best variety, intelligently selected and carefully stored.
- (4) In cultivated crops, giving the rows and the plants in the rows a space suited to the plant, the soil, and the climate.
- (5) Intensive tillage during the growing period of the crops.
- (6) The importance of a high content of humus in the soil. The use of legumes, barnyard manure, farm refuse, and commercial fertilizers.
- (7) The value of crop rotation and a winter cover crop on southern farms.
- (8) The accomplishing of more work in a day on the farm by using more horse power and better implements.
- (9) The importance of increasing the farm stock to the extent of utilizing all the waste products and idle lands of the farm.
- (10) The production of all food required for the men and animals on the farm.
- (11) The keeping of an account with each farm product, in order to know from which the gain or loss arises.

THE INSTRUCTIONS.

Our instructions have the following advantages: (1) What the Department of Agriculture at Washington knows from its vast stores of information about the special crop under consideration; (2) what the State agricultural experiment stations in the South have demonstrated to be the most advantageous methods; (3) what the best farmers in the South have tested and proved to be the most successful practices upon the farm, and (4) the knowledge obtained by the traveling agents of this demonstration work, who visit and have personal knowledge of the localities in the State in which they are stationed. Even then the instructions given are along the lines of correct principles, leaving many details to the good judgment of the farmer.

In this cooperative work great stress is laid upon a more thorough preparation of the soil in the autumn, because in our southern climate the frosts do not penetrate the soils sufficiently to open them and admit air; we must therefore do by plowing in the fall and by some winter cultivation what Nature does in the colder North.

In the richest soils there is but little food ready prepared for the plant, and Nature's plan is that this food shall be prepared more or

less daily by the action of the air, the moisture in the soils, and the sun. These three agents make active the forces that prepare the food, so the plant can be properly nourished. This can not be done without plowing and cultivating to admit the air, and the earlier this work is commenced before the winter the greater the effect it will have upon the crop of the following season.

The effect of using good seed is not sufficiently appreciated, nor perhaps is it understood just what makes good seed. It must be the best variety for the purpose, carefully selected early in the fall and stored in a dry place. The reasons for very frequent cultivation are the admission of air, the conservation of moisture in the soil, and the prevention of a surface crust.

Young plants require excellent cultivation, just as young animals require the best food and care.

The judicious use of commercial fertilizers is one of the most important matters in modern agriculture, for this furnishes plant food directly and indirectly to the young plants. For soil improvement we must largely depend upon barnyard manure, the compost heap, and leguminous plants, such as cowpeas.

The importance of doing more as well as better work in a day has not been sufficiently impressed upon the southern farmer. This requires the use of stronger teams and better tools. Working 3 acres in a day where 1 is worked now and working each acre three times as well is a problem in profit easily understood after demonstration.

HOW FARMERS ARE INFLUENCED TO ADOPT BETTER METHODS.

In the South nearly all the merchants, bankers, and lawyers in the towns and smaller cities own farms and are intensely interested in agriculture. They form an effective center of influence, easily convinced of the value of the cooperative demonstration plan by reason of their high intelligence. Meetings are called and the work inaugurated. No further argument is necessary after the demonstrations have been made. Facts do the talking. The teachers in the public schools are generally alert and render most valuable assistance. The agricultural colleges and agricultural experiment stations give hearty cooperation. Thus, general interest is aroused in these demonstrations, which leads to careful observation and study on the part of the farmers and of the community. Public meetings are held for the discussion of these plans. In the cotton-producing States the first instructions include cotton as the main cash crop, corn as the standard food for work animals and the basis for more stock on the farm, cowpeas for food and for the renovation of the soil, oats or wheat as a winter cover crop, and the meadow and the pasture as the most economical source of food for farm stock. When

the farmer has mastered these crops he is ready for diversification in any desired direction.

In districts where cotton is not the standard cash crop, instruction is given in whatever replaces cotton as a money-earning crop. These simple lessons at the start are gradually made progressive until they cover all information necessary to success in the agriculture of the district.

As a means of reaching thousands of farmers with whom our agents do not come in personal contact, systematic use is made of the newspapers. Every bulletin or letter of instruction sent to cooperators is also furnished to about 2,000 county newspapers, and by most of them published in full. The hearty cooperation of the press has been of great value to the demonstration work.

THE CULTURAL SYSTEM FOR PRODUCING COTTON UNDER BOLL-WEEVIL CONDITIONS.

As it is evident that the cotton boll weevil will soon spread over the entire cotton-producing territory of the United States, it is a matter of general interest to know how cotton is at present produced with the weevil present.

Success in making a cotton crop under boll-weevil conditions is based upon three principles. It was found (1) that the numbers of the weevils could be limited so that they would not become totally destructive to the crop until the first and middle crops are out of danger; (2) that the cotton plant can be so bred and selected as to throw nearly its whole life forces into the lower and middle crops, and (3) that the plant can be so hastened to maturity by the application of cultural methods that most of the bolls will be developed to the safety point before the weevils are too numerous.

Guided by the principles just mentioned, the Bureau of Plant Industry has worked out a cooperative plan of producing cotton under boll-weevil conditions, which is known through the South as the "cotton-cultural system." This plan is based upon our knowledge of the cotton plant and upon the life habits of the boll weevil as ascertained by the Bureau of Entomology.^a Its chief features may be briefly mentioned, as follows:

(1) The destruction of the weevils in the fall (*a*) by burning the cotton stalks early in the fall while the weevils are still upon them and (*b*) by burning all rubbish in and about the field which might serve for hibernating quarters.

It is so difficult to secure a general adoption by the farmers of the plan of early burning of the cotton stalks that we have allowed the stalks to be turned under provided the immature bolls are destroyed.

^a See Bulletin No. 51 of the Bureau of Entomology.

- (2) Immediately after destroying the bolls breaking (plowing) the field as deep as conditions will allow.
- (3) The shallow winter cultivation of the soil.
- (4) As early planting as the season will allow with safety to the crop.
- (5) The planting of early-maturing varieties of cotton.
- (6) The use of fertilizers.
- (7) Leaving more space between the rows, and on ordinary uplands having a greater distance between plants in the row than is usually allowed. On rich or highly fertilized lands it is better to crowd the plants slightly in the rows to avoid the excessive growth of the stalks.
- (8) The use of the toothed harrow before and after planting and on the young cotton.
- (9) Intensive shallow cultivation.
- (10) Agitation of the stalks by means of brush attached to the cultivator.
- (11) Picking up and burning the squares that fall, where practicable.
- (12) Controlling the growth of the plant if excessive by barring off or topping.
- (13) Selecting the seed.
- (14) The rotation of crops and the use of legumes.

It will be noted that the system as outlined has a twofold object: (1) To reduce the number of weevils and (2) to aid early maturity in order to obtain a crop in advance of the weevil.

A few remarks concerning the main features of this plan may prove of value.

DESTRUCTION OF THE WEEVILS.

One of the greatest dangers to the cotton crop is the wintering of large numbers of weevils. By a failure to destroy early in the fall the immature cotton bolls and the rubbish in the fields, enough weevils may be wintered over to jeopardize the crops the ensuing year. If the immature bolls and the field rubbish are destroyed the stalks may be safely plowed under. The rubbish in the field which may serve for hibernating quarters includes the borders and fence corners.

Two methods of destroying the over-wintered weevils while they are feeding on the tender terminal buds are advocated: (1) They may be hand picked and burned or (2) some may be destroyed by the use of the harrow and brush.

FALL AND WINTER CULTIVATION OF THE SOIL.

After the destruction of the bolls in the fall, breaking (plowing) the field 1 or 2 inches deeper than usual assists in the destruction of the weevils and in the preparation of the field for successful cropping the following season. In order to air the soil and destroy grass, shallow winter cultivation of the soil should be practiced, i. e., working the land with a toothed harrow or a disk once every twenty or thirty days during the winter, as the weather may permit. The soil should be in excellent condition at the time of planting.

EARLY PLANTING AND THE USE OF EARLY-MATURING VARIETIES.

The object of early planting is to hasten the maturity of the crop. The Bureau of Entomology has shown that the weevils do not multiply until the squares begin to form and do not generally become numerous enough to destroy the entire crop before the last of July. In addition to this, early planting has been found generally helpful against cotton pests, such as the bollworm and the leafworm. Furthermore, the winter rains usually leave the soil with plenty of moisture, while in the spring there is liable to be a drought which may retard germination in late planting.

Varieties of cotton differ in time of maturity, and the same variety may differ owing to soil, moisture, fertilization, cultivation, etc. The planting of early-maturing varieties of cotton is not only important as an aid in securing a crop, but also as a means of destroying the weevil. The early-maturing cotton can be gathered and the immature bolls destroyed before it is time for the weevils to go into winter quarters. If all growers would plant early-maturing cotton and follow the plan here outlined it would result in greatly lessening the damage of the weevil.

In advising the planting of early-maturing cotton it is not the intention to advocate the exclusive use of small-boll cotton. These varieties may be better adapted to the northern limits of the cotton belt, but in nine-tenths of the cotton-producing territory there are large-boll varieties which can be just as successfully grown under boll-weevil conditions as the small-boll cottons. They must be varieties that are generally vigorous and that put out short-jointed fruit limbs close to the ground.

USE OF FERTILIZERS.

The use of fertilizers, especially acid phosphate and potash, to hasten maturity and increase fruitage, as well as the use of cotton-seed meal when necessary to promote vigor and growth, is recom-

mended. Soils and methods of application are fully explained, and it has been demonstrated that a small quantity of fertilizer properly applied accomplishes marvelous results.

SPACING BETWEEN PLANTS AND ROWS.

Planting in rows wider than usual and allowing more space in the row on light lands are advised under boll-weevil conditions. Special attention must be directed to have the rows the proper distance apart and to thin the plants in the rows. There must be width enough for the sun's rays to reach the earth between the rows and thus aid in destroying the larvæ of the weevil.

Generally speaking, more space to the plant makes a better stalk with more limbs, more bloom, and a higher grade of cotton. The spacing between the rows and in the rows must depend on the soil and the variety of cotton. More space should be given to fertilized than to unfertilized cotton. If, however, extreme space is allowed between plants in the rows and intensive cultivation is given there may be enough stimulus imparted to the growth of the plant to actually retard maturity unless the growth is controlled by barring off, as explained later; hence, on rich lands it is best to give plenty of space between the rows and to crowd the plants a little in the rows.

USE OF THE TOOTHED HARROW.

The use of the toothed harrow as soon as the crop comes up is of sufficient importance to warrant special mention. After early planting the germination is frequently slow and the earth may become crusted. The harrow may be used to break the crust before the plants are up and should be used soon afterwards to keep the soil loose so that the plants will take on rapid growth at once. The crop is surprisingly advanced by the judicious use of the harrow.

INTENSIVE CULTIVATION.

Plowing or cultivating deep the first time and shallow at all subsequent times is an important feature of good cotton production. It destroys weeds, increases the plant food, and conserves moisture, consequently hastening maturity. Under boll-weevil conditions the cotton crop should be cultivated every week. Some of our most successful cooperators have cultivated fifteen times and continued till picking commenced.

AGITATION OF STALKS.

Violent agitation of the cotton stalks when cultivating or plowing, by means of a brush attached to the cultivator or plow, is recommended. Some farmers attach a chain to the tongue and smooth

poles to the whiffletrees, and also a pole to the handles, so as to brush the stalks more than once in passing. Bundles of soft, leafy twigs are better. This knocks off the infested squares. The great majority of squares fall off naturally in a very few days after they become infested. Abundant testimony has come from our cooperators to show that as long as weekly cultivation of the crop with violent agitation of the stalks is continued the damage done by the boll weevil is greatly reduced.

PICKING UP FALLEN SQUARES.

An important aid toward the destruction of the weevils is picking up the squares that fall. If two or three generations can thus be destroyed, it will result in retarding the increase of the weevil and in adding to the cotton crop. This reduces the rapidity with which the weevils multiply and is a great aid in saving the crop.

BARRING OFF OR TOPPING.

Under boll-weevil conditions the main cotton crop must be made upon the lower and middle limbs. There is no use of a tall plant. The growth of the plant should therefore be controlled by barring off or topping. As soon as the plant indicates too rapid growth, bar off on each side, thus slightly root pruning and retarding upward growth. The tendency will then be to throw more vigor into the lower limbs and to put on more fruit. This method is especially valuable on rich bottom lands where the stalks frequently grow 6 to 7 feet high. It should be noted that with the boll weevil no top crop is made; hence, more bottom crop must be secured, requiring a low, limby, vigorous plant.

SELECTING AND STORING SEED.

Scarcely any item in the cultural system is of more importance than the selection of the seed as an aid to early maturity in the following crop. The largest, best, and earliest bolls from the most vigorous short-jointed plants should be selected for seed in advance of the general picking and be stored in a dry place. The planting of early-maturing varieties and the selection of seed from the earliest and best bolls on the most vigorous and best developed stalks are fundamental principles in growing cotton irrespective of the boll weevil and can not be too closely followed.

ROTATION OF CROPS AND USE OF LEGUMES.

The Bureau of Plant Industry in all its instructions seeks to build up soil energy and to improve the mechanical condition of the soil as well. An important factor to this end is rotation of crops and the increase of humus by plowing under green plants, especially cow-

peas. This builds up the soil and renders it more porous and responsive.

Some of the serious difficulties in cotton production arise from the growing of consecutive crops of cotton on the same land. This reduces fertility and hence, operates against early maturity. With the best of efforts to clear fields of the weevil in the fall by burning the stalks and deep plowing, some weevils will survive, and a few soon infest a field. By planting one half of the land to corn and cowpeas and the other half to cotton, as much cotton can be produced as formerly and the land will be gradually restored to its original fertility. The corn and cowpeas will also add materially to the income of the farm, but the special reason urged for such rotation under boll-weevil infestation is that the crop of corn and peas leaves the field free from the weevil, as it feeds only upon cotton. It is evident that with the boll weevil it requires more labor to cultivate an acre of cotton; consequently, only as many acres should be planted as can be given the best attention, so as to produce a maximum crop, thus leaving more land for cereals and for meadows and pastures.

DEMONSTRATION WORK ON VARIOUS FARM CROPS.

The Farmers' Cooperative Demonstration Work, as before stated, aims to cover the entire scope of the management of the standard crops in the sections where the work is conducted. In addition to the cotton-culture system, which is the main feature of the work in many localities, it may be well to give brief mention of some of the cooperative work on other crops now under way, such as corn culture, the use of soil-renovating crops, and the production of good farm seeds.

CORN CULTURE.

Corn is the main grain dependence for farm stock and can be successfully raised in most portions of the South. Any considerable increase in its annual production would have a marked effect upon the value of the unused lands for grazing purposes and would perceptibly increase the income of the farms. The importance of corn for food and for rotation with other crops gives it a rank next to cotton as a standard farm crop. Notwithstanding this, its cultivation has been singularly neglected until the average yield per acre has fallen below the profit line in many States. Even at the high value per bushel allowed, the corn crop in many of the Southern States does not pay a living wage or a fair rent value for the land.

There is abundant proof that large and profitable crops of corn can be produced in the South by the use of the best seed and improved methods. The planting of low-grade seed in a shallow and impoverished seed bed is responsible in the main for deficient yields and quality. However, to secure the best results other reforms must be made,

such as better drainage, an adjustment of distances between the rows and the stalks in the rows to meet the requirements of soil and climate, intensive cultivation of the crop, the use of cowpeas in the corn, and the following of the corn with a winter cover crop.

The Farmers' Cooperative Demonstration Work includes instruction along all of these lines, and the results have been most encouraging. Our investigations show that not even 1 per cent of the lands in the South planted to corn are plowed deeply enough at breaking, that they have not sufficient humus, and that they are not given the proper tillage to make the best crop. Seed is so generally defective that only about one-third of so-called good seed is suitable for planting if maximum yields are expected. Along these practical lines we are conducting cooperative demonstrations with the object of increasing the corn crop in the South Atlantic and Gulf States at least threefold per acre without additional cost. A system of seed selection for improving the quality and increasing the yield and methods of storage for the preservation of vitality are outlined, detailed instructions being given on application.

Selection of Seed Corn.

The object of the average farmer in planting corn is to secure the largest crop of good corn possible under the conditions. The selection of the seed is very important.

For the best results corn should be selected in the field. The Japanese select their rice seed before the harvest.

The model ear of corn is only a small part of the problem. The stalk, the leaf, the root habits, the husk, and the environment of the plant from which the ear is taken must be considered. Most of the Southern States are subject to a shorter or longer drought during the period of growth of the corn crop, and the crop will depend largely upon the drought-resisting habits of leaf and roots. Some varieties of corn which are model in ear have so open a husk that the weevils destroy much of it while in the field. Again the ear in the crib does not tell how many weak or bastard stalks grew in the vicinity.

COWPEAS AND OTHER SOIL-RENOVATING CROPS.

As just stated, corn requires a strong, well-tilled soil, and upon thin land, deteriorated by bad management, the yield soon drops below a remunerative average. Such lands will, however, profitably produce other crops of great value for the sustenance of farm stock, and, in addition, the growing of these crops will provide an excellent means of soil renovation. Lands that are now producing 10 bushels of corn per acre will with much less labor produce $1\frac{1}{4}$ tons of cowpea hay per acre, equal in nutritive value to 31 bushels of corn, or they will yield $1\frac{1}{4}$ tons of peanut hay per acre, equal in nutritive value to

23 $\frac{3}{4}$ bushels of corn, and in addition a peanut crop of 25 bushels per acre may be secured.

On rich lands that under good culture will produce 40 or more bushels of corn per acre satisfactory results can be secured by planting cowpeas between the rows of corn. Even rich bottom lands rated to yield 40 bushels of corn per acre if sown to alfalfa frequently produce 5 tons of hay per acre in a season, equal in feeding value to 105 $\frac{1}{2}$ bushels of corn. In addition, such crops as cowpeas, peanuts, and alfalfa rapidly enrich the soil and leave it in excellent mechanical condition for the ensuing year.

Generally speaking, poor hill lands should not be used for corn culture unless they are placed under a thorough system of renovation, or unless fertilization with stable manure or compost is practiced to a high degree.

SEED FARMS.

The good-seed problem has been a most difficult one to solve in the South. Very few farmers have paid any attention to planting pure seed or keeping it pure when planted, and still fewer have tried to improve their seed by selection. Not one farm in one hundred in the South has proper storage for good seed. Through field agents prominent farmers in every county have been induced to establish seed farms, where the cultivation of the crop and the selection and storing of the seed are supervised by agents of this cooperative demonstration work under an agreement that the seed produced shall be distributed to the farmers at a moderate price. The best seeds for a given section are observed and a general interest is aroused among the farmers to plant a separate seed patch on every farm and carefully select for improvement.

PRACTICAL RESULTS ACCOMPLISHED.

The field operations in connection with the Farmers' Cooperative Demonstration Work extend over such a vast territory that it is difficult to state results in a concrete way. The following statements give the more important items in condensed form:

Amount available from Congressional appropriations for year 1907-8.	\$77, 739. 80
General Education Board, contribution ^a	69, 000. 00
Slater fund ^a	1, 000. 00
Voluntary local contributions (estimated) ^b	20, 000. 00
	<hr/> 167, 739. 80

^a The responsibility for handling these funds remains in the hands of the contributors, acting under the advice of the agent in charge.

^b Many counties ask for more demonstration farms and more improved seed than the Department of Agriculture can furnish on account of lack of funds. Some of these pledge the money necessary to thus supplement the work.

Agent in charge.....	1
General assistant agents.....	2
Field agents.....	143
States partially or wholly worked.....	10
Public meetings held annually.....	2, 750
Circulars distributed annually.....	200, 000
Number of demonstration farms, 1907-8, of which exact records are kept in central office.....	12, 000
Number of cooperating farmers, 1907-8.....	20, 000
Number of farmers visiting the demonstration farms annually (conservatively estimated).....	360, 000

Great interest is everywhere manifested in better preparation of the soil, in planting selected seed, and in general betterment.

Thousands of prize contests have been started in cotton and corn production among farmers and also among boys on the farm.

Thousands of letters bearing testimony to the value of the work have been received, but it is impossible to present any extended digest of these within the limits of a Farmers' Bulletin.

The following extracts from letters received show the people's estimate of the value of this demonstration work:

MARSHALL, TEX., *October 10, 1907.*

We, the undersigned committee for Harrison County, Tex., make the following preliminary report on the Farmers' Cooperative Demonstration Work done the past season in this county.

On account of the ravages of the boll weevil, Harrison County, Tex., was threatened with a disaster in the loss of the cotton crop that would affect every material interest in the county. The loss of money was not the sole consideration. Our tenants and farm laborers would to a large extent leave the county, and it would thus permanently injure our Commonwealth. In this emergency we appealed to the United States Department of Agriculture through you for advice and aid. You came to our county and organized the work in February, 1907, under an arrangement by which the Department of Agriculture would furnish superintendence and the people of this county would raise enough funds to buy improved seed for the demonstration farms. The citizens of the county promptly raised and deposited in bank \$1,000 and later contributed \$700 more, making a total of \$1,700 invested in better seed. All agreements between the Department of Agriculture and the people were promptly and satisfactorily carried out. Almost without exception this was the worst season this section has ever known for producing cotton, but without reservation we wish to make the following statements:

(1) The results of the demonstration work have been in the highest degree satisfactory to our people, and they regard this movement as one of the greatest ever made for the upbuilding of our section.

(2) Our people are unanimous in asking for its continuance and would regard the discontinuance of the work as an untold disaster.

(3) Among the many good things accomplished we enumerate the following:

(a) It established over 300 demonstration farms, scattered over the entire county.

(b) It taught better culture and introduced better seed. These two items alone were worth more than \$100,000 this year to our county in actual cash, to

say nothing of future benefits. The improvement was so apparent that the observing traveler on the highways could pick out every demonstration field.

(c) This demonstration work saved a stampede of tenant farmers and laborers from the farms.

(d) It gave confidence to the merchants and bankers that a crop would be made, and thus promoted credit.

(e) It demonstrated to the farmers that a crop of cotton could be made under extremely adverse condition of weather and insect pests, and they enter upon another year with perfect confidence.

Great credit for the success of this year's work is due to the excellent supervision of W. F. Proctor, State agent for Texas, and to the untiring energy of T. O. Plunkett, local agent.

JNO. H. POPE.	M. SCULLY.
W. T. TWYMON.	H. B. MCWILLIAMS.
P. G. WHALEY.	W. L. MARTIN.

The above committeemen are well known to me and are among the most substantial and reliable citizens of Harrison County, Tex., and I also personally indorse the statements made.

H. S. LITTLETON,
County Judge, Harrison County, Tex.

PALESTINE, TEX., *January 1, 1908.*

DEAR SIR: We, the undersigned citizens of Anderson County, Tex., desire to acquaint you with the character of the work done in this county since last March through the department known as the Farmers' Cooperative Demonstration Work, and to call your attention to some of the beneficial results accomplished.

The work of the Department in this county was done on a comparatively small scale. The enterprising board of trade of the city of Palestine contributed \$600 to this work, which constituted the sum of local support the work has had in the way of money contributed. But, notwithstanding this, the result of the work accomplished has been most gratifying in many ways.

Two hundred demonstration farms have been established; improved seed has been used; improved methods of cultivation have been employed, and a fine showing has been made. Outside of these demonstration farms a conservative estimate places the average yield of cotton per acre at about 300 pounds of seed cotton, or about 1 bale to 6 acres. The record made by the demonstration farms is 608 pounds of seed cotton per acre as an average. The yield of corn per acre outside of the demonstration farms is certainly not greater than 15 bushels per acre. The demonstration farms show an average yield of 28½ bushels per acre.^a

This good showing on the cotton is still further augmented by the fact that while it formerly took about 1,700 pounds of seed cotton to make a bale, the improved seed used on the demonstration farms produces a bale with 1,400 pounds of seed cotton.

These manifest results of the work are proving very stimulating to the farming interests, and the advantages of the work of this first season are simply incalculable. We believe that one of the certain results is a general awaken-

^a The yields of cotton and corn given are unusually low because of the excessive rainfall.

ing of the farmers of this county, to the need of better seeds and up-to-date methods of farming.

It must be remembered that the showing that has been made this last year has been made under the most adverse circumstances imaginable. Adverse crop conditions have existed from the very beginning of the work.

We earnestly petition that the good work be continued in this county on just as large a scale as possible, and we pledge the same our hearty cooperation and encouragement. * * *

JOHN R. HEARNE,
President, Board of Trade, and
President, Royall National Bank.
R. R. CLARIDGE,
President, Texas Div., Southern
Corn Association.

Y. L. JONES,
Merchant.
H. HORWITZ,
Merchant.

H. W. WATTS,
Ex-Sheriff, Anderson County.
DON M. BARRETT,
Ex-Tax Collector, Anderson County.
S. M. PAUL,
Farmer.
J. J. STRICKLAND,
Representative,
Thirtieth Legislature.

DENISON BOARD OF TRADE,

Denison, Tex., January 2, 1908.

DEAR SIR: Referring to your esteemed favor of recent date, beg to say that we greatly appreciate your interest and cooperation in our efforts for agricultural advancement, and we expect great good to result from the work planned next year. The work of the past year has served to thoroughly arouse our people to an understanding of the great work that your Department is doing in the interest of agricultural advancement.

Your work in this community during the past year has been of inestimable value to our people. There has been a wonderful awakening of interest among our farmers, who are now on the alert for new ideas and progressive methods. There was a time, perhaps, when farmers regarded the work of the Department of Agriculture as empty theory and spurned the advice of what they pleased to term "book farmers," but they now realize the science of agriculture and the wonderful possibilities for improvement and for increasing their earning capacity. Such an awakening is manifest on every hand in the vicinity of Denison, where wonderful progress has been made during the past year. I feel safe in the assertion that there has been more scientific and methodical work on the farms about Denison during 1907 than ever before. * * * This is evidence of real prosperity—prosperity so firmly established that our little city and the surrounding country hardly realized the existence of the financial flurry which so upset conditions throughout the country.

We regard the work in the interest of agricultural advancement as being the most productive effort of this organization, and we feel deeply indebted to you for cooperation, which has made our work much more effective than it could have been otherwise. We feel that the object lessons provided by you last year were very effective, and the establishment of the 30 demonstration and cooperative farms planned for the next year insures even greater progress. Two of the farmers who operated demonstration plats the past year under the able direction of Mr. J. L. Quicksall have sold all their Triumph seed they had to spare at \$1 per bushel.

We are especially anxious to encourage the corn growers whom we have succeeded in so thoroughly arousing during the past year. I have never known so

much interest in the improvement of corn as is in evidence here at this time.
 * * * We are anxious to render any possible service that will facilitate your work in the vicinity of Denison, believing that your continued cooperation will assist us in making this the greatest agricultural section of the Southwest.

Very truly yours,

T. W. LARKIN,

Secretary.

TAYLOR, LA., *January 5, 1908.*

DEAR SIR: Some four years ago I worked a plat of land by your cultural method, which gave me much better results than the usual methods previously used. I have been following the same instructions in part for the last three seasons, and find this method gives better results, especially the thorough preparation of the seed bed and the distance between rows and plants. I find the crop much easier worked and the yield better in quality, as well as quantity. I also have tried to help a good thing along by showing your instructions and my crop to others and by having my tenants work by same. One of the parties to whom I read the instructions and showed the crop asked me to see his crop last summer, saying he had worked it my way and had the best crop he ever raised in his life. I think he had a fine crop for the season.

Respectfully,

W. C. WALL.

CLARENDON, ARK., *December 20, 1907.*

DEAR SIR: I took up your plan of farming in 1906 in a small way with good results; in fact, was so well pleased with it that I planted and cultivated something like 400 acres this year. I followed your directions in preparation and cultivation, using 200 pounds of phosphate per acre. While we had the wettest and coldest and most backward spring I ever knew, causing me to plant the greater part of my crop over the fourth time and as late as June 9 to 12, then only getting about half a stand on most of it, and after that date only had rain enough to keep the plows out of the field a few hours until picking time, I am satisfied with the result, some of it paying me as high as \$30 per acre net rent, the lowest \$6 per acre, averaging about \$13 per acre net. I more than doubled my yield of corn. I expect to go at it more extensively next year. I have had my plows going for two weeks, preparing cotton land for 1908.

Very respectfully,

W. S. JEFFRIES.

STONEWALL, LA., *December 13, 1907.*

DEAR SIR: Having spent twenty-five years in paying for cotton lands and a cotton gin and otherwise getting in shape to grow and handle cotton to advantage, we have studied and watched with deep interest every movement which was calculated to relieve us from the ravages of the boll weevil, and now we write to thank you and Mr. Cowden (agent) for the work done in this community in the way of establishing demonstration farms this year. We feel sure this is the best manner to reach most of our people, who have grown skeptical of book farming, but are easily convinced by a practical application of your methods. We have tried your plans for two years and think it our only hope to outwit the boll weevil.

Trusting you may be able to continue your work in our parish next year,

We are, with regards, yours truly,

J. M. & M. G. NELSON.

THE BUSINESS MEN'S LEAGUE OF HELENA, ARK.,

Helena, Ark., January 11, 1908.

DEAR SIR: Our league has on foot a movement to increase the production per acre of cotton and corn in this section.

Two years ago an experiment was conducted under the immediate care of Messrs. E. D. Pillow and H. G. Stephens, one of your representatives having a general supervision of the experiment. No fertilizer was used, but the cultural methods adopted proved wonderfully beneficial and a large yield of cotton resulted. During the season just past, Mr. Stephens conducted an experiment upon his own behalf, using nitrate of soda as a fertilizer for cotton and cotton-seed meal for corn. He has made us a report which we will publish, and that, together with a letter from Mr. E. D. Pillow, will be mailed by us to about 1,000 farmers in this section. * * * We would also ask your cooperation in this matter and would like to know if it would be possible to secure the services of a representative of the Agricultural Department to make a tour of inspection at short intervals for the purpose of aiding these farmers by way of instruction and general information. The experiment would be more apt to prove profitable if some one would make the rounds and let it be known in advance that an inspection would be made.

Kindly write us fully upon this subject and tell us to what extent and in what manner you can aid us in this movement.

Yours truly,

E. C. HONOR.

CONCLUSION.

It has been proved by our cooperative demonstration work that by following the instructions of the Bureau of Plant Industry a good crop of cotton can be raised in the worst-infested boll-weevil districts and despite the ravages of this pest. It is possible that the future may discover some better method of meeting the boll-weevil problems, but experience has shown that the method outlined is the only safe one at present. The boll weevil has now covered a large portion of Texas, Louisiana, Arkansas, Oklahoma, and several counties in Mississippi. It is annually invading new territory with a column 600 miles long and in numbers sufficient to cover every stalk of cotton to a width of 30 miles. A cotton crop can be produced despite the boll weevil, and the sooner American farmers face the situation the better it will be for all concerned. To demonstrate the truth of this theory is one object of the Farmers' Cooperative Demonstration Work.

In the foregoing pages have been mentioned only some of the lines of demonstration which have been undertaken for rural uplifting. The results have far exceeded our expectations, and the farmers have accepted the work gratefully and have cooperated to the best of their ability in every undertaking. It is along such lines as these that great economies can be practiced and valuable reforms wrought for the betterment of rural conditions and for solving the problems of the farm.

FARMERS' BULLETINS.

The following is a list, by number, of the Farmers' Bulletins available for distribution. The bulletins entitled "Experiment Station Work" give in brief the results of experiments performed by the State experiment stations. Titles of other bulletins are self-explanatory. Bulletins in this list will be sent free to any address in the United States on application to a Senator, Representative, or Delegate in Congress, or to the Secretary of Agriculture, Washington, D. C. Numbers omitted have been discontinued, being superseded by later bulletins.

22. The Feeding of Farm Animals. Pp. 40.
24. Hog Cholera and Swine Plague. Pp. 16.
25. Peanuts: Culture and Uses. Pp. 24.
27. Flax for Seed and Fiber. Pp. 16.
28. Weeds: And How to Kill Them. Pp. 30.
29. Souring and Other Changes in Milk. Pp. 22.
30. Grape Diseases on the Pacific Coast. Pp. 15.
32. Silos and Silage. Pp. 30.
33. Peach Growing for Market. Pp. 24.
34. Meats: Composition and Cooking. Pp. 31.
35. Potato Culture. Pp. 24.
36. Cotton Seed and Its Products. Pp. 16.
42. Facts about Milk. Pp. 32.
44. Commercial Fertilizers. Pp. 38.
47. Insects Affecting the Cotton Plant. Pp. 32.
48. The Manuring of Cotton. Pp. 16.
51. Standard Varieties of Chickens. Pp. 48.
52. The Sugar Beet. Pp. 48.
54. Some Common Birds. Pp. 48.
55. The Dairy Herd. Pp. 30.
56. Experiment Station Work—I. Pp. 30.
58. The Soy Bean as a Forage Crop. Pp. 24.
59. Bee Keeping. Pp. 48.
60. Methods of Curing Tobacco. Pp. 24.
61. Asparagus Culture. Pp. 40.
62. Marketing Farm Produce. Pp. 31.
63. Care of Milk on the Farm. Pp. 40.
64. Ducks and Geese. Pp. 55.
65. Experiment Station Work—II. Pp. 32.
66. Meadows and Pastures. Pp. 30.
69. Experiment Station Work—III. Pp. 32.
71. Essentials in Beef Production. Pp. 24.
72. Cattle Ranges of the Southwest. Pp. 32.
73. Experiment Station Work—IV. Pp. 32.
74. Milk as Food. Pp. 39.
77. The Liming of Soils. Pp. 24.
78. Experiment Station Work—V. Pp. 32.
79. Experiment Station Work—VI. Pp. 27.
80. The Peach Twig-Borer. Pp. 16.
81. Corn Culture in the South. Pp. 24.
82. The Culture of Tobacco. Pp. 22.
83. Tobacco Soils. Pp. 23.
84. Experiment Station Work—VII. Pp. 32.
85. Fish as Food. Pp. 32.
86. Thirty Poisonous Plants. Pp. 32.
87. Experiment Station Work—VIII. Pp. 32.
88. Alkali Lands. Pp. 23.
91. Potato Diseases and Treatment. Pp. 15.
92. Experiment Station Work—IX. Pp. 30.
93. Sugar as Food. Pp. 31.
95. Good Roads for Farmers. Pp. 46.
97. Experiment Station Work—X. Pp. 32.
98. Suggestions to Southern Farmers. Pp. 48.
99. Insect Enemies of Shade Trees. Pp. 30.
100. Hog Raising in the South. Pp. 40.
101. Millets. Pp. 30.
102. Southern Forage Plants. Pp. 48.
103. Experiment Station Work—XI. Pp. 30.
104. Notes on Frost. Pp. 24.
105. Experiment Station Work—XII. Pp. 32.
106. Breeds of Dairy Cattle. Pp. 48.
107. Experiment Station Work—XIII. Pp. 32.
108. Saltbushes. Pp. 20.
110. Rice Culture in the United States. Pp. 28.
111. Farmers' Interest in Good Seed. Pp. 24.
112. Bread and Bread Making. Pp. 40.
113. The Apple and How to Grow It. Pp. 32.
114. Experiment Station Work—XIV. Pp. 28.
116. Irrigation in Fruit Growing. Pp. 48.
118. Grape Growing in the South. Pp. 32.
119. Experiment Station Work—XV. Pp. 30.
120. Insects Affecting Tobacco. Pp. 32.
121. Beans, Peas, and Other Legumes as Food. Pp. 38.
122. Experiment Station Work—XVI. Pp. 32.
124. Experiment Station Work—XVII. Pp. 32.
125. Protection of Food Products from Injurious Temperatures. Pp. 24.
126. Practical Suggestions for Farm Buildings. Pp. 48.
127. Important Insecticides. Pp. 46.
128. Eggs and Their Uses as Food. Pp. 40.
129. Sweet Potatoes. Pp. 40.
131. Household Tests for Detection of Oleomargarine and Renovated Butter. Pp. 10.
132. Insect Enemies of Growing Wheat. Pp. 38.
133. Experiment Station Work—XVIII. Pp. 32.
134. Tree Planting in Rural School Grounds. Pp. 32.
135. Sorghum Sirup Manufacture. Pp. 40.
137. The Angora Goat. Pp. 48.
138. Irrigation in Field and Garden. Pp. 40.
139. Emmer: A Grain for the Semiarid Regions. Pp. 16.
140. Pineapple Growing. Pp. 48.
142. Principles of Nutrition and Nutritive Value of Food. Pp. 48.
144. Experiment Station Work—XIX. Pp. 32.
145. Carbon Bisulphid as an Insecticide. Pp. 28.
147. Winter Forage Crops for the South. Pp. 40.
149. Experiment Station Work—XX. Pp. 32.
150. Clearing New Land. Pp. 24.
151. Dairying in the South. Pp. 48.
152. Scabies in Cattle. Pp. 32.
153. Orchard Enemies in the Pacific Northwest. Pp. 39.
154. The Home Fruit Garden: Preparation and Care. Pp. 16.
155. How Insects Affect Health in Rural Districts. Pp. 19.
156. The Home Vineyard. Pp. 22.
157. The Propagation of Plants. Pp. 24.
158. How to Build Small Irrigation Ditches. Pp. 28.
159. Scab in Sheep. Pp. 48.
161. Practical Suggestions for Fruit Growers. Pp. 30.
162. Experiment Station Work—XXI. Pp. 32.
164. Rape as a Forage Crop. Pp. 16.
165. Silkworm Culture. Pp. 32.
166. Cheese Making on the Farm. Pp. 16.
167. Cassava. Pp. 32.
168. Pearl Millet. Pp. 16.
169. Experiment Station Work—XXII. Pp. 32.
170. Principles of Horse Feeding. Pp. 44.
172. Scale Insects and Mites on Citrus Trees. Pp. 48.
173. Primer of Forestry. Pp. 48.
174. Broom Corn. Pp. 30.
175. Home Manufacture and Use of Unfermented Grape Juice. Pp. 16.
176. Cranberry Culture. Pp. 20.
177. Squab Raising. Pp. 32.
178. Insects Injurious in Cranberry Culture. Pp. 32.
179. Horseshoeing. Pp. 30.
181. Pruning. Pp. 39.
182. Poultry as Food. Pp. 40.
183. Meat on the Farm: Butchering, Curing, and Keeping. Pp. 37.
185. Beautifying the Home Grounds. Pp. 24.
186. Experiment Station Work—XXIII. Pp. 32.
187. Drainage of Farm Lands. Pp. 38.
188. Weeds Used in Medicine. Pp. 45.

190. Experiment Station Work—XXIV. Pp. 32.
192. Barnyard Manure. Pp. 32.
193. Experiment Station Work—XXV. Pp. 32.
194. Alfalfa Seed. Pp. 14.
195. Annual Flowering Plants. Pp. 48.
196. Usefulness of the American Toad. Pp. 16.
197. Importation of Game Birds and Eggs for Propagation. Pp. 30.
198. Strawberries. Pp. 24.
199. Corn Growing. Pp. 32.
200. Turkeys. Pp. 40.
201. Cream Separator on Western Farms. Pp. 23.
202. Experiment Station Work—XXVI. Pp. 32.
203. Canned Fruits, Preserves, and Jellies. Pp. 32.
204. The Cultivation of Mushrooms. Pp. 24.
206. Milk Fever and Its Treatment. Pp. 16.
208. Varieties of Fruits Recommended for Planting. Pp. 48.
209. Controlling the Boll Weevil in Cotton Seed and at Ginneries. Pp. 32.
210. Experiment Station Work—XXVII. Pp. 32.
211. The Use of Paris Green in Controlling the Cotton Boll Weevil. Pp. 23.
213. Raspberries. Pp. 38.
215. Alfalfa Growing. Pp. 40.
217. Essential Steps in Securing an Early Crop of Cotton. Pp. 16.
218. The School Garden. Pp. 40.
219. Lessons from the Grain Rust Epidemic of 1904. Pp. 24.
220. Tomatoes. Pp. 32.
221. Fungous Diseases of the Cranberry. Pp. 16.
222. Experiment Station Work—XXVIII. Pp. 32.
223. Miscellaneous Cotton Insects in Texas. Pp. 24.
224. Canadian Field Peas. Pp. 16.
225. Experiment Station Work—XXIX. Pp. 32.
226. Relation of Coyotes to Stock Raising in the West. Pp. 24.
227. Experiment Station Work—XXX. Pp. 32.
228. Forest Planting and Farm Management. Pp. 22.
229. The Production of Good Seed Corn. Pp. 24.
231. Spraying for Cucumber and Melon Diseases. Pp. 24.
232. Okra: Its Culture and Uses. Pp. 16.
233. Experiment Station Work—XXXI. Pp. 32.
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235. Preparation of Cement Concrete. Pp. 32.
236. Incubation and Incubators. Pp. 32.
237. Experiment Station Work—XXXII. Pp. 32.
238. Citrus Fruit Growing in the Gulf States. Pp. 48.
239. The Corrosion of Fence Wire. Pp. 32.
241. Butter Making on the Farm. Pp. 32.
242. An Example of Model Farming. Pp. 16.
243. Fungicides and Their Use in Preventing Diseases of Fruits. Pp. 32.
244. Experiment Station Work—XXXIII. Pp. 32.
245. Renovation of Worn-Out Soils. Pp. 16.
246. Saccharine Sorghums for Forage. Pp. 37.
247. The Control of the Codling Moth and Apple Scab. Pp. 21.
248. The Lawn. Pp. 20.
249. Cereal Breakfast Foods. Pp. 36.
250. The Prevention of Wheat Smut and Loose Smut of Oats. Pp. 16.
251. Experiment Station Work—XXXIV. Pp. 32.
252. Maple Sugar and Sirup. Pp. 36.
253. The Germination of Seed Corn. Pp. 16.
254. Cucumbers. Pp. 30.
255. The Home Vegetable Garden. Pp. 47.
256. Preparation of Vegetables for the Table. Pp. 48.
257. Soil Fertility. Pp. 39.
258. Texas or Tick Fever and Its Prevention. Pp. 45.
259. Experiment Station Work—XXXV. Pp. 32.
260. Seed of Red Clover and Its Impurities. Pp. 24.
261. The Cattle Tick. Pp. 22.
262. Experiment Station Work—XXXVI. Pp. 32.
263. Practical Information for Beginners in Irrigation. Pp. 40.
264. The Brown-Tail Moth and How to Control It. Pp. 22.
266. Management of Soils to Conserve Moisture. Pp. 30.
267. Experiment Station Work—XXXVII. Pp. 32.
268. Industrial Alcohol: Sources and Manufacture. Pp. 45.
269. Industrial Alcohol: Uses and Statistics. Pp. 29.
270. Modern Conveniences for the Farm Home. Pp. 48.
271. Forage Crop Practices in Western Oregon and Western Washington. Pp. 39.
272. A Successful Hog and Seed-Corn Farm. Pp. 16.
273. Experiment Station Work—XXXVIII. Pp. 32.
274. Flax Culture. Pp. 36.
275. The Gipsy Moth and How to Control It. Pp. 22.
276. Experiment Station Work—XXXIX. Pp. 32.
277. The Use of Alcohol and Gasoline in Farm Engines. Pp. 40.
278. Leguminous Crops for Green Manuring. Pp. 27.
279. A Method of Eradicating Johnson Grass. Pp. 16.
280. A Profitable Tenant Dairy Farm. Pp. 16.
281. Experiment Station Work—XL. Pp. 32.
282. Celery. Pp. 36.
283. Spraying for Apple Diseases and the Codling Moth in the Ozarks. Pp. 42.
284. Insect and Fungous Enemies of the Grape East of the Rocky Mountains. Pp. 48.
285. The Advantage of Planting Heavy Cotton Seed. Pp. 16.
286. Comparative Value of Whole Cotton Seed and Cotton-Seed Meal in Fertilizing Cotton. Pp. 14.
287. Poultry Management. Pp. 48.
288. Nonsaccharine Sorghums. Pp. 28.
289. Beans. Pp. 28.
290. The Cotton Bollworm. Pp. 32.
291. Evaporation of Apples. Pp. 38.
292. Cost of Filling Silos. Pp. 15.
293. Use of Fruit as Food. Pp. 38.
294. Farm Practice in the Columbia Basin Uplands. Pp. 30.
295. Potatoes and Other Root Crops as Food. Pp. 45.
296. Experiment Station Work—XLI. Pp. 32.
297. Method of Destroying Rats. Pp. 8.
298. The Food Value of Corn and Corn Products. Pp. 40.
299. Diversified Farming Under the Plantation System. Pp. 14.
300. Some Important Grasses and Forage Plants for the Gulf Coast Region. Pp. 15.
301. Home-Grown Tea. Pp. 16.
302. Sea Island Cotton: Its Culture, Improvement, and Diseases. Pp. 48.
303. Corn Harvesting Machinery. Pp. 32.
304. Growing and Curing Hops. Pp. 39.
305. Experiment Station Work—XLII. Pp. 32.
306. Dodder in Relation to Farm Seeds. Pp. 27.
307. Roselle: Its Culture and Uses. Pp. 16.
308. Game Laws for 1907. Pp. 52.
309. Experiment Station Work—XLIII. Pp. 32.
310. A Successful Alabama Diversification Farm. Pp. 24.
311. Sand-Clay and Burnt-Clay Roads. Pp. 20.
312. A Successful Southern Hay Farm. Pp. 15.
313. Harvesting and Storing Corn. Pp. 32.
314. A Method of Breeding Early Cotton to Escape Boll-Weevil Damage. Pp. 20.
315. Progress in Legume Inoculation. Pp. 20.
316. Experiment Station Work—XLIV. Pp. 32.
317. Experiment Station Work—XLV. Pp. 32.
318. Cowpeas. Pp. 26.