THE CUT-OVER LANDS OF SOUTH MISSISSIPPI

By E. B. FERRIS.

1. Northeast Highland Soil Area.
2. Northeast Prairie Soil Area.
3. Pontotoc Ridge Soil Area.
4. Flatwoods Soil Area.
5. Short Leaf Pine Soil Area.
7. Yazoo Basin or Delta Soil Area.
8. Central Prairie Soil Area.
10. Gulf Coast Soil Area.

The discussion in this bulletin deals principally with the Long Leaf Pine Belt (shaded area) but applies to some extent to other sections of the state.

AGRICULTURAL COLLEGE, MISSISSIPPI

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The Cut-Over Lands of South Mississippi.

Introduction.—The McNeill Branch Experiment Station was established in 1900 by the state legislature for the purpose of studying thoroughly the soils of the long-leaf pine belt of the state of Mississippi, and of giving the information thus obtained to the public which is interested in these soils. Active work was started here in 1902 when the first appropriation was made for the support of this Station and has been going on ever since. A great deal of information concerning these soils has since been obtained which has in part been published and distributed as bulletins and sent out by the United States Station at the A. & M. College.

The long-leaf pine belt is the least developed portion of Mississippi from an agricultural standpoint and many of the counties of this section have less than five per cent of their soils improved, while some of them have less than two per cent. As the name indicates this section was once entirely covered with a growth of long-leaf yellow pine, a considerable percentage of which has already been removed, but this section still has some of the finest bodies of timber in the United States or, perhaps, in the world. As the timber has been removed, immense bodies of this land have accumulated and await development by the farmer. Until within the past few years no concerted effort has been made to induce immigration into this territory and the inhabitants already here have been entirely too few to keep the numerous saw-mills and turpentine orchards in active operation.

Considerable effort is now being made by the owners of these lands, either individually or collectively, and by the boards of trade of a number of progressive towns to advertise the natural advantages of these lands and to induce settlers from other states to come in and develop them. Judging by the numerous requests received here for detailed information about these lands the efforts of these organizations are being felt, and it is largely to supply these demands that this bulletin of information is being prepared. It is hoped to give in it just such information as the average settler will require who comes here from other sections and attempts to develop these lands from the raw state in which they have been left by the saw-mills.

Climatic and health conditions.—The long-leaf pine country as a whole has a delightful climate and is perhaps the most desirable portion of the South to live in so far as health is concerned. The summers are long but never oppressively warm, a good portion of the section being close enough to the Gulf to get the delightful sea breeze that blows
every night from the south. The winters are generally warm and the few cold spells are always of a very short duration. As a rule the soils drain perfectly and there is almost an entire absence of mud, so that while the rainfall is heavy, the country has many of the health advantages of a dry climate. The water soaks quickly into the soil or is rapidly drained off over the surface, so that within a few hours after the heaviest rains the ground dries off and the atmosphere is apparently free from dampness. The country is almost free from malarial troubles; typhoid fever is seldom to be found where any sanitary precautions are taken, and pulmonary troubles are perhaps as seldom found here as in any other portion of the United States. In fact, it is claimed that atmospheric conditions throughout the pine country are peculiarly favorable to the cure of pulmonary diseases and tuberculous sanitariums are being established in certain portions of Louisiana where conditions are exactly similar to those here. Under the name of the "Ozone" belt this country is becoming famous as a health giving section.

The hookworm disease, however, is quite prevalent throughout the territory and has done much to impair the general health of the native people and to render less effective their efforts to develop the country. This trouble is now thoroughly understood by the medical profession and, like yellow fever, will soon be a thing of the past in the South. This hookworm disease yields readily to the simplest treatment and the people are fast coming to realize its injurious effects and to see the importance of sanitary precautions to prevent its spread. During the past summer thousands of people in this county alone took the treatment given free by the Rockefeller Hookworm Commission.

This is a remarkably well watered country, both as to surface and underground water. Springs, branches, creeks and rivers give an inexhaustible supply of surface water which is usually as clear as crystal. On an inclosure of 160 acres this Station has four different branches which are fed by innumerable springs and which never go dry. In many places overflowing artesian wells may be had at depths ranging from 400 to 1,000 feet and, in the absence of these, shallow wells may be had at less than one hundred feet. This Station has a six-inch well one hundred feet deep from which can be pumped 1,800 gallons per hour for an indefinite time.

A complete weather record has been kept here for nine years and the following table gives a summary of maximum and minimum temperatures and rainfall for the most of this nine-year period.
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Roads.—The country as a whole has a sandy loam soil which drains quickly and when properly surfaced makes almost as smooth roads as the best of road-building material.

Until very recently, however, the public roads have been little more than cow trails with enough logs and stumps removed to permit vehicles to go through. However, a great interest has now been stimulated in better roads and the several counties have introduced the contract system of working the roads, have removed the stumps, surfaced the road beds, and put in culverts, so that, if the spirit of advancement does not wane, the country will soon have a system of public roads almost equal to the best pikes and at a cost ridiculously small in comparison.

Soils.—In round numbers the state of Mississippi has thirty million acres of land, some ten million acres of which are embraced in the so-called long-leaf pine belt. The soils of this pine belt are sandy loams usually underlaid by sandy-clay subsoils of a red or yellow color. There are several types of these soils, but in his soil survey of the state Hilgard divides them into three classes of which the soils near the coast form one class, while the better drained pine lands to the north and west of these are themselves divided into two classes. This soil work of Hilgard’s has since been supplemented by much more complete surveys of limited areas made by the Bureau of Soils of the United States Department of Agriculture, copies of which may be easily obtained by writing to the Bureau of Soils, Washington, D. C. The soils near the coast are mainly low and flat, inadequately drained, and in many instances having little or no clay in the subsoil to hold the fertilizers applied to them. Altogether these coast soils are inferior to the main body of well drained pine lands, which commence from ten to fifteen miles from the coast and extend north and west for one hundred miles or more. These coast lands usually lie in gentle swales and low ridges so that it is nearly always possible to drain them easily, but up to the present time only the ridge lands are regarded as being fit for cultivation. Some of the best trucking communities of the state have recently been developed along the Gulf Coast, while oranges, figs, and pecans are being grown there quite successfully.

The main body of pine lands has excellent natural drainage and the line of demarcation between the two types into which Hilgard divides them is not very distinct. It is a fact that the soils in the more northern and western parts of the pine belt belong to an older formation geologically, and are in the main more fertile than those nearer the Gulf Coast. This is not only shown by the larger size of the pine timber, but by the better growth of vegetation generally. It is, too, better developed agriculturally, due somewhat to the fact that it was nearer
the older agricultural communities and was the first to be settled by the farmer. This country was the last section of the state to get railroads and is by far the section most dependent on them for development, both to carry out its pine timber and to bring in its supply of fertilizers on which the success or failure of the farmers so largely depend. In 1882 when the New Orleans and Northeastern Railroad was built through it, Hattiesburg, now a city of more than ten thousand inhabitants, with four lines of railroad entering it, was public domain, subject to entry at $1.25 per acre. It was about the center of the pine belt, sixty miles from a railroad in any direction, and the few people who inhabited the territory lived from their flocks and herds, growing just enough corn to make their bread and using the manure from cattle to fertilize the soils required to do this.

All the soils of this pine belt are poor chemically and have to be fertilized before they can be cultivated economically. They are especially deficient in nitrogen and phosphorus and unless these are supplied with leguminous crops and raw phosphate rock, or in the form of commercial fertilizers or animal manures there is no profit in cultivating them. However, with the expenditure of a few dollars per acre for plant food these soils are easily the most reliable crop producers in the state, make the heaviest yields of nearly all cultivated crops, and are less affected by extremes of climate, particularly droughts and floods. They are much more easily prepared and cultivated than are the stiffer and richer lands of the state and are susceptible of a higher state of improvement under intensive cultivation, as is evidenced by the fact that by far the greater part of the heavy yields of corn made by the members of the boys' corn clubs were made on long-leaf pine soils in this and other southern states.

Like every other country in the world, this section has good and poor lands all in the same community, made so by such natural causes as topography, soil formation, etc., to say nothing of the influences of good or bad treatment, but in all instances here where the lands are fairly level, well drained, and underlaid by sandy-clay subsoils of red or yellow color, they are good soils and susceptible of a high state of development. The cost of clearing such lands and the expense of building them up to the point of greatest development is quite heavy so that the initial cost of the unimproved lands represents only a small part of the actual cost of the improved farm. This expense is so heavy that settlers with limited means should be careful to keep a considerable reserve fund for improvements and clearing.

These lands will reach their highest state of development in the hands of the small farmer or landowner who will either do his own
work, or give it very close supervision. To trust the cultivation of these soils to the ignorant negro laborer in the manner prevailing over the greater part of the older agricultural sections of this state would likely prove ruinous and the plantation methods so common in the larger part of the cotton sections, while bad there, would be much worse here. The successful farmer in this section should have enough intelligence to rotate his crops, grow leguminous crops whenever possible (and this may easily be done two years out of every three) should keep livestock to make manure, and should have enough knowledge of the use of fertilizers to know how with each individual soil and crop to fertilize most economically. With such a class of farmers the writer fully believes the long-leaf pine belt of South Mississippi would prove the most desirable section of the state, health and other conditions considered. It has at last come to its own in the matter of railroad facilities, at least eleven different lines of railroad, some with several branches, making a complete network of railroads through it. There are several other proposed railroads surveyed through the territory which, doubtless, will be completed within a few years. This goes to show more than words can express what the capitalists of the country think of the future prospects for South Mississippi.

Range for cattle.—The lands in this section are owned in large bodies by timber syndicates and large saw-mill operators and a very small percentage of them have ever been cleared or even fenced. There is no stock law and the range for cattle is practically unlimited, an animal, for instance, turned out at McNeill being free if it chooses to go forty miles south to the Gulf, and possibly more than one hundred miles east, north, or west, before reaching a section where the stock law does exist. The grasses for the greater part of the year are abundant and capable of maintaining cattle sleek and fat from early spring until late fall, but since the greater part of the range cattle are not fed through the winter, they usually get very poor at this season, some die, and the greater part of the gains made in summer are lost in winter, so that the native cattle require five or six years to get a growth they might attain in two years if they were as well fed through the winter as they are through the summer months.

The counties in this section of the state were once known as the "cow counties," because the people lived almost entirely from their flocks and herds, but the value of the timber interest has, in late years, so overshadowed livestock that the section is universally known as the timber belt. The most prosperous people in the country now, except the timber men, are those who handle cattle and sheep, but the most of these depend almost entirely on the range, and grow almost nothing
on which to feed this livestock through the winter. The climate of
the country is so mild that it is useless to provide shelter for cattle,
even dairy cows doing as well when kept in open lots as when provided
with comfortable stalls. The people are coming more and more to
realize the importance of providing cheap feeds for their cattle in win-
ter, and are growing now relatively large quantities of corn and velvet
beans, which of all crops, apparently comes nearest to meeting the
requirements of a cheap feed easily handled, the beans remaining in
the fields through the entire winter, or until consumed by the cattle.

The country is entirely within the tick belt, and the problem of
going rid of this pest is bound to be a more serious one here than in
other sections of the state where the cattle are confined to pastures,
still with a people entirely willing to put up with the temporary hard-
ships of tick eradication, the task would not be a hopeless one.

The writer believes there is a great opportunity in this section for
a man with limited means to buy small tracts of these lands to be used
for growing feed for cattle and then to take advantage of the unlimited
range for grazing them throughout the nine months of spring, summer
and fall, and feeding them just enough through the winter to keep-
them in a growing condition. In this way, lands considerable distances
from a railroad could be utilized in growing all kinds of forage crops
for which they are best suited and these converted through the livestock
into pork, beef, mutton, or wool, before being marketed. By such
a system the soils could be furnished with nitrogen by means of legum-
inous crops, with an abundance of humus through the remains of these
crops and the manure from animals consuming them, and with phos-
phorus through raw phosphate rock rather than acid phosphate and at
a cost one-fourth as great. In this way the expense of keeping the
lands supplied with the necessary plant food could easily be reduced
from three or four dollars per acre to less than fifty cents.

Dairying.—Except for the lack of nutritious milk-producing grasses,
no country offers better natural advantages for dairying than this
one, and yet few countries have the industry so poorly developed.
With its mild climate, abundant water supply, freedom from mud,
and convenience to high-priced markets, South Mississippi seems
destined to become the future dairy section of the state, especially that
part of it situated near the railroads entering New Orleans and within
seventy-five miles of that city. When so located, milk can be sent
into the city twice daily and the schedule of prices is much higher than
in other cities of the same size in the North or East, varying from four
cents per point of butter fat in summer to five and one-half cents in
winter, or from twenty to twenty-eight cents per gallon from this Sta-
tion's herd of grade Jersey cattle. In addition to the New Orleans market dairy products, and especially cream, may be sold in such places as Laurel, Hattiesburg, Gulfport, Mobile, and the Florida cities, all as much or more convenient to this territory than to the places from which they actually buy such products.

While the native grasses here are not very nutritious, lespedeza or Japan clover is fast spreading naturally over the pastures and ranges, and carpet and Bermuda grasses are becoming quite common. A few years' pasturage with dairy cattle in connection with raw phosphate rock and lespedeza will soon build these soils up to where they will furnish as good summer pasturage as any in the state, a strong point in their favor being that the pastures are seldom dried up here in summer or fall on account of a lack of rain. Here the rainfall is such that pastures remain green generally until frost, while the mild winters and sandy soils make it possible to grow green crops and graze cattle through the entire winter. The heavy rainfall of summer and early fall make it difficult to save hay and dry forage, but contributes greatly to the growth of heavy crops of corn which can best be saved as silage, which of all feeds seems to stimulate the greatest flow of milk. By feeding its dairy cattle on corn silage and cottonseed meal and by grazing them through the winter on velvet beans, rape, and oats this Station has been able to get a better flow of milk, and to make much more money, by having the cows freshen in the fall than in the spring. Winter prices of milk are forty per cent higher than summer prices, considerably less expense is necessary for ice, the demand for milk even at the increased price is much better, and the business more satisfactory in every way.

Clearing pine lands.—The most serious problem connected with the agricultural development of this section is the clearing of the land for cultivation, and the cost of doing this is represented largely in the removal of the stumps. The fact is, these lands are easily brought into cultivation if worked with the stumps on them, for generally they have very little underbrush, and the lateral roots of the pine interfere very little with the plow. A large percentage of the lands already in cultivation are worked with the stumps on them, the owners gradually removing these as they feel disposed, a thing which frequently never happens. The life of the average long-leaf pine stump is very long, the most of them being full of pitch and almost as imperishable as bronze. These lands cannot be cultivated economically with the stumps on them because the stumps themselves take up considerable space, and it is impossible to plow close up to them, and besides without considerable handwork grass will get started around these stumps
and befoul the entire land. It is impossible to use improved implements on stump lands and not only is the cost of preparing and cultivating them made greater by reason of the small plows necessary, but it is impossible to turn into the soil organic matter from restorative crops so necessary to give it life and to furnish nitrogen, so that one frequently notices the ridiculous practice of farmers burning off their velvet bean fields because it is impossible to turn the litter into the soil with their one-horse plows.

The McNeill Experiment Station has removed the stumps from about one hundred acres of these lands, using all known methods and keeping sufficient data to give a general idea as to cost by the several methods. Bulletin No. 159, Clearing Pine Lands, issued by this Station, containing full information in regard to methods and costs, may be had upon application.

**Fertilizers for Pine Lands.**

Practically all the lands in the pine belt have to be fertilized before they can be cultivated economically, so that the question of the use of fertilizers is a vital one to those who cultivate these lands. This fertilizer question has been studied thoroughly here for the past ten crop years and records kept of results obtained by fertilizing a number of crops in many different ways. The soils were first analyzed chemically and physically to determine the actual amount of plant food contained therein, and the relative amount of sand, silt, and clay which determine the physical qualities of the soil. These analyses are given in the following table:

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A glance at the amount of phosphoric acid in soil and subsoil shows the exceedingly small quantity of this important ingredient of fertil-
izers contained in these soils and indicates the relative importance of phosphorus in any fertilizer applied to them. The results of hundreds of tests with fertilizers conducted here under all classes of crops bear out the evident conclusion drawn from a study of these analyses that phosphorus is the mineral element most seriously lacking in these soils. While these soils contain less potash than those of the other soil formations of the state, this ingredient is still relatively high, as compared to phosphoric acid, there being almost nine times as much potash in soil and subsoil as there is phosphoric acid. This fact is also borne out by practical or actual results, for the addition of potash either alone or in combination with phosphoric acid and nitrogen has given little increase of crop. It is well to add that in the last few years indications point to some need for potash on the soils here, especially with crops that are subject to fungous diseases.

Even these crops were not materially benefitted by it for a number of years after the soils were brought into cultivation and the indications are that its effects now are indirect rather than direct. Nitrogen is necessary even on freshly cleared lands here and must from the start be supplied either with commercial fertilizers or by growing leguminous crops. Nitrogen when purchased in fertilizers costs so much, is so easily lost from the soil by leaching or oxidation, and is so cheaply supplied by leguminous crops, so easily grown here either alone or as catch crops, that it is really extravagant to buy this nitrogen in any well planned system of cropping.

When this Station was established here ten years ago, one had to search diligently to find a sprig of lespedeza, now this legume has spread so thoroughly over the section that it is beginning to be regarded as one of the best pasture crops. This plant will in a few years greatly add to the supply of nitrogen in these soils and the writer believes that this lespedeza grown on the unimproved lands and such legumes as velvet beans, cowpeas, soy beans, peanuts, vetch, and perhaps crimson clover grown as catch crops on the cultivated lands will make the purchase of any nitrogen unnecessary, and at the same time, by increasing the supply of organic matter in the soil, make it possible to substitute raw phosphate rock for acid phosphate and at a cost one-fourth as great per pound of added phosphorus.

The almost perfect mechanical composition of these soils cheapens the expense of drainage, lessens the cost of preparation and cultivation, admits of free circulation of air in the soil itself, and gives an ideal place in which to place purchased plant food. The actual plant food contained in such soils is more available to plants than the same quantities would be in soils less tractable and they certainly respond more freely to the use of commercial fertilizers in any form than any other
class of soils in the world. In fact, these soils answer well the Germans' definition of good soils because they are certainly a good place to put fertilizers of any kind with the assurance of getting maximum returns for the money so invested. This does not mean that all money spent for the fertilizers actually used on these soils is judiciously invested, for, as a matter of fact a great deal of it is not. The fact is, people have gone fertilizer-mad, as it were, and have learned to depend almost entirely on buying plant food in a sack rather than on manufacturing the same on the farm by growing leguminous crops and by keeping more live-stock from which to make manure. From the experience with the matter at this Station, it would seem that the fertilizer question resolves itself into the simple proposition of adding more humus to the soil by growing more leguminous crops which at the same time will supply the necessary nitrogen, leaving only the phosphorus to be purchased, which in the presence of an abundance of rotting organic matter can be supplied as raw phosphate rock.

Thus, instead of spending twenty dollars a ton for a complete commercial fertilizer, which, generally speaking, would contain about two dollars' worth of potash and nine dollars' worth each of nitrogen and phosphoric acid, the farmer could on these soils dispense with the potash entirely, and could supply the nitrogen with leguminous crops and animal manures, and instead of paying twelve and one-half cents per pound for phosphorus in acid phosphate could, by increasing the humus content of his soils, get practically the same results by using raw phosphate rock at a cost of three cents per pound for phosphorus. We would by no means recommend that this substitution of raw phosphate rock for acid phosphate be done indiscriminately, for, unless the organic matter is present in quantity, the result would be very disappointing. There is so much doubt as to the financial benefit from the addition of potash to fertilizers used here that we do not hesitate to advise its elimination, except in individual instances where the farmer has satisfied himself that it does good. In this connection it is well to emphasize the importance of conducting simple experiments on every well conducted farm to determine the special needs of their several kinds of soils. The soils of this section are of a sedimentary nature and while they are all alike in some respects they differ widely in others, and not only this, but the fertilizer requirements of the same soil change greatly from year to year, due to methods of cropping and cultivation. It is just as important, therefore, that the farmer should keep in touch with the fertilizer needs of his soils as that he should be familiar with performance of his dairy cows by measuring their feed, weighing the milk, and by frequent use of the Babcock test.
Experience at McNeill has been that lime is seldom of much benefit to these soils, either as a direct plant food, or indirectly as a means of correcting acidity in the soil. If needed at all as a direct plant food it would be supplied along with phosphorus either with acid phosphate or raw phosphate rock, and as a matter of fact, conditions here are against the accumulation of sufficient organic matter in the soils to render them very acid. Our long summers and mild winters dissipate the organic matter in the soils here much faster than is the case in the North where the summers are short and where the ground is frozen for long periods of time through the winter. In the North the soils naturally have more organic matter in them, methods of farming have been such that greater quantities of vegetable matter are yearly added to them, and all this decays much more slowly than it would with us, so that the chances are that lime will never give the same benefit here that it frequently gives in more northern latitudes.

**Nitrogen.**—In ordinary farm practice it will always be necessary to purchase some nitrogen, especially for growing truck crops and sugar cane which requir highly nitrogenous fertilizers and where the high values of the product grown will justify the purchase of this nitrogen in commercial forms. But even these crops will never be grown to the best advantage except on lands where at least a part of the nitrogen has been added with leguminous crops and active manures. Heretofore cotton has been grown here persistently and to the exclusion of other crops and, being a crop that requires clean cultivation without summer catch crops or winter cover crops, the organic matter present in these soils has not only been burned out, but no more has been added to them, except in the form of commercial fertilizers. The advent of the boll weevil, however, will revolutionize farm practice here and force the farmers to diversify and self-preservation will lead to other crops that will supply nitrogen and organic matter and at the same time require livestock through which to market them. The growth of such leguminous crops as lespedeza, velvet beans, soy beans, cow peas, peanuts, and beggar weed, all of which grow here to perfection in summer; and vetch, crimson clover, and burr clover, which do fairly well in winter, will probably revolutionize present customs about getting nitrogen, especially with the introduction of more livestock to consume these crops and the cottonseed meal that now so largely furnishes our supply of nitrogen in fertilizers.

Cottonseed meal has heretofore furnished a large part of the nitrogen in fertilizers, but it is becoming so highly regarded and in such demand as a food stuff that it is being largely supplanted as a fertilizer by sulphate of ammonia, nitrate of soda, dried blood, tankage and fish
products. This cottonseed meal is worth practically the same as a feed as it is as a fertilizer and by judicious use it can be made to serve first as a feed and then as a fertilizer by carefully conserving the manure from cattle fed on it. In 1902 this Station fed steers with cottonseed meal and hulls on land here and has since kept the records of the increased yields of corn and cotton due to this manure, finding that it is possible to get both values. With dairy cattle the Station is now carrying on somewhat similar work by feeding largely on cottonseed meal as a concentrate and by confining the cattle at night on small paddocks near the barn. In this way a considerable acreage has been enriched while the manure from the herd during the day is dropped on the pastures where it is as valuable as a grass producer as it would be as a fertilizer for any other crop. Cottonseed meal is an ideal source of nitrogen for most farm crops and at the same time furnishes small quantities of potash and phosphoric acid. It is easily distributed and with acid phosphate and potash salts makes a mechanical mixture easily distributed and entirely inoffensive to smell or to handle. The nitrogen in this meal is in an organic form and has first to be decomposed and to undergo a chemical change before it can be taken up by plants, and for this reason it does not meet the requirements of quickly maturing crops, such as early vegetables, so well as does nitrate of soda.

Sulphate of ammonia is being used largely now as a source of nitrogen and experience here has been that it is fully equal to cottonseed meal so far as availability is concerned, but that it does not mix so well with acid phosphate, nor is it so easily distributed, having a decided tendency to form into lumps and to refuse to pass evenly through the opening in the distributer. It contains a much higher per cent of nitrogen than does cottonseed meal and for the past few years this nitrogen has sold at several cents per pound less than that in the meal. The nitrogen in sulphate of ammonia is not directly available to plants and has first to undergo a chemical change, so that it has no advantage over cottonseed meal in this respect.

Nitrate of soda is an important source of nitrogen, is easily dissolved in the soil and immediately available to crops. It is especially valuable as a source of nitrogen for early vegetables, and as a top dressing for other crops where immediate results are wanted. Being so readily soluble it is easily leached out of the soil and is also lost by evaporation from the surface in dry weather, if it should fail to be properly covered. It is excellent as a top dressing for oats in the spring, but care should be exercised to put it on just ahead of a rain, otherwise it may be lost entirely. Nitrate of soda does not mix well with acid phosphate, either mechanically or chemically, having a tendency to gum and also
to have its nitrogen driven off by the acid in the acid phosphate. This material is imported into this country from South America by the Nitrate Agencies Company, New Orleans, La. This concern has been giving especially good prices on this and other fertilizing materials when ordered in carload lots.

Dried blood, tankage, and fish-scrap are all organic sources of nitrogen, easily decomposed and furnish highly available nitrogen. The first two are by-products of the slaughter-houses while the latter is obtained along the seacoast where fish are handled in large quantities. They mix well with acid phosphate and are easily distributed, though the odor of some of them is anything else than agreeable. Bat guano was at one time an important source of nitrogen, but the supply is largely exhausted. It is regarded as being especially good for truck crops and is used largely in this state in trucking communities.

All the materials furnishing nitrogen are sold on guaranteed analyses, and the purchaser should be careful before buying to know what this guarantee is, otherwise he can be badly cheated by buying different grades of even the same material.

Phosphorus.—As stated before, phosphorus is the element of fertility most seriously deficient in these soils, and it must be purchased in some form and put there for it cannot be obtained by growing restorative crops as is the case with nitrogen. It is, however, a much cheaper element than nitrogen, costing in its soluble form less than one-third as much per pound as nitrogen, while in its raw or insoluble form it costs less than one-twelfth as much.

While there are many sources of phosphorus in fertilizers, such as cottonseed meal, ground bone, tankage, and slags, the source of the main supply is phosphate rock mined in Canada, South Carolina, Florida, and Tennessee. The rock used in this section is largely mined in Tennessee. The phosphorus in the raw rock is insoluble in water and cannot be taken up directly by plants, nor is it of any value as a plant food in its raw state except when finely ground and on land where there is an abundance of decaying organic matter. On such soils the decay of the organic matter generates acids which act on the raw rock in much the same way that the sulphuric acid acts in the manufacture of acid phosphate, though much more slowly, of course. For a long time phosphate rock in its raw state was thought to have little value as a fertilizer and it was seldom recommended by experiment station men, but since the actual phosphorus in it costs only about one-fourth what it does in its soluble form and it is known to become gradually available in the presence of this decaying organic matter in the soil, it is coming into favor. This Station has used the raw rock very successfully, especially
in connection with velvet beans, the decay of which leaves great quantities of humus in the soil.

Acid phosphate is the source of nearly all the phosphorus in this state and is made by grinding the raw rock to an impalpable powder and mixing the same with equal quantities of strong sulphuric acid which brings about at once a chemical change by which the phosphorus is rendered soluble and a considerable quantity of calcium sulphate or gypsum is formed. Acid phosphate forms the greater part of the average complete commercial fertilizer sold in this state, many popular brands being made by mixing together 600 pounds of cottonseed meal, 1,200 pounds of acid phosphate, and 200 pounds of kainit. This formula gives a mixture analyzing about 1.75% each of nitrogen and potash and 10% of phosphoric acid. In these experiments here to determine the fertilizer requirements of these soils every application of acid phosphate has given a marked increase of crop and on lands that have previously grown leguminous crops has been all that was required to give maximum yields, while for the legumes themselves it furnishes the plant food needed regardless of previous cropping.

Potassium.—This element is furnished by several different materials, such as cottonseed meal, wood ashes, ground tobacco stems, and a number of minerals. Practically the entire supply of potassium now used in this country is imported from Germany where it is mined very much as common salt is mined in this country. The three forms most commonly found on the markets are: kainit, containing 12% of actual potash; muriate of potash with about 50% of potash; and sulphate of potash analyzing about the same as the muriate. In tests at McNeill, kainit has been largely used as a source of potash and the conclusions drawn so far from a large number of such tests have been against the use of this element in our fertilizers. As stated before these soils contain about nine times as much potash as they do phosphoric acid and the relative importance of the two would be at least in this proportion, so far as results here go to show.

Kainit has been used as a source of potash here largely because it was so generally used in the mixed fertilizers sold in the state. It contains only about twelve per cent of potash and some thirty-six per cent of common salt and the chances are that much of the power of kainit to prevent rust in cotton is due to the common salt it contains rather than to any direct aid from potash. The most reliable fertilizer work that has been done here has been with cotton and the plats receiving kainit have usually made more cotton than the blank plats, but the addition of kainit to a mixture of acid phosphate and cottonseed meal has not uniformly increased the yield of cotton. Since the
advent of the boll weevil, plats receiving kainit alone have seldom made any cotton at all, due to the lateness at which it begins to fruit.

CROPS BEST SUITED TO THE SECTION.

Cotton.—Some of the best cotton soils of the state with the exception of the Delta, are in the long-leaf pine section, but the writer has never regarded the lands so near the Gulf as are these at McNeill, forty miles away, as being well suited to cotton, due more to an excessive rainfall during the summer months than to any other known cause. Before the boll weevil made its appearance, yields of cotton here were much less satisfactory than those of other crops and since that time the people in this immediate community have about stopped growing it entirely, though the Station has some cotton this year that will likely make above one-half bale per acre, all having been set before the middle of June. Farther north and west from here the rainfall is not so heavy while the soils are just as responsive to fertilizers, and quite as capable of forcing crops grown on them to early maturity.

These soils are all of a light, sandy nature, quick to dry out and to warm up in the spring and, therefore, capable of growing early crops of every kind. A quick start in the spring so as to have the cotton begin fruiting before the weevils appear in great numbers means more towards getting a crop of cotton than all other influences combined, according to experience here in growing cotton with the boll weevil present, and the writer believes that the well drained hill lands north and west of us will come nearer growing cotton profitably under boll weevil conditions than any other section of the state, the Delta not excepted.

Corn.—The heaviest yields of corn ever grown have been on the soils of this section and they are certainly the most reliable corn lands in the state so far as yields are concerned, though we must admit that the corn weevil is a much greater pest here than in other parts of the state, frequently destroying the corn in the fields if harvesting is delayed too long. The most successful method of growing corn here has been to plant the corn in water furrows made by bedding the land, or better by flat breaking the land first and opening deep furrows with middle burster, distributing the fertilizer at the bottom of this furrow, and after mixing the same with a bull-tongue furrow, planting the corn at the bottom of the furrow and working the soil to same as the crop is cultivated. This gets the roots deep in the ground so that the corn stands the drought better and has much better support against the wind. Experience has shown that corn planted between April
fifteenth and May fifteenth gets much better seasons than that planted earlier and is much less subject to attacks from "bud worms" than that planted later. At the time suggested the weather is nearly always dry and the corn can be cultivated at very little expense, so that with the approach of the rainy season after the middle of June it shoots up like magic, and will mature almost any quantity left in the ground. The prolific varieties that make two or more ears to the stalk are regarded as best and a single stalk to the hill with hills 'close together gives much better results than double stalks with hills twice as far apart.

Considerable thought has been given to the subject of saving the corn crop here most economically, for as commonly practiced much of the value of this crop has been wasted even after it has been produced. The old method of pulling the leaves from the stalk and saving them as fodder is still practiced to a considerable extent and is a source of much loss. The Experiment Station has harvested a good deal of corn by cutting the stalks while still green, but after the ears have practically matured in the same way that the crop is so generally saved in the North, but the stalks grown here are much larger than the average of those grown in the North and therefore more difficult to save. Then, too, all except the latest platings of corn here mature in summer when showers are of almost daily occurrence, making it practically impossible to properly cure this corn.

A great deal of corn is now being grown here along with velvet beans and the two make an excellent combination, if properly handled, but a great deal of this corn is usually destroyed in the fields by weevils and by rotting, the velvet bean vines pulling many of the stalks down, so that the ears rot on the ground, or else shade the corn so completely that even the ears on standing stalks are damaged during protracted wet spells. This trouble may be practically eliminated by planting the corn very early, in late February or early March, and then planting the beans six weeks or two months later. In this way the corn matures and may be gathered (the ears pulled from the stalks) before the beans are large enough to interfere seriously with the development of the corn or with the gathering of it. As commonly practiced here the corn and velvet beans are planted in alternate rows and by this method a heavier crop of beans will probably result, but at the expense of the corn. The Station has had excellent results by growing corn in every row and by planting the beans by the side of each row of corn about the first of May with corn planted the first of March. In this way the beans are grown entirely as a catch crop and interfere little with a maximum yield of corn which may be harvested in August, leaving the beans almost one hundred days to occupy the land alone. When grown in this way,
average yields of corn have been made, and the beans themselves have shown a value of eight dollars per acre when harvested through milch cows, and the soil left completely hidden with a covering of fallen leaves and uneaten stems, so that the productive capacity of the land was greatly increased in a single season and the cost of fertilizing a succeeding crop correspondingly decreased.

The most satisfactory way of saving the corn crop so far tried at this Station is to convert it into silage. The cost of building a silo is not materially higher than that of a barn for housing the forage and ear corn; every particle of the growing plant is saved and in a condition in which there will be no waste in feeding it; the entire crop can be saved regardless of the frequent rains that make it next to impossible to cure the stalks; and when put in the silo there is no loss from rats and weevils, both of which are very destructive to the stored grain. Practically all kinds of livestock will eat this silage and there is no other feed that equals it, cost considered, as a producer of milk and butter. Cowpeas planted in silage corn will maintain the supply of nitrogen and humus in the soil and may be saved for hay or grazed off by the cattle, horses, and hogs, as conditions warrant.

**Small grains.**—This Station has done considerable work in testing numerous varieties of small grains, such as oats, wheat, rye, and barley. All of these have proved to be unreliable except the Texas Red Rust Proof oat or closely related varieties, such oats as the "Turf" oat, wheat, and rye being generally badly damaged by rust with the appearance of warm weather in the spring. Yields of as much as three tons of well headed oat hay per acre are frequently made here and the crop generally matures in May or June when weather conditions are favorable for saving hay. For best results these oats should always be planted early in the fall and will furnish good grazing up until March, the sandy nature of the soil making it possible, without injury, to keep cattle on them for the greater part of the time. Heavy yields of corn and fair crops of cowpeas may be grown on the same land after the oats are removed, making three crops in a single year.

**Leguminous crops.**—Summer legumes, such as cowpeas, soja beans, velvet beans, lyon beans, Spanish peanuts, and Florida beggar weed, have been grown here with marked success and are well adapted to conditions obtaining in the pine belt as a whole. Each of these crops has its special advantage conditioned on the use to which it is put and the way it is to be grown. For instance, none of these crops will equal the cowpea as a purely hay crop, none the velvet bean as a catch crop for winter grazing, none the soja bean as a grain crop for hogs, and none the Spanish peanut as a combination grain and hay crop, while all are
valuable as soil-improving plants and may be grown to perfection when fertilized with phosphorus alone.

Winter legumes, such as crimson clover, red clover, burr clover, and vetch have been grown here with only fair success and it is necessary first to build up the soil with animal manures, or to fertilize them well with commercial fertilizers and then inoculate them with the germ life peculiar to the crop by spreading over them soils from fields which have successfully grown these crops. By so treating the land fine crops of vetch have been grown here and fair crops of the other legumes mentioned.

Alfalfa has been planted here a number of times, the soils have been limed, inoculated, and the crop at times cultivated, but always with the result that the alfalfa has been choked out by the crab grass the following summer.

Sugar cane.—Sugar cane grows here to perfection and when the soils are highly improved the yields are enormous. The Station having made at one time a yield of more than fifty tons to the acre, while a yield of twenty tons per acre is not uncommon. This cane is grown chiefly for syrup, the quality of which, when properly made, being equal to the best maple syrup and superior to any other syrup made from cane grown on heavier lands elsewhere.

A ton of cane corresponds roughly to twenty gallons of syrup which sells generally at from forty-five to sixty cents per gallon, giving no mean revenue per acre. Sugar cane is an expensive crop to grow, requiring well improved land to begin with, liberal applications of fertilizers, considerable expense for seed, and an expense approximating fifty per cent of the worth of the crop as it stands in the field for stripping, cutting, topping, and converting into the finished product, syrup. It occupies the land from two to three years here from a single planting and leaves it in a run-down condition chemically and physically which will require several years for correction. The industry as now carried on in this country is far from what it should be, due chiefly to defects in the manner of manufacturing the syrup, the most of which is made in small lots on crude evaporators, by many individuals who trust to the eye entirely to tell when the juices have been properly cooked, and who usually make as many grades of syrup as there are operators and evaporators. As a consequence a good portion of this syrup either goes to sugar or sours before it reaches the consumer, or soon thereafter, and the trade in it has been greatly demoralized.

This Station has done a great deal of work with sugar cane and has, perhaps, the most complete syrup plant in the country, designed especially for the business and costing more than three thousand dollars.
Work with syrup on this plant and with cheaper outfits easily improvised to meet the especial needs of the individual farmer has convinced us that as good a grade of syrup can be made on the one as on the other, and that the essential difference between the good and bad syrup is mainly due to improper cleaning of the juices as they are cooked and to the fact that they are not usually evaporated to the proper density. To make a syrup that will not sugar nor sour it is absolutely essential that some measure other than the eye, be used to determine the density of this syrup and a saccharimeter or hydrometer may be bought for fifty cents which if used will absolutely guarantee a uniform density for this syrup. Steam heat is decidedly the best means of cooking this syrup, but in the absence of this, cheap home-made pans heated by wood fires may be used, these filled with a given quantity of cane juice and this thoroughly skimmed and cleaned until a density of 34 degrees at the boiling temperature is reached, when it should be quickly removed from the fire and the syrup sealed in cans while still hot. In this way a high grade syrup that will keep for years without sugaring or souring may be made and should be marketed at not less than sixty cents per gallon to the consumer. A special bulletin on this subject has been issued by this Station and may be had for the asking. (Bulletin No. 129. Sugar Cane for Syrup Making.)

Fruits and Vegetables.

Fruits.—This Station has done a lot of work with such fruits as blackberries, dewberries, raspberries, strawberries, mulberries, grapes, apples, peaches, pears, and plums. Blackberries grow wild here in the greatest abundance, dewberries, to a certain extent, while raspberries are never seen and the effort to cultivate them has not been successful. Possibly the best strawberry industry in the South has recently been developed around Hammond and Independence, Louisiana, on lands of this same long-leaf pine type and almost the exact type of soils that we have here.

Strawberries have done remarkably well here and have proved the best paying crop this Station has ever grown. The industry has never been developed here because of a lack of people to grow the berries and not on account of inferior soils or a lack of facilities for getting them to market. Two acres of land planted to strawberries here paid more than two hundred dollars per acre for three successive years from a single setting of plants.

Scuppernong grapes grow here to perfection and have no insect enemies nor fungous diseases that have ever been detected. Other grapes have never done so well, except where they have been sprayed to protect them from insects and fungous diseases, especially the latter.
Mulberries are perfectly at home here and both wild and cultivated varieties do well. A successful experiment at silk production has been carried on near McNeill by Syrians who have used the native mulberry trees for feeding the silk worm larvae. These people report very satisfactory results, claiming conditions as favorable here for the production of silk as in their native country.

San Jose scale and nematode root disease have made the growing of apples, peaches, and plums impossible here and the Station has had to destroy a large number of these trees. It would seem that peaches might be made to grow here to perfection, but the general result has been that after a few years of exceptionally good growth the trees almost invariably die from some cause. Such was the result at this Station and the cause was attributed to both the scale and the root disease.

Pecans are successfully grown over the entire pine belt and the lands near the Gulf coast seem peculiarly adapted to the crop. This Station has a few budded pecan trees that were planted or set out in 1902 and we have been disappointed in the length of time required for them to begin bearing, for the trees have not yet set any fruit.

Vegetables.—This section should reach its highest state of development from an intelligent system of truck growing combined with a healthy livestock industry and especially dairying. The soils are almost an exact reproduction of the fruit and vegetable lands of the Atlantic seaboard and are well adapted to the growth of early crops of various kinds. The sandy nature of the soils causes them to dry out and warm up early in the spring and, therefore, to hasten the production of any crop grown on them. Truck growing, however, requires much more skill and intelligence on the part of the producer than is usually required in the growing of staple crops and is attended by much more risk, for, while the profits may at times be large, the losses may be equally heavy. Such crops occupy the land only a short time in winter or early spring and always make it possible to recoup a possible failure by growing second or third crops.

Freshly cleared lands here are too poor to produce the best quality or quantity of truck crops and should first be improved by the use of animal manures and leguminous crops. However, such crops as strawberries and sweet potatoes do better on newly cleared lands than they do on older soils by reason of the fact that they are troubled less with grass. A few of the most promising truck crops will be mentioned and the remarks based largely on the experience with them at this Station.

Beans.—This is one of the least expensive truck crops to grow as well as one of the most reliable. It occupies the land only about seventy-
five days from March the first, the average date of planting, and does not require an excessively rich soil nor expensive fertilization, while the preparation of soil and cultivation of the crop amounts to very little. With the exception of anthracnose, or the rust of the pod, the crop is not seriously damaged by insect pests or fungous diseases, and this anthracnose only attacks the yellow-podded varieties. One hundred bushels of marketable beans is not an exceptional yield and the prices vary from twenty-five cents to two dollars per bushel shippers' net to the producer. Shippers' net means the amount remitted to the shipper after paying freight or express charges and the commission merchant's charge for selling. After this crop is taken from the land heavy yields of corn with catch crops of cowpeas or velvet beans may be made, or the land planted to a number of other crops, one of the best of which is the sweet potato.

**Cabbage.**—Unlike the bean the cabbage requires a very rich soil, is more expensive to grow in many respects, and is sometimes seriously damaged here by insect pests, chief of which are the cut worm and cabbage leaf worm. This crop may be grown here either in spring or winter, the climate being mild enough to permit of growing the crop in open fields if the plants are allowed time to get a good growth before the approach of very cold weather. The Station has grown several crops of cabbage by planting the seed directly in the field in early September, thinning the plants later to a stand, and finally marketing heavy yields of cabbage in January and February, after the thermometer had gone as low as eighteen degrees, this being exceptionally cold weather here. Cabbage may be grown here either for the very early spring market or for the late market that usually develops locally and in nearby towns and cities after the early crop has been exhausted, but insects grow much worse as the season advances and the late crop is not so reliable as earlier plantings.

**Tomatoes.**—These grow to perfection in the pine belt, especially in the more northern and western portions where the climate is less humid and fungous disease not so destructive. When grown at McNeill tomatoes have been greatly damaged by what we know as the blossom end rot which seriously injures the earlier and higher-priced fruit which the plants put on. Spraying with Bordeaux mixture will control this trouble, but frequent showers often interfere with the proper use of this fungicide.

**Irish potatoes.**—Both fall and spring plantings of potatoes may be grown here with a fair degree of success. The sandy nature of the soils is conducive to the early maturity of this crop and this is usually
at the expense of heavy yields. This Station has made as much as 150 bushels of potatoes per acre, but such yields are much above the average of this territory. The Colorado potato beetle interferes with the crop and will have to be killed several times if they are kept under control. If seed from the spring crop are spread out on an earthen floor in thin layers and covered with sand they will keep through the summer and may be used in the fall for planting a second crop. The usual practice here is to put them under some kind of shelter and for two weeks before planting keep them moist so as to cause them to sprout. The sprouted seed may be planted in dry weather and will soon come up to a stand and give fair yields of potatoes before frost.

Sweet potatoes.—No soils grow a better quality of sweet potatoes than do these here and the yields are usually all that could be desired. The crop does not require an especially rich soil and is grown here largely on newly cleared lands, because on such soils the crop can be grown at a minimum of expense in the matter of cultivation and the yields on such soils are quite satisfactory. The Station has made yields of 250 bushels per acre on these newly cleared lands and has sold them at fifty cents per bushel on the cars at McNeill, loading directly from the field. The market for these potatoes, however, is easily glutted at digging time in the fall and as a rule they do not keep satisfactorily through the winter. They are easily canned and make a most excellent article of diet, scarcely to be distinguished from the fresh potato, but as yet there are no factories here for canning them and the people only grow such quantities as they think will be consumed in the established markets during the fall and early winter. Potatoes grown here are of the yam type and are very sweet and juicy, quite the reverse of the sweet potatoes grown so largely in New Jersey which are dry and mealy. The Northern markets prefer the dry potato and do not furnish a good market for our potatoes which have to be sold almost entirely in strictly Southern cities.

Other vegetables.—Practically all the common vegetables of the South may be grown here successfully and the home garden may be made to supply the table with fresh vegetables the entire year. All crops of the cabbage family, such as turnips, cauliflower, kale, kohlrabi, with lettuce, onions, radishes, etc., have been successfully grown here through the winter months in open fields, and the truckers along the Gulf Coast have made quite a success at growing some of these crops, notably lettuce and radishes for Northern markets, shipping the same in carload lots.
Asparagus has proved a profitable crop here and has been grown in considerable quantity on this Station where a number of experiments have been made with it to determine the best means of fertilizing it with commercial fertilizers.

Other farm crops.—Practically all of the saccharine and non-saccharine sorghums have been successfully grown here, but since corn and the regular sugar cane do equally well, if not better, there is little inducement to grow them.

The soils generally do not have sufficient lime to grow the eating varieties of peanuts very successfully, the tendency with them being to develop faulty pods or "pops," but the Spanish variety does well and is grown extensively. It furnishes one of the cheapest hog feeds that can be grown here and in connection with rape, soy beans, Bermuda pasture, and corn can make this an ideal place to grow pork cheaply. In fact, nearly all root crops do well here, chufas yielding even better than peanuts, while cassava makes possibly the heaviest growth of roots of any crop ever planted at the Station, the same being a very nutritious and palatable feed for livestock.

Hay crops.—The country has very few natural hay crops and has to depend largely on cultivated crops as forage, such as cowpeas, soy beans, peanuts, and sorghum. Mexican clover, a non-legume, usually grows luxuriantly in cultivated fields, largely in corn after this is laid by, and is used to some extent as a hay crop. In certain sections of the pine belt lespedeza grows high enough to cut and makes a most excellent hay. Paspalum or water grass has recently made its appearance in great quantity on the Station farm and grows to a great height, making an immense quantity of a rather coarse hay, the value of which we have never determined. Bermuda grass, while making possibly our most valuable pasture grass, will hardly grow high enough to cut for hay and the same may be said of carpet grass.

The Station is this year trying the three recently introduced grasses: Guinea, Para, and Natal,—and the first two have made almost phenomenal yields of a very coarse hay, while the seed of the last failed to germinate and no plants were obtained. The Para and Guinea grasses will make a number of cuttings here and both will approximate sugar cane in tonnage. They are both very coarse and would probably make better soiling crops than hay crops, though by cutting them frequently the quality of the hay as regards coarseness would be greatly improved.
THE CUT-OVER LANDS OF SOUTH MISSISSIPPI.

TYPICAL LONG LEAF PINE FOREST.
AVAILABLE BULLETINS AND CIRCULARS.

The following bulletins and circulars of the Station may be had on request:

**Bulletins.**

No.
60—Value of Cotton Seed to the Farmer.
84—Report of Field Work at College Station for 1903.
90—San Jose Scale.
91—Inspection and Analyses of Commercial Fertilizers.
92—Beef Cattle.
93—Peach and Plum Culture.
95—The Dairy Cow.
104—Inspection and Analyses of Cotton-Seed Meal.
107—Pork Production at the Delta Station.
114—Inspection and Analyses of Cotton-Seed Meal.
119—Report of Work at the Delta Branch Station for 1907 and 1908.
121—Experiments in Feeding Beef Steers.
122—Report of Work at the Holly Springs Branch Station for 1908.
125—Inspection and Analyses of Commercial Feeding Stuffs.
127—Inspection and Analyses of Cotton-Seed Meal.
128—Inspection and Analyses of Cotton-Seed Meal.
129—Sugar Cane for Syrup Making.
132—The Soils of Mississippi.
133—Inspection and Analyses of Commercial Feeding Stuffs.
135—Cotton 1909.
137—Inspection and Analyses of Commercial Feeding Stuffs.
138—Inspection and Analyses of Commercial Feeding Stuffs.
139—The Boll Weevil in Mississippi, 1909.
140—Cotton Diseases in Mississippi.
141—Control of Diseases of Fruits, Flowers and Vegetables.
142—Inspection and Analyses of Commercial Fertilizers.
143—Inspection and Analyses of Cotton-Seed Meal.
144—Inspection and Analyses of Commercial Feeding Stuffs.
145—Inspection and Analyses of Commercial Feeding Stuffs.
146—Suggestions for Growing Home Fruits.
147—Apple Growing in Mississippi.
148—Inspection and Analyses of Cotton-Seed Meal.
149—Inspection and Analyses of Commercial Feeding Stuffs.
150—Inspection and Analyses of Commercial Fertilizers.
151—Inspection and Analyses of Cotton-Seed Meal.
152—Inspection and Analyses of Commercial Feeding Stuffs.
153—Inspection and Analyses of Commercial Feeding Stuffs.
154—Inspection and Analyses of Commercial Feeding Stuffs.
155—Recent Cotton Experiments.
156—Inspection and Analyses of Cotton-Seed Meal.
157—Report of Work at the Delta Branch Experiment Station for 1911.
158—Report of Work at McNeil Branch Experiment Station for 1907-1911.
159—Clearing Pine Lands.
160—The Cut-Over lands of South Mississippi.

**Circulartes.**

Asparagus. Insect Pest Law.
Blackleg. Underground Waters of Mississippi.
Boll Weevil. Hairy Vetch.

Address, AGRICULTURAL EXPERIMENT STATION,
Agricultural College, Miss.