

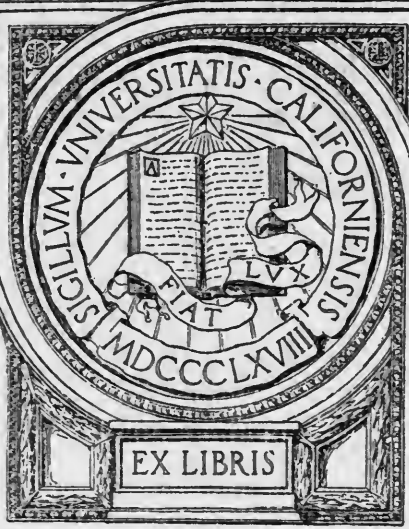
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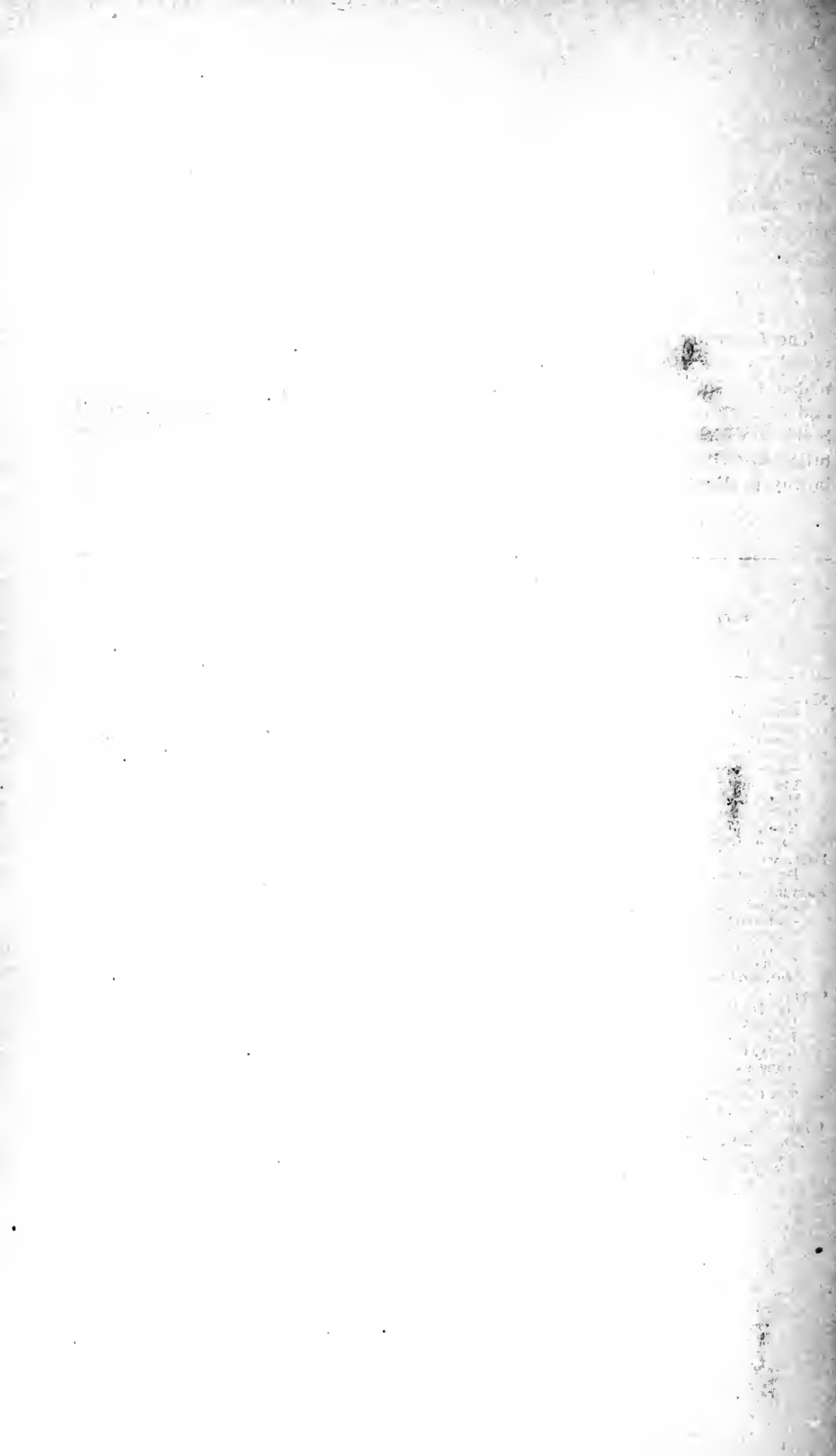
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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXII.

THE NORFOLK SANDY LOAM.

BY

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WASHINGTON:
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1911.

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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXII.

THE NORFOLK SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

An aggregate area of 2,000,850 acres of the Norfolk sandy loam has been mapped in the various soil surveys along the Atlantic and Gulf coasts. The type has been encountered in 40 different areas located in 10 different States. It extends from New Jersey on the north through the entire Atlantic coast region and westward into Alabama. Small areas have also been found in Mississippi and in Texas, but by far the greater part of the type has been encountered along the Atlantic coast and in the eastern Gulf coast region. It is probable that when further soil surveys are made in this general region considerable additional areas of the Norfolk sandy loam will be encountered. It is probable that there are not less than 15,000,000 acres of the type in the lower lying section of the Atlantic and Gulf Coastal Plains.

CHARACTERISTICS OF SOIL AND SUBSOIL.

The surface soil of the Norfolk sandy loam to an average depth of 10 or 12 inches is a medium gray or yellow sand. This material is ordinarily loose and incoherent, although in some cases it may be somewhat loamy from the admixture of small amounts of finer grained material. The surface soil usually grades downward at a depth of about 1 foot into a loamy sand, which in turn is succeeded at greater depths by a friable, sandy, yellow clay. Throughout the entire soil section the coloration is either gray or a shade of light yellow. Only in a few instances where subsoil drainage is not adequate is there any mottling with gray in the deeper subsoil. The Norfolk sandy loam is thus easily distinguished from the Orangeburg sandy loam, which possesses a deep red, sandy clay subsoil, or from the Portsmouth sandy loam, which possesses a black, mucky surface soil and a mottled yellow and gray subsoil. It differs from the Tifton sandy loam, in that it usually lacks the accumulation of iron gravel, or iron concretions, which characterize that type, and also lacks the deeper yellow, brown, or reddish mottlings of the subsoil.

SURFACE FEATURES AND DRAINAGE.

Throughout all of the areas where it occurs, the Norfolk sandy loam is marked by a nearly level, undulating, or gently rolling surface. In very few instances is it more than slightly ridged. The differences in elevation within individual areas rarely reach more than 20 or 25 feet, unless those areas are of considerable extent. The type is found principally in the littoral section of the Atlantic Coastal Plain and the eastern portion of the Gulf region. It rises from near sea level to altitudes of 150 to 200 feet, and probably the greater proportion of the type is to be found between altitudes of 50 and 150 feet above sea level.

Owing to the textural peculiarities of the type and also to the fact that it lies in somewhat elevated interstream areas, it is usually fairly well drained. Only in shallow depressions which occur within the type and in local areas along the bottoms of some of the larger streams is there any lack of drainage. In general, the type may be characterized as one which absorbs atmospheric moisture readily on account of the loose, porous character of the surface soil, and which also retains that moisture sufficiently to promote the growth of general farm crops through the presence of the heavier sandy loam or sandy clay subsoil at no great depth. Thus the type is possessed of those characteristics with regard to its moisture relationships which render it extremely valuable for the production of general farm crops, and at the same time make it profitable to produce quite a wide range of special crops, particularly the market garden vegetables.

Erosion is not a serious problem in the case of the Norfolk sandy loam. It is sufficiently absorptive of moisture to prevent the formation of any rapidly flowing streams across the surface in the times of heavy precipitation, and furthermore the slopes within the area of the type are usually so slight that no active stream erosion has yet damaged the soil for agricultural purposes.

LIMITATIONS IN USE.

Because of the rather loose texture of the surface soil of the Norfolk sandy loam it is not particularly well suited to the production of small grains and of grass. Where it is properly tilled the type is well suited to corn, and, in the more southern States, to cotton. These same characteristics make the Norfolk sandy loam suitable for the medium and late season trucking crops, which may be grown within the Atlantic Coastal Plain Region. Those areas located near transportation lines and in regions where unseasonable frosts are not liable to occur may well be used for trucking and market gardening. Other areas of the type in the more northern region, less favor-

ably situated as regards climate and transportation facilities, may be used for corn, certain grains, and other general farm crops. In all of the more southern States it constitutes a valuable upland cotton soil.

Throughout its entire extent the Norfolk sandy loam is somewhat deficient in the amount of organic matter stored within the surface soil. This arises from its open, porous, well-aerated condition, which gives rise to the rapid oxidation of such organic matter as may have been in the soil naturally and as may be incorporated by the farmer in attempting to increase the productiveness of his land. Fields which have been continuously cultivated to an intertilled crop are those in which this deficiency is usually most evident.

Neither the drainage features of the Norfolk sandy loam nor erosion conditions require any particular consideration. In the main the type is excellently drained and not subject to any serious erosion.

For the production of corn, cotton, and similar crops it is usually desirable that the plowing upon this type of soil should not be too deep. By shallow plowing the surface soil is well stirred, and any organic matter present may be incorporated, while the somewhat compacted subsoil is left undisturbed and forms an excellent natural reservoir for the storage of moisture. In the later operations of crop production shallow tillage should be preferred to any deep cultivation of the soil. For this reason the improved cultivators, particularly the disk cultivator or those with the spiked or spring tooth arrangement, should be preferred to the small turning plow, which is too frequently used, particularly in the cotton fields.

The Norfolk sandy loam occurs under a considerable range of climatic conditions. In the North Atlantic States it lies within the cool temperate division where rainfall is ample. Farther south it lies within the warm temperate division where rainfall is excessive so far as the majority of soil types are concerned. Considering the porous surface nature of the Norfolk sandy loam it is improbable that any of the areas where it occurs receive too much rain for the proper tillage of the soil. Owing to the wide range of temperature over the areas occupied by the type, crops vary greatly and their adaptability will be discussed under a separate heading.

IMPROVEMENT OF SOIL EFFICIENCY.

It may be said that there is altogether too large a proportion of the type devoted to the production of general farming crops. Upon all areas where the depth of the sandy surface soil exceeds 1 foot the Norfolk sandy loam is not well suited to corn, cotton, oats, or other staple crops. Where the depth of the surface soil is less than 1 foot, these crops may be grown advantageously. Therefore, in the cultivation of the Norfolk sandy loam, considerable attention should be

paid, not only to the depth of the surface sandy material, but also to drainage, so that the best drained areas may be selected for truck crops, and those not excessively drained used for the production of the general staple crops.

Improvement in tillage methods would involve principally the use of disk machinery for plowing and harrowing the soil. The use of such machinery would save considerable time and expense of tillage, and at the same time the soft, friable surface soil would be adequately stirred. Furthermore, a large amount of organic matter in the form of weeds or other litter could be thoroughly incorporated into the surface soil for the maintenance of its organic matter content. Practically no attention need be paid to the improvement of the drainage of the type, or to its protection from erosion.

Probably the one great need of the Norfolk sandy loam is the restoration of organic matter to the surface soil. For this purpose a considerable number of leguminous crops is available. These vary somewhat in the different regions where the type is found. In all the northern localities from New Jersey to Cape Hatteras crimson clover makes one of the best green-manuring crops for this type. It may be sown in the fall, and will usually make a considerable growth before the end of the growing season in the early winter. Even during the winter months, in the more southern portions of the region, it will continue to grow. It revives at an early date in the spring; and, before it is necessary to plow the land for a regular season crop, the crimson clover will have attained a sufficient height to provide a considerable tonnage of organic matter, which may be turned into the surface soil. In more southern localities the cowpea constitutes an admirable crop, which may either be sown alone to occupy the entire surface of the land, or may be sown between the rows of crops, like corn, after the last working in the summer. In either case the plowing under of the roots and stubble, or in the first case, the plowing under of the entire crop will aid materially in the maintenance of organic matter.

In the South Atlantic and Gulf States in addition, cowpeas, velvet beans, and bur clover may also be used for the same purpose. In all localities where the type occurs the winter or hairy vetch should constitute a valuable winter cover and green-manuring crop. In addition to these leguminous crops, which are the most valuable for such purposes, winter rye in the more northern localities, and winter rye or winter wheat in the more southern States may be grown. The production of one or more of these crops, as the tillage system may require, should be advocated wherever the type is farmed, either for general farming purposes or the production of special crops.

In this connection it is necessary to call attention to the desirability of applying lime to the soil after the green-manuring crop has been

turned under. Unless this practice is followed there is a possibility that the decomposition of the large amount of organic matter will not proceed with sufficient rapidity to bring it into a desirable condition before the roots of the succeeding crop reach to the points where it has been accumulated. The application of burned stone lime to the amount of 1,500 or 2,000 pounds to the acre will hasten the process of decay, and there will be no difficulty in the use of the green manure, if lime is applied, after it is plowed under, at a period of 10 days to two weeks before the succeeding crop is seeded or planted.

LIMITATIONS UPON SPECIAL CROPS.

In the more northern areas where the Norfolk sandy loam occurs it is possible to use this soil to the best advantage for such crops as sweet potatoes, early Irish potatoes, watermelons, cantaloupes, and asparagus. All of these crops are suited to the climate and mature at a sufficiently early date upon the Norfolk sandy loam to make the type one of the best trucking soils. Further to the south, where the climate is somewhat warmer and the season earlier, the Norfolk sandy loam is hardly able to compete with the Norfolk sand, which is the earliest trucking soil, or with the Norfolk fine sand, which produces larger yields at about the same date that the crops would be matured upon the Norfolk sandy loam. In the more southern localities a large proportion of the extra early Irish potato crop is produced upon the Norfolk sandy loam. In the more northern areas where the total depth of the surface soil does not exceed 1 foot, the Norfolk sandy loam is an excellent corn soil, particularly when it is well tilled with reference to the maintenance of the moisture supply. In the more southern areas, the corn yields decrease, due to drought during the latter portion of the summer, and the type is better suited to the production of cotton than of corn. There are, therefore, certain variations in the proper uses of the soil type which are dependent; primarily, upon climatic conditions.

Wherever areas of the Norfolk sandy loam are located near to large cities, which consume considerable amounts of vegetables at all seasons of the year, it is probable that the best use for the type is for market gardening. For trucking it is not so essential that the land should be near large cities. It is only necessary that transportation to the city markets should be reasonably swift and frequent. Therefore, in all of the localities along the Atlantic seaboard where the type is developed, a considerable trucking industry has arisen upon the Norfolk sandy loam. The soil is not so early as the Norfolk sand, nor does it produce quite such large crop yields as the Norfolk fine sand or the Norfolk fine sandy loam. It is nevertheless a valuable soil for vegetable production.

EXTENT OF OCCUPATION.

The use of the Norfolk sandy loam varies widely in the areas where it occurs. In the more northern Atlantic Coast States it is largely used for general farming or for special trucking. In the South general farming upon the Norfolk sandy loam is confined mainly to cotton, with certain special early truck crops like the early Irish potatoes. There still remain thousands of acres of the type, particularly in southern Alabama and Texas, which are not farmed. With improvements in the methods of crop production, and possibly with the introduction of new crops, considerable areas of the type will become available for a wide range of agricultural uses.

Within the lower lying portions of the Atlantic Coastal Plain the Norfolk sandy loam is probably only exceeded in value for the production of cotton by the Norfolk fine sandy loam and by certain types of the Orangeburg series. It is possible under proper climatic conditions to produce the short-staple upland cotton and also the long-staple and sea-island cotton upon this type.

CROP ADAPTATIONS.

Corn is almost universally produced upon the Norfolk sandy loam. In New Jersey the type is well suited to this crop, and yields of 35 to 45 and 50 bushels per acre are secured. Farther south the production is not maintained at so high an average, and from 12 to 30 bushels per acre is considered a good yield, with an average of about 20 bushels. For the profitable production of corn the incorporation of considerable amounts of organic matter in the surface soil is necessary. Where such tillage and preparation has been practiced, yields have been doubled within periods of five years. Cases are known where the output has been increased from 25 bushels per acre to 80 and 85 bushels per acre through this practice.

Cotton is generally grown south of the Virginia line. In all of the areas where it is produced upon the Norfolk sandy loam the yields vary decidedly with the character of tillage which the crop has received. Upon the best tilled fields of the type cotton yields from one-half to three-fourths bale per acre of medium upland cotton. Upon other portions not so carefully tended the yields may sink as low as two-fifths of a bale per acre. It would be possible through the adoption of proper crop rotation, the incorporation of organic matter, and the shallow tillage of the surface soil at frequent intervals during the growing season to increase the average production to at least three-fourths bale per acre.

Oats are usually sown as a winter crop upon the majority of the cotton plantations in the South Atlantic and Gulf States. The yields upon the Norfolk sandy loam are frequently very low. In most cases

it is impossible to ascertain what the yield of grain might be, since the crop is sown chiefly for the purposes of covering the soil during the winter months, and later on cut as hay for the purpose of feeding the work stock during the early spring and summer. It is probable that the grain yield of oats upon the Norfolk sandy loam nowhere exceeds 20 bushels to the acre, and that the average yield is lower than this.

Cowpeas are being more extensively used each year as a soil renovator and forage crop in the South Atlantic States. The crop is well suited to the Norfolk sandy loam, and where the peas are sown broadcast for hay yields of 2 to even 3 tons of baled hay per acre are secured. In some instances the peas are also grown for seed. The growing of this crop is strongly recommended and it should constitute one crop in the regular rotations upon all of the cotton-planting areas occupied by the Norfolk sandy loam.

In eastern Virginia and some portions of eastern North Carolina the Norfolk sandy loam is recognized as the best soil for the production of peanuts for market purposes. In these localities the peanuts are planted about the same time as corn. They are cultivated up to the time of blossoming and harvested during October and November. The nuts are then dried for two or three weeks and thrashed. From $1\frac{1}{2}$ to $2\frac{1}{2}$ bushels of unshelled peanuts are planted to the acre in rows from 30 to 36 inches apart. In a favorable season about 50 bushels of nuts and 2 tons of straw per acre are secured. In addition to the production of the crop for the nuts themselves considerable acreages are coming to be planted as pasturage for hogs. The peanut vine hay is considered very good for the feeding of work stock.

In eastern North Carolina bright cigarette tobacco is grown upon the Norfolk sandy loam, crops ranging from 500 to 1,500 pounds to the acre. Upon well-tilled fields the average yield is between 1,000 and 1,200 pounds. The soil type is one of the best for this type of tobacco of any in the eastern portion of the United States. In the production of this crop the Norfolk sandy loam and two of its associated types have largely taken the place of the sandy soils of the Piedmont section where it was first grown. In the Florida-Georgia tobacco-growing section the shade-grown wrapper tobacco is also produced to advantage upon the Norfolk sandy loam, where the depth to the subsoil does not exceed 10 to 12 inches. If the depth of surface soil be greater than this, irrigation is sometimes employed to insure a sufficient supply of moisture during the growing season.

In southern Georgia, western Florida, and southern Alabama the Norfolk sandy loam is also used extensively for the production of sugar cane for sirup. The cane grown upon this type of soil gives an excellent yield per acre and the sirup is of a light amber color of good flavor. For this reason additional areas of the Norfolk sandy

loam are annually being planted to cane throughout the eastern Gulf section. The type may be recommended for this crop. In other localities in the South Atlantic and Gulf States sorghum is also grown upon the Norfolk sandy loam for sirup.

Truck crops.—The Norfolk sandy loam is probably the best soil for the production of the main truck crop of Irish potatoes found from New Jersey to South Carolina. It is also used for this purpose in Georgia and in Florida, though not so extensively. The date for planting begins with early February in the most southern localities and averages about 1 week later for every 100 miles northward. The Norfolk sandy loam forces the crop to early maturity. Tillage is easy and where proper attention is given to the crop during the growing season, and the land is properly fertilized, fairly good yields are secured. These vary from 100 to 150 bushels, though the best truck growers secure as high as 175 and even 200 bushels of potatoes per acre. The crop marketed from the Norfolk sandy loam is usually shipped at a sufficiently early date to secure the highest market prices for the Irish potatoes.

In the preparation of the Norfolk sandy loam for Irish potatoes considerable organic matter is necessary in the soil. This may be secured through the application of stable manures or by plowing under a green crop produced during the winter months for this purpose. The majority of the growers also apply considerable amounts of special potato fertilizers in the production of this crop. One of the first requisites of a good potato fertilizer is a high percentage of potash salts. The fertilizers used for the early truck potato crops usually contain from 3 to 4 per cent of nitrogen, from 8 to 10 per cent of potash, and about the same amount of phosphoric acid. Many of the truck growers prefer the sulphate salts of potash to any other form.

The Norfolk sandy loam is an excellent soil for the production of sweet potatoes. In the region south of Cape Hatteras the crop is raised as a staple for home consumption. In the States to the north, from the Eastern Shore of Virginia to New Jersey inclusive, the crop is produced as a market gardening or truck crop. Different varieties of potatoes are planted in the different localities, the red varieties being particularly favored in New Jersey. The yield per acre varies considerably, owing to the differences in tillage and skill in handling the crop. In general it may be said that the staple crop in the Southern States produces from 75 to 200 bushels per acre, and that the truck crop in the more northern States produces from 75 to 150 bushels per acre, depending upon seasonal characteristics. The soil is well suited to the production of this crop wherever the climate is favorable and the extension of sweet-potato culture should be favored in all localities.

A considerable variety of other truck crops is raised upon the Norfolk sandy loam. In the southern localities, the early English peas and snap beans are raised for shipment to northern markets, and watermelons, cantaloupes, cucumbers, and tomatoes are produced in various trucking areas with fair success. Asparagus grows well, although, the crop is not quite so early as upon the Norfolk sand. In some areas cabbage and squash are grown, but neither of these crops is recommended for extensive planting.

Fruit crops.—Peaches are grown to a limited extent upon the Norfolk sandy loam, and the planting of peach orchards can well be extended upon this type in the North Atlantic coastal section. In New Jersey a few successful orchards exist. Elsewhere, peaches are only planted to any extent upon the type in the State of South Carolina. The trees are not quite so long lived as upon certain of the soils of the Orangeburg series, but the color and quality of the fruit produced are excellent. Grapes are also grown upon the Norfolk sandy loam, both in New Jersey and in North Carolina. In the more southern localities the Scuppernong variety is grown to excellent advantage.

Some pecan orchards have been planted in South Carolina and other southern sections. None of them have reached sufficient maturity to enable one to judge as to the qualifications of the soil for pecan orcharding. However, its excellent surface drainage and the existence of the moisture holding sandy clay subsoil at no great depth would indicate that pecans might be grown to advantage upon the type.

FARM EQUIPMENT.

Usually the Norfolk sandy loam in all the areas where it occurs is worked with the lighter weight teams and tools. There is no particular necessity for using a large amount of horsepower, or for using large-sized tools for the cultivation of this type. Its characteristics are such that shallow plowing and shallow surface cultivation of the intertilled crops during the growing period are not only adequate but preferable for the tillage of the type. It is more essential to maintain an adequate surface dust mulch to prevent rapid evaporation of moisture than to plow deeply.

The equipment of farm buildings varies decidedly with the different localities where the type is developed. In all of the more southern regions the ordinary equipment is that usual to cotton plantations. In the trucking regions, some additional buildings are provided for the protection of those who pack the truck or fruit crop for market, and certain additional structures are sometimes erected for the storing of spraying machinery and other equipment wherever the production of tree fruit is added to that of the truck crops. As a

general rule there are no very expensive buildings, nor any very elaborate equipment upon the Norfolk sandy loam.

SUMMARY.

The Norfolk sandy loam is an extensive soil type developed within the lower lying portions of the Atlantic and eastern Gulf Coastal Plains.

It lies at varying altitudes from sea level up to 150 or 200 feet above tide, but the greater part of the type is probably found between altitudes of 50 and 150 feet.

The surface of the Norfolk sandy loam is nearly level, undulating or gently rolling, and there are no steep slopes or marked differences of elevation within the different areas of the type.

The surface soil of the Norfolk sandy loam is a gray or a pale-yellow medium sand, having a depth of about 12 inches. This is underlain to a depth of nearly 2 feet by a loamy sand or sandy loam of a yellow color which grades downward into a friable yellow sandy clay.

The surface and subsoil drainage of the Norfolk sandy loam is usually complete and adequate.

The Norfolk sandy loam may be characterized as a fair general farming soil in all of the areas where it occurs, and is particularly well suited to the production of medium upland cotton in the more southern States. It is also a type which may be utilized for the production of the main truck crops of mid-season maturity.

For the improvement of crop yields upon the Norfolk sandy loam greater attention should be paid to the growing of the legumes, to be used as green manures. For this purpose crimson clover is available in the more northern States, and cowpeas, winter vetch, and the velvet bean in the more southern States. Rye or winter oats may be used for the same purpose.

Among the truck crops, the Norfolk sandy loam is particularly well adapted to the production of extra early Irish potatoes for the northern market. It is also well suited to the production of sweet potatoes, either as a general crop in the more southern States, or as a special market-garden crop in the Northern States. Watermelons, cantaloupes, cucumbers, tomatoes, and asparagus are well suited to the type, while cabbage and squash are grown to a limited extent.

Among the fruits, peaches and grapes are best suited to the Norfolk sandy loam.

In certain localities, peanuts, bright cigarette tobacco, and sugar cane are grown upon the Norfolk sandy loam to good advantage.

In the more northern trucking region, nearly all of the available surface of the Norfolk sandy loam has been occupied for the produc-

tion of some classes of crops. In more southern localities, where transportation facilities are adequate, considerable areas of the Norfolk sandy loam have been occupied for trucking purposes, and in more remote districts the soil is extensively used for general farming. In the eastern Gulf region there are large areas of the type still available for agriculture.

The farm equipment upon the Norfolk sandy loam is usually of the lighter type, and is well suited to the tillage of such a friable, easily moved surface soil.

Approved.

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., August 11, 1911.

APPENDIX

The following table shows the extent of the Norfolk sandy loam in the areas surveyed to this time.

In the first column is stated the particular soil survey in which the soil was encountered; in the second column, its extent of development in acres; and in the third column, the volume of the Field Operations of the Bureau of Soils in which the report upon the area may be found. Those desiring a detailed description of the soil and of the general conditions which surround it in any particular area may consult these volumes in almost any public library.

Areas of the Norfolk sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.
<i>Acres.</i>		
Alabama:		
Autauga County.....	10,816	1908
Baldwin County.....	9,664	1909
Bibb County.....	2,432	1908
Coffee County.....	29,504	1909
Henry County.....	42,688	1908
Lee County.....	39,296	1906
Macon County.....	9,408	1904
Montgomery County.....	32,896	1905
Tallapoosa County.....	10,048	1909
Florida:		
Escambia County.....	37,824	1906
Gadsden County.....	50,816	1903
Gainesville area.....	86,784	1904
Marianna area.....	50,688	1909
Georgia:		
Bainbridge area.....	24,576	1904
Grady County.....	37,440	1908
Thomas County.....	49,216	1908
Tift County.....	20,416	1909
Waycross area.....	30,208	1906
Mississippi:		
Jasper County.....	16,128	1907
New Jersey:		
Salem area ¹	16,790	1901
Trenton area ¹	8,640	1902
North Carolina:		
Craven area.....	27,288	1903
Edgecombe County.....	117,440	1907
New Hanover County.....	1,216	1906
Pitt County.....	33,472	1909
Raleigh to Newbern area ²	216,580	1900
Robeson County.....	297,152	1908
Scotland County.....	79,040	1909
South Carolina:		
Conway area.....	5,184	1909
Darlington area ³	65,024	1902
Lee County.....	79,616	1907
Orangeburg area.....	126,592	1904
Saluda County.....	9,472	1900
Sumter County.....	82,240	1907
Tennessee:		
Henderson County.....	1,984	1905
Texas:		
Robertson County.....	9,920	1907
Woodville area.....	52,864	1903
Virginia:		
Chesterfield County.....	32,704	1906
Hanover County.....	88,256	1905
Yorktown area.....	94,016	1905

¹ Mapped as Quinton sandy loam.

² Mapped as Norfolk sandy soil and Selma silt loam.

³ Mapped as Norfolk sandy soil.





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