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

THE SUSQUEHANNA FINE SANDY LOAM.

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THE SUSQUEHANNA FINE SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

An area of 1,686, 528 acres of the Susquehanna fine sandy loam has been encountered in 27 different soil survey areas located in five different States. This soil is practically confined to the timbered region of the Gulf Coastal Plain. Small areas are found in southwestern Georgia. Larger areas occur in central Alabama, and the type is developed to a limited extent in eastern Mississippi. It is west of the Mississippi River in northern Louisiana and in the timbered portion of eastern Texas that the widest development of the Susquehanna fine sandy loam occurs and throughout this region it is a dominant soil in many of the counties.

CHARACTERISTICS OF SOIL AND SUBSOIL.

The surface soil of the Susquehanna fine sandy loam is a gray or brown fine sand or fine sandy loam, having an average depth of about 12 inches. This material rests upon a stiff clay subsoil which is prevalently red or yellowish red in color, becoming almost universally mottled and variegated with red, yellow, gray, or drab at greater depths. Boundaries between the soil and subsoil are usually sharply defined. Frequently the surface soil contains considerable amounts of iron concretions and of plates and fragments of iron-cemented sand. Occasionally a small amount of fine quartz gravel is also present.

The Susquehanna fine sandy loam most closely resembles the Orangeburg fine sandy loam in its general coloration and texture, but is readily distinguished from that type by its stiff plastic clay subsoil as distinct from the red sandy clay subsoil of the Orangeburg types.

SURFACE FEATURES AND DRAINAGE.

In all of the more eastern areas of its occurrence the surface of the Susquehanna fine sandy loam is rather sharply rolling to hilly and broken. In fact it is prevalently a timbered, hill soil. In many instances the slopes are so steep and the surface of the type so broken

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that agriculture has not occupied any large proportion of this soil east of the Mississippi River. In the western areas the surface of the type is more gently rolling and a smaller proportion becomes broken or eroded. It is highly valued for agricultural purposes and a large portion of it is under cultivation. The elevation of the type above sea level varies considerably. In the more eastern areas in the vicinity of the Gulf the surface lies at altitudes of 200 to 250 feet above tide level. In the central portion of Alabama and in eastern Mississippi the altitudes range from 350 to 500 feet above the sea, while in northern Louisiana and in eastern Texas the greater portion of the type lies in the vicinity of 500 feet above sea level.

Owing to the rolling surface and the considerable elevation of this type, the natural surface drainage is well established. The drainage of the surface soil is always sufficient, but the proximity of the stiff plastic underlying clay frequently gives rise to areas of poor drainage upon the more level portions of the type.

The chief difficulty in the agricultural occupation of the Susquehanna fine sandy loam, however, arises from its liability to excessive erosion upon all of the steeper slopes. Not only the surface configuration of the land, but also the character of the soil and subsoil itself favor the rapid removal of the surface material. The stiff plastic clay subsoil prevents the rapid downward percolation of the rain, and upon all the steeper slopes the soft sandy soil becomes saturated and is easily eroded. As a result, over considerable areas the underlying clay reaches the surface in numerous gullies and in small eroded areas upon all of the steeper slopes. This tendency toward excessive erosion has resulted in keeping a considerable part of the type in timber and in the abandonment of thousands of acres which were first cleared, then farmed for a short period of time, and with the development of active erosion again permitted to grow up to second-growth timber of various classes.

LIMITATIONS IN USE.

The Susquehanna fine sandy loam is primarily a general farming soil used for the production of staple rather than special crops. The presence of the stiff clay subsoil at no great depth is generally unfavorable to the growing of special truck or fruit crops. The subsoil drainage is not sufficiently well established, and in general the soil is somewhat too cold and late for the production of vegetables or any of the fruits. In some areas where the surface soil is deeper and where drainage has become well established, crops of this character are grown for the local market or for home use. Otherwise the type is principally devoted to cotton and corn production.

It has been generally observed in connection with the tillage of the Susquehanna fine sandy loam that the type is fairly productive when

first cleared from the forest stand, and that after five or six years of continued clean cultivation to cotton or corn the crop-producing power of the soil gradually diminishes until paying crops are obtained only with difficulty and in exceptionally favorable years. In almost all cases this decrease in crop-producing capacity is accompanied by the active destruction of the small amount of organic matter naturally present in the surface soil.

The type was originally largely covered by extensive growths of pine, particularly in the more eastern sections, and by scattered growths of hardwood in the Texas timbered belt. In neither instance was the natural accumulation of organic matter in the surface soil sufficient to withstand many years of clean cultivation. As a result, the diminution in crop production has accompanied the decrease in the small initial amount of organic matter. Where the type has been more carefully tilled and efforts made to preserve the organic matter content, less difficulty has been experienced in maintaining crop yields. This method of treatment of the Susquehanna fine sandy loam constitutes one of the important points in its profitable agricultural occupation.

There are extensive areas covering the more hilly portions of the type where farming should not be attempted because of the tendency to rapid erosion of the surface soil. Upon all of the steeper slopes and upon many of the more gentle ones clean cultivation promotes the bodily removal of the surface soil, leaving exposed the plastic raw clay subsoil. Such areas are not fitted for the production of even the most hardy crops, and many otherwise excellent fields upon this soil have been destroyed within a brief period of time through excessive erosion.

These limitations restrict the widespread occupation of the Susquehanna fine sandy loam to the more gently rolling portions of the type and necessitate careful attention to the rotation of crops and the restoration of organic matter if the yields of the great staple crops are to be maintained.

IMPROVEMENT IN SOIL EFFICIENCY.

The methods for improving the Susquehanna fine sandy loam should be directed along two principal lines. It is necessary to prevent the excessive erosion of the surface soil of the type and to increase the organic matter content of the surface soil if crop yields are to be maintained.

The first essential for the prevention of excessive soil erosion is the restriction of cultivation to those fields and areas which possess a gently sloping surface, in no case exceeding 10° of slope. All areas of greater slope should either be left in the native timber growth or should be allowed to become reforested.

Even upon the more gently sloping areas precautions are necessary to prevent the washing away of the surface soil. The ordinary methods of contour farming by which the furrows are carried nearly horizontally around the slopes will be sufficient upon all the undulating areas and even upon the more gentle slopes. Upon somewhat steeper slopes, frequent terraces should be left in grass for the purpose of intercepting the movement of surface soil across the field.

It is very desirable that the Susquehanna fine sandy loam should be deeply plowed in the fall months, in order to render the surface soil porous and competent to absorb the heavier rains of winter and early spring. A far greater proportion of the rainfall will be absorbed by the soil and a smaller amount will pass across the surface, carrying the soil with it. In the majority of areas where this type occurs it is also best to produce a winter cover crop, which will aid greatly in the prevention of erosion. Winter oats and winter rye are both valuable forage crops which may thus be grown to advantage, while the winter vetch and crimson clover, among the legumes, are especially well suited to production upon this soil. The surface vegetation prevents the rapid movement of water across the soil and the roots aid in binding the soft sandy loam and holding it against erosive agencies. In addition the roots and stubble of the winter cover crop or, if desired, the entire crop may be turned under in the spring in time for the production of either cotton or corn and a very valuable addition of organic manure be made. It is therefore desirable to grow some form of winter cover crop upon the Susquehanna fine sandy loam for the double purpose of preventing soil erosion and of restoring organic matter to the soil.

In many areas where the type has been encountered it has been the experience of the farmers that it was very productive for the growing of both cotton and corn when first cleared, but that after five or six years of continual cultivation to these crops the yields steadily diminished, making it necessary either to occupy new land or to resort to heavy applications of commercial fertilizers. This tendency arises from the exhaustion of the organic matter or humus content of the surface soil. By contrast, many of the best farmers in numerous areas where the type is found have easily maintained and even increased the crop-producing power of the soil through the use of organic manures. Wherever it is possible, the stable and yard manures made upon the plantation should be carefully saved and applied to this or similar sandy soils upon the farm. Usually the supply is not adequate for the treatment of any large area each year and it is necessary to resort to other sources of organic matter. There is an increasing tendency to use cottonseed meal upon this type for the production of both cotton and corn. Applications of 350 to 500

pounds per acre are made in addition to the use of the ordinary mineral fertilizers. The applications are made in the row prior to the planting of the cotton. Increased yields invariably result.

It is probable that over the greater portion of this type it will be necessary to resort to the use of the green-manuring crops in order to secure any material increase in the humus content of the soil. A considerable variety of leguminous crops may be used for this purpose. Cowpeas are particularly suitable and may either be sown between the rows of corn at the last working and allowed to make a late midsummer and early autumn growth, to be turned under for green-manuring purposes the next spring, or the crop may be grown upon land given over to its use. In the latter case the cowpeas may be seeded in the spring and an excellent crop of cowpea hay secured in time to permit of the preparation of the land for the sowing of a winter oat crop. Either method will restore a considerable amount of organic matter to the soil, in the first case through the plowing under of the entire crop, and in the second case through the turning in of the roots and stubble. Soy beans may be similarly used. Both crimson clover and winter vetch may be sown between the rows of cotton or of corn late in the season in order to produce a winter growth suitable for green-manuring purposes.

In almost all cases where large amounts of green organic matter are turned into the soil it is highly desirable to apply lime to promote the decomposition of the vegetable matter. Either the burned stone lime may be applied at the rate of 1,500 to 2,000 pounds per acre or ground limestone may be applied in about double that amount. Wherever green manuring has been properly practiced upon the Susquehanna fine sandy loam it has resulted in materially increased crop yields and in the lasting improvement of the physical condition and the crop-producing power of the soil.

Practically no systematic crop rotation has been introduced upon the Susquehanna fine sandy loam. It is desirable that a rotation suited to the different communities where the type is found should be adopted. One of the chief requisites of such a rotation would be the production of some leguminous crop for at least one year in the regular rotation. It is possible to produce an early crop of cotton and follow this with a crop of winter oats in the majority of areas where the type is encountered. The oats may be grazed off or cut for hay and the land plowed for corn. With the last cultivation of the corn crop, cowpeas should be sown between the rows and in the succeeding spring turned under to serve as a green manure. A considerable variety of cropping may be arranged to meet the needs of the individual plantation owner, provided oats and cowpeas, and in some localities also crimson clover and winter vetch are grown in conjunction with cotton and corn.

LIMITATIONS UPON SPECIAL CROPS.

The Susquehanna fine sandy loam has been chiefly developed as a cotton and corn soil, and the special crops have only been grown in a few areas where the type occurs. In the eastern Texas timbered belt, however, sweet potatoes, peanuts, and sorghum are all successfully grown, while limited areas produce watermelons and tomatoes. The type is fairly well suited for the production of these crops and they may well be grown for household use or to supply local market demands. This soil, however, is not so well suited to the production of truck crops as the members of either the Orangeburg or Norfolk series, and its general use for such purposes can hardly be recommended. The near presence of the stiff plastic clay subsoil makes the type one which warms up rather slowly in the spring, while it is also somewhat subject to drought during late midsummer. It is not, therefore, a particularly good special-purpose soil.

EXTENT OF OCCUPATION.

There is great variation in the extent to which the Susquehanna fine sandy loam is occupied for agricultural purposes. In the majority of the eastern areas only the more level portions of the type have been occupied, while the more hilly areas, being subject to severe erosion, have been left in forest. In Alabama only the best areas are tilled and probably 75 per cent of the type remains uncultivated. In northern Louisiana the timber has only been recently cleared from large areas of the type which are being occupied for agricultural purposes. With the exhaustion of the organic matter in the surface soil, many of the fields are soon thrown out of cultivation, and it is probable that not over one-third of the total area of the type in the northern parishes is annually cultivated. In the northeastern portion of Texas the type is more highly esteemed for agricultural purposes and approximately one-half of it is annually planted to crops. This arises particularly from the more level character of the surface, but even in this region the steeper slopes remain uncultivated.

There are large areas of the Susquehanna fine sandy loam capable of cultivation which may still be utilized for farming purposes. In order that these may be profitably occupied, the requirements of the soil with regard to deeper tillage, the maintenance of organic matter, and the protection from erosion must be thoroughly understood.

CROP ADAPTATIONS.

Cotton is the principal crop produced upon the Susquehanna fine sandy loam. The yields are uniformly low, ranging from one-fourth to one-half bale in the majority of instances and probably

not averaging above one-third of a bale per acre for the entire type. Upon freshly cleared land the yields are considerably in excess of this amount. The rapid exhaustion of organic matter, the habit of ridged cultivation, and the failure to rotate crops are the three fundamental causes for this decrease in the crop-producing power. This is abundantly shown by the success of individual farmers who have carefully attended to the cultivation and manuring of the type, since they uniformly report yields of cotton averaging one-half bale per acre or more.

In the region of its most extensive occurrence in eastern Texas the average yield of cotton has also been reduced in recent years through the ravages of the boll weevil. These are being met through improved methods of cultivation, through the growing of early maturing varieties, and through the introduction of crop rotations. The Susquehanna fine sandy loam when properly handled is capable of yielding a fair return of cotton maturing at an early season, thus avoiding the most serious damage from the boll weevil. It is probable that this more sandy soil will come to be more and more appreciated for cotton production as these methods of cotton growing are more generally understood. In fact, the type is very well suited for meeting just these emergencies.

Corn is also universally grown upon the Susquehanna fine sandy loam, but in far smaller aggregate acreage than cotton. The yields are low, ranging from 10 to 25 bushels per acre and probably averaging about 15 bushels. Again, faulty methods of soil management and of crop rotation are responsible for these low yields. The same methods which improve the type for cotton production are applicable to corn, and the use of organic manures and the adoption of a rotation containing at least one leguminous crop will materially increase the corn yields upon this soil.

Winter oats are grown to a limited extent chiefly as a forage crop. In cases where the oats have been harvested, yields of 25 bushels per acre have been secured.

Peanuts have been grown in northeastern Texas to an increasing extent during the last few years and constitute an excellent crop for production upon this soil. Sorghum is also grown in the same region, giving yields averaging about 3 tons per acre. Sweet potatoes, tomatoes, and melons are grown to a limited extent in a number of localities, giving fair yields.

Although peaches have been grown successfully upon some areas of the Susquehanna fine sandy loam, it is scarcely possible to recommend the crop for general production upon the type. For home use a few trees may be set upon the best drained areas, but in general the clay subsoil is too stiff and retentive of moisture to constitute a good orcharding soil.

FARM EQUIPMENT.

The farm equipment of the Susquehanna fine sandy loam does not differ materially from that of the other soils in the region in which it occurs. The small turnplow and the one-horse or one-mule hitch are most commonly used. The introduction of better machinery for the tillage of the soil is to be recommended. The disk plow and harrow permit a broadcast preparation of the land and are recommended for all of the more level areas, since deeper plowing and the thorough stirring of the surface soil are essential for the proper treatment of this type.

SUMMARY.

The Susquehanna fine sandy loam is an extensive type of soil throughout the Gulf Coastal Plain area. It occurs to a considerable extent in Alabama and adjoining States, but is chiefly found in northern Louisiana and the timbered belt of eastern Texas.

It occupies rolling to hilly areas lying at altitudes of 200 to 500 feet above tide level.

Cotton and corn are the principal crops grown upon the Susquehanna fine sandy loam, the former yielding about one-third of a bale per acre, and the latter about 15 bushels. Winter oats, cowpeas, sorghum, peanuts, sweet potatoes, tomatoes, and melons are also grown.

For its improvement the Suequehanna fine sandy loam needs careful protection from soil erosion, deeper plowing, and the incorporation of organic matter in the surface soil. It is capable of considerable improvement by the use of these methods.

There remain extensive areas of this soil type capable of occupation and agricultural development, particularly in the western Gulf coast region. This sandy soil is well suited to the growing of cotton under boll-weevil conditions; the early maturity of the crop constitutes one of the essential features of combating this pest.

In general the Susquehanna fine sandy loam is not particularly well equipped with modern farm machinery, and the introduction of tillage tools suited to the deeper plowing and the broadcast preparation of the land is to be advised.

APPENDIX.

The following table shows the extent of the Susquehanna fine 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 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 Susquehanna fine sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.
Alabama:	*Acres.*	
Bibb County	27,456	1908
Butler County	147,072	1907
Coffee County	65,472	1909
Dale County	74,880	1910
Lamar County	14,912	1908
Georgia:		
Grady County	4,096	1908
Thomas County	832	1908
Louisiana:		
Bienville Parish	88,960	1908
Caddo Parish	74,624	1906
De Soto Parish	110,336	1904
Lincoln Parish	19,584	1909
Winn Parish	163,584	1907
Mississippi:		
Jasper County	6,080	1907
Monroe County	1,664	1908
Texas:	*Acres.*	
Austin area [1]	7,424	1904
Bastrop County	195,456	1907
Camp County	23,360	1908
Cooper area	128	1907
Franklin County	77,952	1908
Grayson County	81,664	1909
Henderson area	53,312	1906
Houston County	32,128	1905
Morris County	66,176	1909
Robertson County	143,424	1907
San Marcos area	55,616	1906
Titus County	125,824	1909
Waco area	24,512	1905

[1] Mapped as Lufkin fine sandy loam.

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