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

THE CECIL SANDY LOAM.

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

THE CECIL SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Cecil sandy loam is the dominant soil type of the southern Piedmont region, so far as geographical extent is concerned. From central Virginia southward through the central or Piedmont sections of North Carolina, South Carolina, Georgia, and east-central Alabama it occupies extensive areas. The bureau has encountered this soil type in 29 different surveys located in the five States mentioned. In those soil surveys it has covered an aggregate area of 3,143,960 acres. In some of the single soil surveys it has been so extensively developed that it occupied more than one-half of the entire area included in the survey. While the total extent of the Cecil sandy loam in the Piedmont section can not be determined until that region has been entirely covered by detailed soil surveys, still it is safe to predict that fully one-third of the southern Piedmont is occupied by this single type. Only the Cecil clay is comparable with it in widespread development.

THE CHARACTERISTICS OF THE SOIL AND SUBSOIL.

The surface soil of the Cecil sandy loam, to an average depth of about 10 inches, is a gray, brownish-gray, or yellow sandy loam. This grades downward through a narrow zone of friable red sandy clay into a deep subsoil, which in almost all cases is a tenacious stiff red clay. This in turn rests at considerable depth upon the partly decomposed granite or gneiss from which both surface soil and subsoil have been derived by the ordinary processes of weathering. The Cecil sandy loam occupies the less eroded portions of the territory covered by the Cecil materials. It still carries on its surface the more thoroughly disintegrated and weathered remains of the original mass, and those coarser materials, such as the broken quartz and feldspar, which it has been impossible for water moving across the surface to carry away. The Cecil sandy loam is therefore to a degree an erosion type, whose sandy surface material has originated through the removal of the finer silt and clay particles and their

transportation to lower levels. Where erosion has been excessive the entire soil mass has been carried away and galled spots occupied by stiff red clay are found within the fields. These constitute local areas of the Cecil clay and where broadly developed are mapped as such. Every gradation between the galled areas, where only subsoil material exists, and the full development of the typical Cecil sandy loam may be found in any of the surveyed areas. Advantage should be taken of this difference in depth of the surface soil in the selection of the appropriate crop for each particular area of the type.

Scattered through both the surface soil and subsoil material there will be found greater or less quantities of angular white quartz, or white "flint," as it is locally known. These masses are the remains of old veins and seams of quartz which intersected the original granite or gneiss rock.

The Cecil sandy loam contrasts sharply with the Cecil clay, which is the other important type in the same series. The latter type consists of a stiff red clay or heavy chocolate-colored loam, extending from the surface to a considerable depth. It has no gray or brown sandy covering like the Cecil sandy loam. The members of the Cecil series are also easily distinguished from the soils of the Durham series, are also easily distinguished from the soils of the Durham series, which are gray or yellow at the surface and possess lemon-yellow or pale-yellow subsoils. Similarly the Cecil series may be separated from the Iredell series, which have brown or yellow surface soils and yellow or mottled yellow and gray subsoils. The stiff waxy subsoil of the members of the Iredell series is very impervious to water and gives rise to the scrub-oak soils and "beeswax" land of this Piedmont section. The Cecil sandy loam is rarely associated with the soils of the Chester series, which have a brown surface soil and a yellow loamy subsoil, or with the Penn series, which have a characteristic Indian red color in both soil and subsoil and are derived through the weathering of sandstones and shales.

SURFACE FEATURES AND DRAINAGE.

The Cecil sandy loam occurs only in that broad plateau section which lies along the front of the Appalachian Mountain Ranges, and from that region slopes gently seaward until it is covered by later deposits of the Coastal Plain along what is known as the fall line. This section extends from New Jersey to east-central Alabama, but the Cecil soils are only developed in the more southern portion from Maryland to Alabama. The Cecil sandy loam occupies the level uplands, the rolling or undulating crests of ridges, and those portions of the higher part of the Piedmont section which are best protected from active soil erosion and which have, therefore, been able to maintain the deeper surface covering of sandy and sandy loam material. In consequence the surface of the Cecil sandy loam in its typical development is undulating to gently rolling, and

is to be found at the higher elevations usually, except when these elevations consist of low mountain ridges or steep slopes. The Cecil sandy loam lies at an altitude from 350 to 1,200 feet above sea level. It is usually found more extensively developed at medium altitudes rather than at either extreme. Owing to the somewhat sandy nature of the surface soil and to its considerable depth, as well as to its topographic position, the Cecil sandy loam is normally well drained, and is consequently easily warmed and early. There are small areas within the type where the surface is so flat that natural outlet for excess soil moisture is not furnished, and in such small local areas drainage would sometimes be beneficial. In general, however, this is not a fundamental requisite with the soil. The region is practically devoid of swampy areas.

The Cecil sandy loam thus constitutes not only a desirable type of soil for agricultural uses, but it also occurs in such positions that the surroundings of the farm home and its healthfulness are frequently more desirable than the average.

The chief problem for those who farm the Cecil sandy loam is that of maintaining the soil type against erosion. The rainfall within the district where the type occurs is not infrequently heavy, and comes, largely, in the form of torrential downpours during the early part of the spring season, when the surface soil is not protected by the cover of any vegetative growth. Unless the soil has been properly managed by contour farming, terracing, the incorporation of organic matter, and deep plowing, it is sometimes difficult to maintain the soil against active erosion, particularly around the heads of small streams and along slopes of any great degree of declivity. In fact, it has been observed during the progress of the numerous soil surveys in this section that the area of the Cecil sandy loam is annually decreasing through the bodily removal of the surface sandy loam covering and its transportation down the gullies, streams, and rivers of the Piedmont section. Not infrequently where the surface soil is shallow a heavy rainfall will completely saturate the 4 or 5 inches of mellow surface soil, will lubricate the underlying stiff clay, and, if the slopes be at all steep, the surface soil under these conditions will bodily slip down hill, leaving a red gash or scar formed by the exposed subsoil. Land of this character must be so handled that the surface soil may not become saturated to this degree, but that the water falling at any one time may be absorbed by a deeper soil reservoir capable of maintaining both the soil and the soil moisture against the downward pull of gravity along the slope.

LIMITATIONS OF USE.

The mellow sandy loam surface soil of the Cecil sandy loam, while rendering it easily warmed and tilled, also causes it to be susceptible

to rapid loss of moisture through evaporation during the latter part of the growing season. On account of its texture, therefore, the type is somewhat limited in the classes of crops which may successfully be grown upon it. It constitutes the lightest or coarsest textured soil of the Piedmont section which is well suited to general farming operations. The tendency toward loss of moisture through evaporation necessitates the careful tillage of this soil. Such operations as tend to form a dust mulch and thus to conserve moisture are requisite, in order to obtain satisfactory yields in the production of general farm crops.

Over portions of the Cecil sandy loam where the heavier subsoil lies near the surface these textural difficulties may partly be overcome through the gradual increase in the depth of plowing which will enable the farmer to turn up a portion of the more dense and clayey subsoil to be incorporated gradually with the more sandy surface soil. This improvement in texture should be accomplished a little at a time, since the breaking up of any large mass of the partially weathered subsoil would be liable to decrease rather than increase crop yields, temporarily. This is a modification of the characteristics of the surface soil which is not easy of accomplishment with the majority of soil types, but is perfectly feasible in the case of Cecil sandy loam.

The variation in depth of surface soil, due to the different degrees of erosion, also constitutes a limitation upon the uses to which the different portions of the type may best be put. This is shown particularly well in the case of the tobacco crop, where the shallow phase of the Cecil sandy loam is well suited to the production of the dark export tobacco, producing heavy yields. The deep phase of the Cecil sandy loam, on the other hand, is suited in the more northern areas to the production of the bright lemon-yellow cigarette tobacco, which could not possibly be grown of good quality upon the shallower phase. In the same way, at proper altitudes throughout the Piedmont section, the shallow phase of the Cecil sandy loam is well suited to commercial peach orcharding, while the deep phase, though capable of supporting peach orchards, does not give such rapid growth nor such a thrifty condition of the trees. Again the shallow phase of the Cecil sandy loam is far better suited to the production of wheat and clover than the deep phase, while the latter constitutes the better cotton soil. These limitations in the use of the different phases of the soil should be observed in the location of crops upon the Cecil sandy loam and advantage should be taken of the differences in adaptation which render practicable a wider range of crop production than is possible upon the majority of soils. The variation in depth of surface soil also controls in a measure the appropriate depth for plowing. Upon the shallow phase it is advis-

able to increase the depth of plowing as before mentioned. Upon the deep phase shallow plowing and manipulation of the soil to compact the sandy loam immediately below plow depth is preferable.

The topographic attitude of the areas occupied by the Cecil sandy loam also imposes certain limitations upon the use of the type. Upon all of the steeper slopes, where destructive erosion is liable to follow cultivation, timber should be grown or the slope should be seeded with permanent grasses for pastures. Upon the more gentle slopes the practices of contour farming, terracing, and the use of cover crops are essential, while upon the gently undulating or nearly level surfaces these practices are not so requisite and the intertilled crops may be grown with the exercise of few precautions beyond proper tillage, crop rotation, and the restoration of organic matter to the soil.

The climatic surroundings of the type, extending as it does from the Middle Atlantic States to the Gulf region, also embody certain restrictions upon its use. In the more northern regions the staple crops of tobacco, corn, wheat, and grass prevail, and these are best suited to the higher elevations in even more southern latitudes. In the extreme southern portion of the Piedmont cotton, corn, winter oats, and cowpeas constitute the best general farming crops, but even here the early maturing varieties of cotton should be planted at the higher elevations.

Holding in mind these limitations, which are enforced chiefly by the surroundings of the type, although partly by its inherent characteristics, the variations in crop practice and crop yield within the limits covered by the Cecil sandy loam are more easily understood.

IMPROVEMENTS IN SOIL EFFICIENCY.

The fundamental requirement for the improvement of crop yields upon the Cecil sandy loam is the selection of those crops and varieties of crops which are best adapted to production upon the type under its varied climatic surroundings. In the more northern regions where the Cecil sandy loam is developed it is probable that general farming will always remain the dominant type of agriculture upon this and associated soil types. Within this region, which includes Virginia and the northern portion of central North Carolina, the production of tobacco, corn, the small grains, and grass dominates the crop practices on the type.

It has been found through experience that the best crop yields are secured when a short-term crop rotation is adopted, consisting of tobacco followed by winter wheat, followed by one or two years of grass, with the red clover constituting a large proportion of the seeding. The heavy applications of fertilizer made to insure a satisfactory yield of tobacco show a residual effect in increased yields for the succeeding wheat and grass crops, while the seeding to grass during

a portion of the rotation tends to restore organic matter to the soil. It is also noticeable that only one intertilled crop is produced in the four years and the tendency toward exhaustion of organic matter, as already noted, is thus decreased. In more southern locations the usual crop rotation, where any rotation exists, consists in the production of cotton upon part of the acreage, of corn upon the remainder, with both crops followed by winter oats. Little or no attempt is made to seed to the grasses, which are considered undesirable upon land to be devoted to cotton culture. Consequently this character of cropping tends to exhaust the organic matter in the soil, exposes the surface soil to erosion during a considerable part of the time, and is thoroughly unsuited to bring out the best properties of the Cecil sandy loam as a general farming type.

In these more southern regions a greater profit could be derived from the cultivation of this soil if a longer-term crop rotation should be adopted. Varieties of cotton particularly suited to sandy lands should be selected. Many of these varieties are known in the different States where the type occurs through variety tests at the state experiment stations, and some of them have been originated and propagated upon this particular soil.

It has been found to be a good practice in some localities to seed the cotton land to winter vetch late in the season when the cotton is laid by, in order to establish a leguminous winter cover crop over the cotton field. This may be plowed under in the succeeding spring and corn raised upon the land. In many cases cowpeas should be sown between the rows of corn at the last cultivation, giving an additional cover crop of a leguminous character. The land may then be brought back to cotton production if a short rotation is desired, or a winter grain crop may follow the corn, with grass seeding to occupy the ground after the grain is removed. The longer rotation thus outlined will aid in the upbuilding of the crop-producing power of the soil, and in a series of years will usually give as great cash returns as can now be obtained from the continuous planting of cotton or corn upon the same ground with the mere alternation of those two crops. Local modifications of any general system of crop adaptations must always be made to suit local soil and climatic conditions and local market demands for crops.

The textural characteristics of the Cecil sandy loam are such that careful tillage of the surface soil is required in order to maintain it at its full crop-producing capacity. It is a soft, friable soil, easily tilled by the use of light farm teams and light-weight tillage implements. Nevertheless it requires careful and frequent tillage which shall maintain constantly a shallow mulch of dry earth over all cultivated fields. This "dust mulch," as it is known, interposes an insulating blanket between the moist soil and the drying influence of the

atmosphere. With a sandy type like the Cecil sandy loam this is a requisite to the maintenance of a sufficient supply of moisture in the surface soil and the shallower portions of the subsoil for the growth of long-season crops like cotton or corn. The use of the small turn plow for plowing out cotton and corn should only be resorted to when the ground is occupied to an unusual extent by growths of grass and weeds. The shallow stirring implements like the steel-tooth cultivator are every way preferable for the latter part of the tillage of the crop.

In preparing the seed bed, as the soil is turned over by the plow it should be harrowed at once. This will tend to preserve the soil moisture stored in the sandy loam surface soil for the use of crops, instead of allowing its evaporation into the air. Wherever possible the disk plow and disk harrow should be employed in the preparation of the land. Such implements thoroughly stir the surface soil, while they aid in compacting the immediate subsoil without the formation of a "hardpan" layer. Both processes tend toward the conservation of soil moisture.

Few areas of the Cecil sandy loam require any artificial drainage. In fact, the chief tendency of the soil type is toward too free drainage and toward the bodily washing away of the surface soil material. Consequently erosion is the principal soil problem encountered by those who are tilling the type. It is impossible within the limits of the present circular to describe fully the steps which should be taken to prevent soil erosion or to lessen its evil effects upon the tilled land comprised within the limits of this type. The ordinary methods for the prevention of soil erosion consist of contour farming, where the rows of the tilled crop are carried horizontally around the slopes; of terracing, where unplowed strips are left at the requisite intervals to grow up to grass and thus to interrupt the free passage of surface water directly down the slope; of deeper plowing upon the more level areas, in order that the soil reservoir for the absorption of water may be deepened and enlarged; of the incorporation of the largest possible amount of partly decayed organic matter in the surface soil, to form a spongy medium for the absorption and retention of soil moisture; and of the growing of cover crops during the winter months, which by their mat of surface vegetation and through the binding effect of their root growth may aid in maintaining the soil material in its natural position. When to these methods of the control of soil erosion there may be added a systematic rotation of crops which shall maintain a considerable proportion of the entire area of this type under sod cover, there need be little fear of the further encroachment of gullies and eroded soil areas within the limits of the Cecil sandy loam.

The restoration and addition of considerable amounts of organic matter to the surface soil are requisite from two chief standpoints. The first of these is that of giving the somewhat sandy material an additional amount of absorptive and retentive vegetable matter to maintain moisture throughout the growing season for the important crops like cotton, corn, and tobacco. The second is that of adding fibrous material, which shall not only maintain soil moisture and absorb it readily, but shall also act as a binding material to maintain the surface soil against erosion. From both standpoints the addition of organic matter to the Cecil sandy loam is a requisite in the improvement of crop yields.

In order that this material may be added to the soil it is desirable that winter cover crops should be grown whenever possible. These in the more southern latitudes may occupy the ground when the soil would not otherwise be used for the production of a money crop. Under ordinary circumstances the winter crops, like hairy vetch, crimson clover, or a late-season crop of cowpeas, may be allowed to remain upon the land from early fall until time for the preparation of the ground for the succeeding hoed crop. Even winter oats, rye, or wheat have their uses for this purpose, although the leguminous crops first mentioned are preferable. Any one of these crops should then be turned under smoothly and be completely covered when the land is being prepared for cotton or corn. In the more southern locations it is also found desirable to add lime, after the cover crop is turned in, to the extent of 1,000 or even 2,000 pounds per acre, in order to promote the effective decay of the green manure in time for the purposes of the succeeding crop. If the lime be not added, difficulty is not infrequently experienced when the roots of the succeeding crop penetrate the partly decayed mass of the green manure crop and encounter fermentative processes which are still in progress if liming is omitted.

The question of the exact fertilization of any soil type, including the Cecil sandy loam, is one to which no general answer may be made. The difference in climatic conditions, in the previous treatment of the soil, in the character of the crop to be grown, and even in the depth of the soil material itself are so great even within the restricted limits of a single county that a fertilizer practice admirable for one field or one section might not be the best practice for other fields or other regions near by. In general it has been found, however, that high percentages of potash in the commercial fertilizer are not so necessary upon these "gray sandy lands" as upon other types of soil. The addition of nitrogenous manures and those containing considerable amounts of phosphoric acid have usually proved effective. For the addition of nitrogenous matter the leguminous crops should be plowed under, cotton seed or cottonseed meal used as a fertilizer, or,

best of all, the stable manures, when these are available, should be used. The fertilizers ordinarily applied to this soil type contain high percentages of phosphoric acid and low percentages of nitrogen and potash. Frequently the nitrogen content of such fertilizers should be supplemented by the additional use of 300 or 400 pounds of cottonseed meal to the acre.

In the production of special crops like Irish potatoes and tobacco upon the Cecil sandy loam, the use of potash in greater quanties than for the general farm crops has been found desirable. In the case of the production of both tobacco and potatoes it is the general opinion that the soil should not be limed preceding the planting, but that the liming should follow these crops instead.

LIMITATIONS UPON SPECIAL CROPS.

In a sense the tobacco crop may be considered a special crop upon the Cecil sandy loam. In the more northern tobacco-growing regions of middle Virginia and central North Carolina the heavy export tobacco, or the plug tobacco, is grown to the best advantage only upon those portions of the soil type where the heavy sandy clay or clay subsoil exists within 5 or 6 inches of the surface. The area of the Cecil sandy loam which is adapted to the production of this character of tobacco is, therefore, limited by this condition. The bright fire-cured cigarette tobacco, on the other hand, is only produced in its best quality where the depth of the sandy loam surface soil exceeds 12 or 14 inches. Thus the requirements for two special grades of tobacco vary somewhat even upon the same soil type, and care should be used in the selection of the area devoted to the growth of each. The production of the bright tobacco upon the Cecil sandy loam has been somewhat limited within the last few years, owing to competition with tobacco of the same class grown upon the Norfolk fine sandy loam and the Norfolk sandy loam of the Atlantic Coastal Plain region. There are, however, extensive areas of the deeper phase of the Cecil sandy loam from southern Virginia to central South Carolina where this class of tobacco may be grown to good advantage if the limitations above noted are observed.

In the same way the small-grain crops, especially wheat, are best suited to the shallow phase of the Cecil sandy loam, and the same phase constitutes the best clover and grass land within the area of the type. Thus the Cecil sandy loam, which is the lightest type of soil reasonably well suited to general farming within the Piedmont, has its restrictions and limitations, not only of soil texture, but also of depth of surface soil material, determining the crops which may be produced to the best advantage upon different portions of its area.

The climatic limitations attendant upon the geographic distribution of the type are somewhat marked. From central North Carolina

northward, at the elevations usually occupied by the Cecil sandy loam, cotton is not a particularly good crop because of the short growing season. Tobacco, the small grains, and grass are better suited. From the same region southward, however, because of longer season, cotton becomes the most important money crop, followed by corn and the small grains. In the more southern regions in Georgia and South Carolina watermelons are grown upon this type to better advantage than upon any other Piedmont Plateau soil. In the more northern regions of its development the melons may be produced, but are more successful upon some sandy type of the Coastal Plain.

EXTENT OF OCCUPATION.

The Cecil sandy loam, because of its ease of cultivation, its favorable natural drainage conditions, and its elevated position, has always been sought for the location of plantations and farms. As a result, at one time or another practically all of its surface has been cleared and occupied as farm lands. Within the last half century lack of labor, the persistent practice of continuous clean-cultivation systems of cropping, and failure to attend to destructive erosion have caused considerable portions of the type in the more remote and more steeply sloping localities to be thrown out of cultivation. However, in almost all localities where the type is developed the greater part of its surface is occupied by tilled crops, and only in less favorably located regions has any large proportion of its surface been permitted to grow up to the hardwood growths which take possession of this soil when it is unoccupied. Probably more than 60 per cent of the area of the type is now under cultivation, and if the necessary precautions to prevent erosion are observed, even a greater proportion of it might well be tilled. It is considered very desirable land for the production of general farm crops and of certain special crops suited to production upon sandy land.

CROP ADAPTATIONS.

GENERAL FARM CROPS.

Corn is almost universally produced upon the Cecil sandy loam in all localities where it is developed. Both the yellow and white varieties of southern dent are produced, and while the yields are normally low the quality of the corn is almost universally good. In the more northern regions of its development the Cecil sandy loam produces from 12 to 25 bushels of corn per acre, under ordinary conditions of cultivation, but in many localities where proper crop rotations have been adopted the average yield is as high as 25 to 30 bushels per acre. Throughout the extent of the type the yields of corn could probably be doubled if more attention were paid to the incorporation

of organic matter in the surface soil and to the production of leguminous crops in the rotation.

On account of the somewhat elevated position occupied by the Cecil sandy loam, cotton is not generally grown upon it in southern Virginia, and is only produced to a limited extent upon this type in northern North Carolina. In all of the more southern locations, however, it is a universal crop and produces from one-fourth to one-half bale per acre under normal conditions. Three-fourths of a bale per acre is considered a large yield, and is only attained by those farmers who have practiced unusually efficient methods of crop rotation and fertilization. For the production of cotton the Cecil sandy loam is generally considered to be a more certain soil type than the Cecil clay or soil types of other Piedmont series. While the yields are not so heavy as those normally produced upon the Cecil clay, still a fair yield will be produced every year upon the Cecil sandy loam. Cotton will give a fair yield under even more droughty conditions than corn, and it is frequently the case that upon a farm where both the Cecil clay and Cecil sandy loam occur in the more southern regions the cotton will be raised year after year on the sandy soil and the corn as frequently upon the clay. It is a noticeable fact, which has been observed in many locations throughout the cotton and corn growing regions, that the application of even a very light dressing of stable manure upon the Cecil sandy loam has increased the vigor of growth of both cotton and corn, and has increased the yield per acre by 25 or 30 per cent over fields not thus treated. The importance of the application of all stable and yard manures in the production of cotton and corn upon this soil can not be overestimated.

In southern Virginia and northern North Carolina tobacco practically takes the place of cotton as a staple crop upon the Cecil sandy loam. The quality of tobacco produced upon this soil type is in very nice adjustment with the physical properties of the soil. In the Virginia region where the depth of surface sandy loam material is frequently shallow, not exceeding 4 or 6 inches, and upon the same shallow phase in North Carolina the heavy export and manufacturing tobaccos are produced. This shallow phase of the Cecil sandy loam maintains a sufficient moisture supply to produce the thicker, heavier, and darker leaf required for this particular trade. For the production of the export and manufacturing tobaccos the soil is heavily fertilized and yields ranging from 400 to 1,200 pounds per acre are produced. The bright tobacco is only produced to good advantage upon the deeper phase of the Cecil sandy loam where the clay subsoil is not encountered at a depth of less than 12 to 14 inches.

Wheat is almost universally grown upon the Cecil sandy loam throughout the territory where the type occurs. In the more southern

regions the yields are extremely low, ranging from 5 to 12 bushels per acre. In North Carolina and Virginia, particularly where wheat is sowed immediately after the tobacco crop, thus receiving some of the residual benefits of the heavy applications of fertilizer given to the tobacco, the yields are considerably greater, ranging from 10 to 25 bushels per acre. The higher yields are only secured where the very effective rotation of tobacco, followed by winter wheat, followed by clover, has been adopted, and the wheat thus benefits from the heavy fertilizer applications and from the organic matter incorporated by the plowing under of the clover stubble. For the northern regions, where the Cecil sandy loam is developed, this is probably the most effective crop rotation which can be arranged. In the more southern regions wheat is not a crop which one may advise for general production upon the Cecil sandy loam. It should rather be produced upon the Cecil clay.

Oats are almost universally raised as a winter crop throughout the entire area occupied by the Cecil sandy loam. Frequently the crop is used for grazing purposes only, but in all regions where the oats are also harvested for the grain, yields of 15 to 30 bushels per acre are secured. The continued use of this crop is to be advised, since it serves as an excellent winter cover to aid in the protection of the soil against erosion and at the same time pays for the trouble and expense of production through the grain or the grazing afforded. The yields of oats upon the Cecil sandy loam are nowhere as heavy as upon the Cecil clay.

In Virginia and North Carolina a considerable acreage of the Cecil sandy loam is each year devoted in regular rotation to the production of hay. Timothy, redtop, and red clover are seeded following the wheat crop. Under average conditions a yield of about 1 ton of hay per acre is secured. Where heavy fertilization is practiced, and particularly where the rotation of tobacco, wheat, and grass has been followed for some time, yields double this are obtained. In the more southern regions clover is sometimes grown, giving rather low yields. Bermuda grass for pasturage purposes also occupies some of the more sloping locations within the area of the Cecil sandy loam where it has been permitted to grow partly for the purpose of restricting and retarding the active erosion of the soil. Its use in this connection is highly to be recommended, since there are few grasses native to the South and capable of growing upon the more sandy soils which constitute such an effective soil-binder as the Bermuda grass. Steep and gullied slopes should not be plowed for the production of cotton and corn, but the Bermuda-grass pasture should be made as permanent as possible. For the more level upland areas redtop, brome grass, and red clover are to be recommended for hay production upon the Cecil sandy loam in southern North Carolina and southward.

The production of cowpeas upon the Cecil sandy loam has been gradually extended during the past 10 or 15 years. Many of the farmers sow the crop at the last cultivation of the corn, and then pasture off the growth of cowpea hay after the corn has been gathered. This method leaves a considerable amount of stubble and all of the roots of the crop to be incorporated with the soil when it is next plowed. The trampling of the stock also assists in the compacting of the surface soil, and their droppings while grazing over the land constitute an added supply of much needed organic manure. The practice of producing cowpeas in the corn for grazing purposes is highly to be commended, and should be more universally used throughout all the more southern regions where the Cecil sandy loam is found. Cowpeas may also be grown in regular rotation with other crops and harvested for hay. Only a few farmers have thus far practiced this form of hay production, but the yields secured have varied from 1½ to 3 tons per acre. Succeeding crops of cotton or corn are also benefited by the production of this leguminous crop in the rotation.

Sweet potatoes constitute a staple crop throughout the entire extent of the Cecil sandy loam. The yields vary from 75 to 200 bushels per acre, depending upon the condition in which the land has been maintained. Sweet potatoes are well suited to this soil and their more extensive production for shipment to northern markets may well be recommended. Irish potatoes are grown to a limited extent as a crop for home use, the yields ranging from 75 to 100 bushels per acre.

In a few locations, principally in North Carolina, the Cecil sandy loam has been used for the production of tomatoes for canning purposes. The yields vary from 5 to 8 tons per acre, and the crop is considered fairly satisfactory as an additional money crop. The more extensive production of tomatoes, particularly in North Carolina and Virginia, is advisable.

The production of peanuts, garden peas, and other vegetable crops on this type of soil is only of local importance. The type lies in such an elevated position that it can scarcely compete in the production of garden vegetables with the soils of the Norfolk series in the Coastal Plain region. It would, however, be possible to produce the garden peas for canning purposes and sugar corn for the same use in connection with the tomato crops where the canning industry has been established.

FRUIT.

The Cecil sandy loam is probably the best peach soil to be found within the limits of the Piedmont Plateau. Not nearly all of the territory covered by the type, however, could be utilized for the

production of peaches. It is only in those locations where the altitude is sufficiently high to prevent the early budding of the peaches in the spring and to avoid their destruction at a later date by unseasonable frosts that the production of peaches may be considered a commercial proposition. Upon the areas having an altitude of approximately 1,200 feet, and especially in locations where the air drainage and wind circulation aids in preventing frosts, commercial peach orcharding has been very successful. The Elberta peach is the one principally grown, although other varieties are also planted. The trees come into bearing at 3 to 5 years of age and maintain a good growth for 15 or 20 years. In general it may be said that the peach orchards when properly located have been more successful upon the medium deep phase of the type where the sandy clay or stiff clay subsoil is encountered at a depth of 8 or 12 inches. Upon the deeper phase the rate of tree growth is not so satisfactory. There are many thousand acres of the type favorably located with regard to altitude, air and water drainage, and transportation, which are still unoccupied by any commercial plantings of peaches. The extension of this industry upon these selected areas might well be undertaken.

It will be seen from this description of the crop adaptations of the Cecil sandy loam that in the more northern regions there are several alternative crop rotations which are well suited to the type. In the North Carolina-Virginia tobacco region the production of the manufacturing or export tobacco followed by wheat and that followed by the production of the grass crops, including clover, is probably the best rotation which can be adopted. An alternative rotation is that of corn followed by wheat, followed by grass, in case it is desired to omit the tobacco crop. In more southern locations the annual production of cotton or the mere alternation of cotton and corn has constituted one of the factors leading to decreased crop yields upon the Cecil sandy loam. It would be far more desirable to plant cotton, to follow this with a winter cover crop such as oats, to succeed this crop with corn in the next year, sowing cowpeas between the rows in midsummer, and pasturing off the cowpeas after the corn crop has been picked. It would then be possible to return to cotton and secure better yields than the average now reported for the type. Whatever rotation is adopted in either section, great care should be taken to incorporate the largest possible amount of organic matter in the soil and all possible supplies of stable and yard manures should be applied to the land. While the Cecil sandy loam is not considered so productive in the majority of areas where it occurs as the Cecil clay, it is more easily tilled than the latter type. Fair average yields are reasonably certain every year and the soil is highly esteemed for the production of the staple crops.

SUMMARY.

The Cecil sandy loam is the most extensively developed of any of the soil types of the southern Piedmont region, occupying an estimated area of one-third of the total extent of the southern Piedmont Plateau.

It is the most sandy soil suited to general farming purposes in that section.

The crop adaptations of the Cecil sandy loam vary to some degree with the climatic conditions under which it occurs, and in the case of special crops, also, with variations in depth of the surface sandy loam soil.

In the more northern regions tobacco, corn, wheat, oats, and grass are the dominant crops. In the more southern region cotton, corn, and oats constitute the only crops of widespread production.

In addition to these general farm crops sweet potatoes, Irish potatoes, and tomatoes may be grown for local use, for canning purposes, and for shipment. Cowpeas are well suited to production upon the type and should be more extensively grown.

The incorporation of additional organic matter in the surface soil would aid greatly in the maintenance of an adequate moisture supply throughout the growing season. Such practice is requisite to securing large yields of any staple crops.

The heavy applications of commercial fertilizers upon the tobacco crops are not only justified by the increased yields of tobacco secured, but are also rewarded by increased yields in the succeeding crops of wheat and grass where such applications are made.

Mineral fertilizers containing a high percentage of nitrogen and phosphoric acid and a lower percentage of potash are most commonly used for crop production upon the Cecil sandy loam.

Soil erosion is one of the most important problems in connection with this type. The steeper slopes within the area of the Cecil sandy loam should be permanently established in woodland or grass for pasture. The more gentle slopes should be carefully tilled with contour cultivation, terracing, deeper plowing, and the incorporation of organic matter in the soil in order to prevent excessive erosion. The use of winter cover crops should also become more general for the same purpose.

The greater part of the area occupied by the Cecil sandy loam has been cleared and placed under cultivation. Certain portions of these clearings, because of destructive erosion, have been permitted to pass out of cultivation, and then have grown up to the hardwoods or to "old-field" pine.

Unchecked erosion is annually decreasing the total existing area of the Cecil sandy loam. This is a needless loss of productive soil area.

The Cecil sandy loam occupies the higher elevations, the rolling uplands, and the crests of ridges throughout the southern Piedmont section. It is well drained, is well located for residential and agricultural purposes, and occurs in a region practically devoid of swamps.

In addition to its general crop adaptations certain locations covered by this type are also suited to commercial peach orcharding.

Approved.

JAMES WILSON,
Secretary of Agriculture.

APPENDIX.

The following table shows the extent of the Cecil sandy loam in the areas surveyed at 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 Cecil sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.	Survey.	Area of soil.	Year of publication, Field Operations.
Alabama:	*Acres.*		South Carolina:	*Acres.*	
Chambers County	146,752	1909	Abbeville area	236,288	1902
Lee County	155,584	1906	Anderson County	245,568	1909
Tallapoosa County	76,672	1909	Campobello area	85,888	1903
Georgia:			Cherokee County	185,024	1905
Cobb County	23,170	1901	Lancaster County	20,672	1904
Covington area	27,500	1901	Oconee County	176,640	1907
Franklin County	53,120	1909	Saluda County	7,232	1909
Hancock County	206,336	1909	York County	88,768	1905
Pike County	132,160	1909	Virginia:		
Spalding County	54,464	1905	Albemarle area	47,808	1902
North Carolina:			Appomattox County	168,768	1904
Cary area	26,090	1901	Bedford area	33,740	1901
Caswell County	99,200	1908	Hanover County	97,856	1905
Gaston County	66,112	1909	Louisa County	150,400	1905
Hickory area	355,968	1902	Prince Edward area	91,710	1901
Raleigh to Newbern area	15,560	1900			
Statesville area	148,910	1901			