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

THE VOLUSIA SILT LOAM.

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

THE VOLUSIA SILT LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Volusia silt loam occurs at the higher altitudes in the plateau country which stretches from the vicinity of the Delaware River westward along the line between New York and Pennsylvania to the eastern boundary of Ohio, including considerable areas in the northeastern counties of that State. It is not found south of the extreme limits of glaciation. Within this region it has been encountered in eight different soil survey areas and has been mapped to the total extent of 821,184 acres. It is estimated that the type covers not less than 5,000,000 acres in the general region.

CHARACTERISTICS OF SOIL AND SUBSOIL.

The surface soil of the Volusia silt loam, to an average depth of 8 inches, is a yellow or light-brown silt loam. The color varies with the local conditions of drainage and with the amount of organic matter present. In poorly drained areas there is a tendency toward a gray or ash color, while in well tilled fields the surface soil is usually brown. From 8 inches to about 20 inches the subsoil is usually a pale-yellow silt loam, underlain by a compact mottled gray and yellow heavy silt loam. The entire soil mass is filled with angular fragments of shale and sandstone rock of all sizes. The underlying shale or sandstone rock is sometimes encountered at shallow depths, but is usually buried by 3 to 5 feet of soil and subsoil material carrying a few scattered bowlders of foreign rock.

The Volusia silt loam is easily distinguished from the soils of any other series by the universal presence of the flat shale and sandstone. It differs from the Volusia loam in occurring at higher elevations and in the generally lighter color of soil and subsoil. In general, it does not possess the considerable depth to underlying rock of that type.

SURFACE FEATURES AND DRAINAGE.

The Volusia silt loam covers the rolling surfaces of the high hills which have been carved from the plateau region of southern New York, northern Pennsylvania, and northeastern Ohio. At the highest

elevations it is only rolling, but the hills are separated by deep-cut, steep-sided valleys, down the slopes of which the type extends. Its surface varies, therefore, from nearly level or gently rolling to steeply sloping and almost precipitous. The greatest part of the type lies at altitudes ranging from 1,200 to 2,000 feet above tide level. Some portions of it rise to an extreme elevation of approximately 2,300 feet, while the areas found in northeastern Ohio are much less hilly and lie between 900 and 1,100 feet.

The surface drainage of the Volusia silt loam is fairly adequate over the greater part of the type. Numerous springs found upon the hill slopes give rise to small swampy areas and some of the more level tracts are so closely underlain by impervious rock as to be poorly drained. The greatest difficulty with drainage, however, arises from the compacted and dense condition of the subsoil just below plow depth. Long-continued plowing to the same depth, often at times when the subsoil was too wet, has compacted and hardened the layer upon which the plow sole rides, forming what is locally known as "hardpan." This hardpan seriously interferes with the natural internal drainage of the type.

Upon the more level areas of this soil erosion is not a serious problem, but there are many steep slopes within its boundaries which may be protected from destructive washing only through remaining in permanent pasture or in woodlot or forest. From many such slopes, denuded of forest when the region was cleared, practically all of the original soil has been removed, leaving only a mass of shale fragments mingled with a small amount of earth. Such slopes should never have been cleared. They comprise possibly 15 per cent of the total area of the type.

LIMITATIONS IN USE.

The Volusia silt loam occurs at high elevations in a cold northern region. It is a moderately well drained soil, of rather heavy texture, suited under ordinary conditions only to the production of hardy crops which mature in a short growing season. The greater proportion of the type lies at too great an elevation to permit of maturing any variety of corn except the flint, and even this can only be grown for silage in the majority of years. The crop adaptation of the type is therefore restricted by its inherent characteristics and by its climatic surroundings to buckwheat, oats, Irish potatoes, and hay. Other crops are grown to a limited extent, and the better drained areas, which may also lie at lower elevations, possess a greater range in crop adaptations than the general average of the type.

A considerable proportion of the total area of the Volusia silt loam lies upon the rolling tops of the high hills and is unfavorably located

with respect to transportation and shipping points. Even where the actual distance is not great there is frequently a long, steep grade from the farm down to the main routes of transportation. This limitation has affected the economic conditions and methods of farming in the region occupied by this type. Only such farm products prove profitable as may be grown in a cold climate and easily transported to market.

In former times sheep growing and the production of beef cattle constituted a considerable industry upon this soil, but competition with western ranges reduced the profits and a system of grain and hay growing as cash crops replaced the earlier dependence upon animal products. A decline in the productivity of the soil has frequently accompanied the abandonment of animal feeding since the former supplies of stable manure were no longer available. Even dairying is not at all universal upon the Volusia silt loam, owing to the lack of local facilities for the shipment of milk or for its manufacture into butter or cheese.

As a result of these limitations the profits derived from farming the type have frequently declined seriously, and there has been a general decrease in the rural population in many of the townships where this soil is the dominant type. Scarcity of labor has resulted in a tendency toward the aggregation of farm lands into large holdings accompanied by the more extensive forms of cultivation and a greater reliance upon farm machinery instead of hand labor. The lands not so well suited to this form of occupation have reverted to pasture and large areas of the poorer pastures have grown up to brush.

Thus the topographic and climatic environment of the type has tended to diminish the intensiveness of its cultivation and to restrict the area of its active agricultural occupation.

IMPROVEMENT IN SOIL EFFICIENCY.

One of the most necessary steps in the improvement of the crop-producing capacity of the Volusia silt loam is proper attention to the drainage of the type. This soil is fairly well provided with natural surface drainage, except in places where springs break out upon the hillsides and steeper slopes. Over a considerable proportion of the type the subsoil drainage is scarcely adequate for the production of large yields of any crops and it is rarely sufficient to insure a growing season long enough to mature corn and other long seasoned crops. Thousands of areas of this soil would be benefited by the installation of frequent tile underdrains, even in fields which possess considerable surface slope and from which storm waters flow away rapidly. The subsoil of the Volusia silt loam is a compact, retentive silt loam, frequently compacted into a "hardpan" layer by

continued plowing to the same depth or when the moisture content of the subsoil causes puddling in the bottom of the furrow. In all such cases the normal circulation of water through the soil and subsoil is disturbed and the soil is wet and cold during the early part of the season, becoming baked and hard during the later months of summer. It would be difficult to remedy this condition without the improvement in the conditions of underdrainage which may best be accomplished by the use of tile.

The surface configuration of the type is such as to afford sufficient grade for the tile systems and outlets are not difficult of location. The chief difficulties to be encountered lie in the high initial cost of the tile and of the labor for ditch digging and covering. The universal presence of a large amount of stone in the subsoil, the presence of rock ledges at shallow depths and the distance of the farms from points where tile may be obtained cheaply, all tend to make drainage operations expensive. Yet, upon the majority of farms, this improvement is the first essential step toward increased profits. Tile drainage should be undertaken, at least upon a small scale, upon three-fourths of the farms containing areas of this soil.

Drainage should be started by laying lines along the natural depressions to carry away excess moisture which accumulates in the spring and retards the tillage of the field. In many instances a field of 20 or 30 acres may be greatly improved by a few rods of tile drain along some swale or run-off channel which divides the field and interferes with timely cultivation and planting. As the benefits of such drainage are realized laterals may be extended into the body of the field. In all cases careful surveys should be made to establish grades and to arrange the lines of tile to drain the largest area with the least expenditure for tile and labor. Provision should usually be made for the extension of the system as its benefits are proved. Tile of less than 3 inches internal diameter should not usually be laid. The depth of tiling, while dependent upon local conditions, should not be less than 2 feet. The cost per acre will, of course, depend upon the conditions of the particular field to be drained. Experience in other areas and with other types of soil show that fairly good drainage may be secured at a cost ranging from $10 to $20 an acre.

This seems to be a large item of expense for the improvement of a soil having an acreage value no higher than the average of the Volusia silt loam, but it must be remembered that without adequate drainage many of the other required improvements upon the type can not be made at all and the majority of them are only fully efficient after drainage has been attended to. Drainage is, therefore, fundamental to the profitable occupation of the Volusia silt loam and the agricultural efficiency of this soil is chiefly dependent upon this improvement.

In its present condition large areas of the Volusia silt loam can not be made to grow a crop of red clover until the soil has been heavily limed. The use of lime is essential not only to correct "acidity" in the soil, but also to assist in the proper internal drainage of the surface soil through its granulating effect upon the soil particles. It also favors the increase of the bacteria living upon the roots of the leguminous crops, such as clover and peas, and is beneficial to practically all crops grown upon the type. Only in the case of Irish potatoes is the use of lime before the planting of the crop liable to be harmful.

The greater proportion of the Volusia silt loam would be markedly benefited by acreage applications of not less than one ton of burned stone lime, slaked and applied to the soil as it is being prepared for seeding to oats and the grasses. Instead of the stone lime, two or three tons of finely ground limestone or pulverized marl may be used where these sources of lime are cheaper in the equivalent quantities than the burned lime. The lime should be applied from 10 days to 2 weeks before the seeding of the land is attempted and thoroughly harrowed into the surface soil to a depth of 2 or 3 inches. It should be used once in a regular crop rotation of five or six years.

The surface soil of the Volusia silt loam is frequently deficient in organic matter, as shown by the pale gray or ashy color of plowed fields. Continued cropping to hay and grain without the use of any large amounts of stable manure has been largely responsible for the present condition of the soil. In other instances the lack of perfect drainage and consequent poor aeration have resulted in the decay and disappearance of the vegetable matter from the surface soil. The restoration of organic matter is, therefore, one of the problems of its most effective management. In extreme cases, where a run-down field must be built up to a normal condition, buckwheat may be sown in midsummer and allowed to make a good growth until it comes into blossom. This mass of vegetation may then be plowed under as a very effective step in the restoration of humus to the soil. It is a good plan to apply lime to the soil immediately after a large mass of organic matter has been plowed under, especially if a small-grain crop is to be sown.

Winter rye may be sown as a cover crop and pastured during the spring months. Later it may be plowed under and a hoed crop—potatoes or corn— planted. This method is effective upon the steeply sloping lands where protection from erosion during the fall and spring is desirable.

No better method for maintaining the organic matter content of the Volusia silt loam could be devised than the feeding of the crops produced and the restoration of the stable manure to the soil. When this system is regularly practiced and the land is limed to give a

good stand of clover, the organic matter content in the surface soil is readily maintained or even increased, especially if a reasonably short rotation of crops is practiced.

Frequently the proper rotation of crops is seriously neglected, and the ordinary succession is haphazard in the extreme. Some semblance of rotation is still maintained over the greater part of the type. Usually sod land is plowed for corn, potatoes, or even buckwheat. The following year oats constitute the almost universal small-grain crop, although a small acreage of rye is grown upon some farms. The land is then seeded to grass and allowed to remain in sod as long as anything approaching a satisfactory cut of hay may be secured. This includes a period ranging from three to five years or more. When weeds and less valuable grasses have crowded out the timothy, the land is again plowed for corn or potatoes. This system results in a great preponderance of grass land and of tilled land devoted to oats.

The crop rotations should be shortened and carefully maintained in regular order if the best results are to be secured from the cropping of this soil. At all of the lower elevations and upon the better-drained areas at higher altitudes corn should be planted on a part of the acreage devoted to an intertilled crop and potatoes should occupy the rest of the sod land plowed. The best general practice will be to follow the tilled crops with oats, seeding down to the mixed grasses. On dairy farms or where other cattle are fed, a part of the area given to small grain should consist of a seeding to oats, beardless barley, and Canada field peas. In this case the land should certainly be limed before the seeding. The crop may be used as green feed to supplement the pastures or cured for hay for winter feeding. A good stand of mixed grasses is usually secured when they are seeded with this combination. It is practically certain to follow the liming of the crop upon well-drained land. The resulting grass should not be cut for hay more than two years, and the land should then be plowed for the production of corn or potatoes.

Another rotation especially well suited to farms upon which only a small amount of live stock is maintained would be buckwheat, followed by potatoes, followed by oats, and then for two years by grass. The buckwheat, oats, and potatoes constitute sale crops, while the hay may be sold in part and in part used for feeding the work stock. This system requires an abundant use of mineral fertilizers with the potato crop to insure the maintenance of crop-producing capacity.

Another requirement of many thousands of acres of the Volusia silt loam is that of gradually increasing the depth of plowing, so that a portion of the immediate subsoil may be reworked into the surface soil and the "hardpan" layer broken up. Any immediate increase in depth of plowing by more than an inch at a time would

be liable to result in temporary decrease in crop yields. With each plowing of the sod land, however, the plow should be set a little deeper until the total depth of the surface soil is increased to 8 or 9 inches. The average depth of plowing at present is not over 4 or 5 inches. The plow should always be in good condition, and the land should not be plowed when the soil or subsoil is too wet. Even if water does not stand in the furrow the subsoil is frequently much compacted by plowing the soil too wet.

The Volusia silt loam is a type of soil easily thrown out of a good condition of tilth, but it may usually be restored to satisfactory condition within three to five years by good, careful farming.

LIMITATIONS UPON SPECIAL CROPS.

The Volusia silt loam is not only very limited in the character of the special crops which may be grown upon it, but is also restricted as to the general farm crops to which it is best suited.

The best special crop for this soil type is late Irish potatoes. A small acreage of potatoes is annually grown upon almost every farm located upon the type. It is the aim of the farmer to grow enough to supply his own needs and possibly to furnish a few bushels for sale. Under average conditions of tillage yields are not large, owing to poor seed, faulty preparation of the land, and the neglect of the growing crop. Under such conditions of production the yields range from 75 to 125 bushels per acre. With modern methods of management the crop is productive and profitable. In some portions of southern New York potatoes are grown upon a commercial scale. The land is well prepared, organic manures and commercial fertilizers are liberally supplied, the crop is carefully tilled and sprayed, and yields ranging from 150 to 250 bushels per acre are secured. In this region potatoes constitute the chief sale crop, and one New York county, containing large areas of the Volusia silt loam, ranks among the leading counties in potato production in the United States.

In many areas where the type has been encountered it has been recognized as the best soil for potato growing. The tubers are smooth and of good cooking quality. Even neglected crops yield fair returns. Potatoes should form a valuable supplementary crop upon many of the farms upon this type now chiefly given to dairying or stock raising.

The areas of the Volusia silt loam best suited to potato growing possess effective natural drainage in both soil and subsoil. The soil should be well supplied with organic matter either from applications of stable manure or through turning under clover sod or buckwheat. Any area showing a pronounced tendency toward a "hardpan" condition in the subsoil should be avoided.

In addition to the liberal use of stable manure, many growers apply from 250 to 500 pounds per acre of some commercial fertilizer high in potash. Very few crops are properly sprayed, and this practice should be extended wherever potato growing is undertaken upon a commercial scale.

EXTENT OF OCCUPATION.

The entire area of the Volusia silt loam has long been occupied for agricultural purposes. This soil was cleared from its heavy stand of mixed hardwood and evergreen trees in the pioneer days and occupied for general farming purposes and cattle raising. Some sheep were kept upon the majority of farms, the farm being divided between tilled land, pasture, and considerable stretches of forest. The merchantable timber has been cut from practically all of the type at present, and only small woodlots upon the steeper slopes remain. It is probable that fully 60 per cent of the Volusia silt loam is at least nominally under tillage, about 30 per cent is in pasture, and the remainder is occupied by partially wooded tracts, lying upon the steeper slopes.

The improvement in the agricultural efficiency of this soil must take the form of better cultivation of the land now in farms and of the rejuvenation of the pastures which occupy a large proportion of the type. Drainage, liming, the restoration of organic matter to the soil, and the adoption of proper crop rotations which shall make use of the crops best adapted to the type are the most essential steps for its more profitable occupation. Coupled with this attention to the soil, some form of animal husbandry, either dairying, where market facilities are favorable, or the feeding of beef cattle or sheep, in the more remote locations, should become general.

The restoration of profitable grasses to the badly neglected pastures upon the type is essential to its improvement. In many instances the old pastures must be plowed before a profitable reseeding can be obtained. In other cases the cutting of brush, sweet fern and other weeds and the harrowing, liming, and reseeding of the pastures will be sufficient to improve their conditions. Timothy, redtop, Canada blue grass, and alsike and red clover are all available for the mixing of a good pasture combination. Brome grass should be tried alone and in mixtures for pasturage purposes and might be valuable for mowing lands.

CROP ADAPTATIONS.

Owing to its physical characteristics, its high altitude, and its northern location, the Volusia silt loam is better suited to hay than to any other farm crops. Fully 60 per cent of the tilled area of the type is annually devoted to grass growing for hay with an addi-

tional large area for permanent pasture. Timothy is most extensively grown among the grasses. Sometimes alsike clover is seeded with it. Red clover is little grown because of the increasing difficulty in securing a good seeding. Without the liberal use of lime clover is an extremely difficult crop to grow upon any large areas of the Volusia silt loam. The yields per acre of hay vary widely in the different areas where the type has been encountered. In southern New York and north-central Pennsylvania a yield of 1 ton per acre is about the average production upon this soil. In these areas the hay crop ranges in yield from less than three-fourths ton to more than 1½ tons. The grass lands are allowed to remain in seed for too long a period. As lime is never applied and a top dressing of stable manure is rarely used crops are necessarily small. In northwestern Pennsylvania and in northeastern Ohio better management produces larger yields averaging about 1¼ tons per acre. Even this production may be considerably increased by attention to drainage, liming, the use of stable manure as a top dressing upon the meadows, and the shortening of the crop rotation.

There is no question that, rightly managed, the Volusia silt loam is an excellent grass soil. Its fair average yields persisting under long years of mismanagement are proof of this. There is no crop which can be made to give as large clear profits with as little expenditure for labor upon this type as hay. Even fields which now produce too small a crop to pay for the cutting may be brought within three to five years' time into condition to yield 1¼ to 1½ tons of hay to the acre. Better treatment will increase the yields even above this amount.

Oats rank next in acreage to hay. The yields range from 25 to 40 bushels per acre with a general average for the type in the vicinity of 30 bushels. When good seed is used the grain is heavy and bright and the straw of good quality. Improved seed of varieties suited to northern latitudes would increase these yields.

Buckwheat occupies an acreage nearly equal to that given to oats upon the Volusia silt loam. It is not a common farm crop in regions outside of that dominated by this soil, where it constitutes the main catch crop of the farmers. It is commonly sown between July 1 and July 10 upon land not prepared in time for corn, or upon which the latter crop has failed to make a stand. It matures early in September, giving an average yield of about 15 bushels per acre, but with a range between 12 and 25 bushels. Midsummer droughts or early frosts frequently blight the grain and care should be taken to see that only well-drained land is occupied by this crop to give it an opportunity to mature before the first frosts.

As a soil renovator buckwheat ranks high in clearing land from noxious weeds and insect pests. It is frequently sown as a first crop

upon old pasture lands which it is desired to bring under tillage. The grain is sold for milling and large amounts are shipped out of the area for this purpose. Grinding at local mills, where these are properly equipped to produce a good grade of flour, would give rise to the production of buckwheat middlings, high in protein, and admirably suited to supplement the other feeds grown for the dairy herd. The buckwheat crop is worthy of more careful attention in planning crop systems for the Volusia silt loam.

Only a small acreage of corn is attempted at the higher elevations on the Volusia silt loam, since above an altitude of 1,500 feet the growing season for the crop is too short to permit the maturing of grain in ordinary years, except upon particularly well-drained land. At all elevations corn may be grown for silage if the flint varieties like the King Philip or the Genesee River flint are planted. At the lower elevations occupied by the Volusia silt loam, in northwestern Pennsylvania and northeastern Ohio, corn constitutes one of the crops grown in regular rotation, both for grain and silage. The yields range from 30 to 45 bushels per acre of grain and from 8½ to 10 tons of silage per acre.

A small acreage of Irish potatoes is grown upon nearly every farm found on the Volusia silt loam. An area sufficient to produce potatoes for home use and sometimes a surplus for sale is planted each year. In some portions of southern New York the crop has become an important one upon a commercial scale. In the majority of areas where the type has been encountered the special adaptation of the Volusia silt loam, under proper conditions of management, to the production of late Irish potatoes has been recognized. The tubers are usually smooth and of good cooking quality. Where modern methods of production are employed the yields range from 150 to 250 bushels per acre. Usually the crop is badly neglected and the general average of the yields outside of the commercial potato-growing districts ranges from 75 to 125 bushels per acre. The crop should constitute the chief reliance of the farmers upon the Volusia silt loam for sale as a money crop to supplement dairying or stock raising.

In the more western areas of its occurrence a small acreage of winter wheat is grown upon the Volusia silt loam giving yields ranging from 12 to 20 bushels per acre.

Formerly hops were grown to a limited extent upon this type in central New York, but the crop has nearly disappeared at present.

Nearly every farm upon the Volusia silt loam has a few apple trees, planted to furnish a home supply of fruit. Frequently these are neglected to the point of ruin, and very few apples are sold from orchards upon this type. In all of the better-drained areas of the Volusia silt loam, particularly in northwestern Pennsylvania and in northeastern Ohio, where elevation and exposure are favorable,

apples might be made a paying commercial crop. The Northern Spy, Twenty Ounce, and Rhode Island Greening are fairly well suited to production upon this type if locations possessing a depth of soil and subsoil of not less than 4 or 5 feet are chosen, with proper regard, also, to the subsoil drainage and the selection of a site not unduly exposed to prevalent storm winds.

The Volusia silt loam is best adapted to the growing of oats, buckwheat, potatoes, and hay at all of the higher elevations, with corn as a supplementary crop, to be cut for silage. At lower elevations and upon the best-drained areas, corn may be grown for grain production, and winter wheat is a fairly valuable crop. Among the grasses timothy and redtop are best suited to this soil. Red clover can be grown only with difficulty upon the greater proportion of the areas of this type, but alsike is more readily seeded. Attention to the reseeding of pastures is necessary.

Because of the high altitudes at which this soil is developed, its distance from shipping points and markets, and particularly because of its definite crop adaptations, the raising of live stock, including beef cattle and sheep, constitutes the best development of agriculture upon it. It is also desirable that animal husbandry should constitute the chief reliance of farmers upon this soil since it is in need of the restoration of organic matter, and this treatment is difficult or impossible under the prevalent system of oat and hay production for sale away from the farm.

FARM EQUIPMENT.

The present farm equipment of the Volusia silt loam is too frequently antiquated or defective. This is especially true of the areas lying at high altitudes and in positions rather remote from principal highways and railroads. The dwellings and barns in the majority of cases were built 50 years ago, and many of them have not been kept in good repair. With the aggregation of the lands of this type into larger holdings and with the corresponding decrease in rural population, many dwellings have been abandoned and are rapidly falling into decay. Contrasted with these local conditions are areas in many localities where the building equipment has been well maintained, and many comfortable farm homes exist upon the type. In fact, the differences between good equipment and poor within a single township are frequently very noticeable.

Nearly all of the older homesteads, cleared and equipped in the earlier days, are furnished with a one and a half story dwelling and one or several of the 30 x 40 foot hay barns built in the center of the old hay fields. More modern equipments include a good dairy barn and sometimes a feeding shed, if sheep are still kept.

In general the farm equipment of work stock and tools is not abundant. Small horses are chiefly used, and are scarcely adequate to the proper tillage of such a heavy soil. There is also a considerable variation in equipment between the larger and better farms and that of the more remote and scarcely profitable holdings.

In certain areas dairying is the general form of farm management upon the type. Many of the dairy farms are well equipped with good herds, adequate barns, and silos. Milk is produced for shipment, for the creamery or cheese factory, or for home manufacture into butter. The herds are usually either grade cows of some of the dairy breeds, or else native stock of no particular breed. Upon farms where some sale crop is produced in addition to the dairy business, good profits are made. Oats for sale, buckwheat, and potatoes are the chief crop interests upon such farms aside from the growing of the grain and roughage for the herds. Even when no great profits are derived from this system of farming the land is maintained in better condition, and a living income is derived from the capital and labor invested.

SUMMARY.

The Volusia silt loam is an extensive type of soil developed at the higher altitudes in the glaciated northern portion of the plateau country which extends westward along the New York and Pennsylvania line from the vicinity of the Delaware River to the northeastern part of Ohio.

The type lies at altitudes ranging from approximately 900 feet above sea level in northeastern Ohio to elevations of 2,300 feet in south-central New York.

The surface drainage of the type is fairly well established, since the surface configuration of this soil is rolling to hilly, or even steeply sloping. The internal drainage of the subsoil is poor over considerable areas, and numerous springs give rise to small swampy areas even upon some of the steeper slopes. Tile drainage is one of the chief requisites to the better farming of large areas of this soil.

The Volusia silt loam is chiefly devoted to the production of grass for hay and pasture. Fair yields of timothy hay are cut, but there is general difficulty experienced in securing a good seeding to red clover. Alsike clover is fairly successful upon this soil.

Oats constitute the chief small grain grown upon the Volusia silt loam. Buckwheat is most commonly seeded upon lands which have not been prepared in time for the growing of any other crop, or upon fields which have been planted to corn without securing an adequate stand.

Corn can be successfully grown as a grain crop only at the lower elevations and upon the best-drained portions of the type. For

silage it may be grown at higher altitudes. The flint varieties are best suited to production upon this soil, since they mature in a short growing season.

Potatoes are generally grown in small acreage upon nearly all the farms located upon the Volusia silt loam. In some areas the crop is grown commercially with good yields of smooth tubers of good quality. Potatoes constitute one of the best money crops to be grown upon this soil in conjunction with some form of animal husbandry.

Apples are chiefly grown in small home orchards. There are limited opportunities for commercial apple orcharding at the lower elevations, where the total depth of soil and subsoil is over 4 feet and where drainage and exposure are adequate.

The farm equipment upon the Volusia silt loam differs materially within single townships and in the different areas where the type has been encountered. In the more remote localities the buildings are old and in poor repair, especially at the higher altitudes, where the decrease in rural population has been most marked within the past 20 years. Elsewhere the farm equipment is fair to good. Upon the dairy farms the equipment of buildings, stock, and tools is usually better than upon the majority of farms devoted to a system of grass and grain farming for cash sale.

For its improvement the Volusia silt loam requires drainage, the liming of the soil, the restoration of organic matter, the adoption of shorter crop rotations, and the general return to a system of farming in which the crops raised are chiefly fed to live stock.

Approved.

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *February 12, 1912.*

APPENDIX.

The following table shows the extent of the Volusia silt 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 the Volusia silt loam encountered in the soil survey.

Survey.	Area of soil.	Date.[1]
New York:	*Acres.*	
Bigflats area [2]	108,800	1902
Binghamton area	118,976	1905
Livingston County	55,680	1908
Madison County	137,920	1906
Montgomery County	30,720	1908
Tompkins County	78,912	1905
Ohio:		
Wooster area	78,464	1904
Pennsylvania:		
Erie County	211,712	1910

[1] Year of publication, Field Operations. [2] Mapped as Hagerstown shale loam.

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