

**UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF CHEMISTRY AND SOILS**

In cooperation with the Ohio Agricultural Experiment Station

**SOIL SURVEY  
CLERMONT COUNTY, OHIO**

BY

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Ohio Agricultural Experiment Station



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# SOIL SURVEY OF CLERMONT COUNTY, OHIO

By ARTHUR E. TAYLOR, in Charge, and IVAN HODSON, U. S. Department of Agriculture, and G. W. CONREY, WILLIAM CRAIG, and B. D. MORGAN, Ohio Agricultural Experiment Station

## COUNTY SURVEYED

Clermont County is in the southwestern part of Ohio. It measures about 33 miles north and south and 16 miles east and west, and has an area of 465 square miles, or 297,600 acres.

The surface of Clermont County is characterized by deep narrow valleys indicative of youth, and level interstream areas which are probably remnants of an old peneplain. In the southwestern part there is an extensive development of mature relief, similar to that over a large part of Hamilton County to the west. For several miles back from Ohio River, and along East Fork Little Miami River the surface is very broken and hilly.

Where erosion has dissected the plain most thoroughly, the larger streams have cut valleys from 200 to 400 feet deep. There is much variation in the width of the valleys along all of the larger streams of the county. Along Ohio River the valley floor, which consists of level bottom lands, ranges from one-half to 1 mile in width. Along Little Miami River and East Fork Little Miami River, except at the junction of these streams where the valley is 2 miles wide, places where the valley floors may be from one-half to three-fourths mile in width, are immediately succeeded by narrow tracts, little more than wide enough to accommodate the stream bed, with steep slopes on both sides. Along the principal streams of the county there are 2 or 3 levels, where well-defined terraces exist; and 2 higher levels, where remnants of very old terraces occur.

The drainage waters of the southern third of Clermont County flow into Ohio River; the extreme northern part drains into its tributary, Little Miami River, and the remainder drains into East Fork Little Miami River. Extending back from these rivers are intricate systems of smaller streams which ramify the uplands, affording drainage outlets for practically every farm. However, in the eastern half of the county, there are many rather extensive level interstream areas where the natural run-off is extremely slow. The smaller streams are mainly intermittent, flowing rapidly in the winter and spring but drying up in summer.

The first settlement in Clermont County was made in 1795, at Miami, by Col. Thomas Paxton. The early settlers came from regions of the United States settled long before, many of them from



FIG. 25.—Sketch map showing location of Clermont County, Ohio

Kentucky. The present population is chiefly native born, consisting mainly of descendants of the early settlers. During the last 20 years there has been a considerable influx of Kentuckians, especially in the southern half of the county. The census of 1920 reports a total population of 28,291. There are no large towns in the county, the entire population being classed as rural. The distribution of population is rather even, and the average density is reported as 60.8 persons to the square mile.

Batavia, the county seat in the central part of the county, Williamsburg in the east-central part, and Milford and Loveland in the northeastern part, are the principal towns and are railroad points of local importance. Amelia and Newtonsville have canning factories and interurban connections with Cincinnati. Bethel, Felicity, New Richmond, Newtonsville, and Edenton are important shipping points connected with Cincinnati by interurban. New Richmond, Point Pleasant, Moscow, Neville, Chilo, and Utopia are situated on Ohio River and have steamboat shipping facilities. River navigation, which in the early history of the county afforded the chief means of travel, has been of minor importance for many years; but it may become of greater importance in the future as a result of the Ohio River improvement, in connection with which a series of dams are being constructed to aid in low-water navigation. Two dams adjoin Clermont County, one at Chilo, the other near New Richmond.

Clermont County has good transportation facilities. The Norfolk & Western Railway crosses the county, north of its center, in a north-westerly and southeasterly direction. In addition to the railroad, three interurban lines from Cincinnati enter Clermont County; one crosses the northern part, a second extends in a southeasterly direction through Bethel with a spur line south from Bethel to Felicity; a third follows the Ohio River Valley to New Richmond.

Four State roads cross the county east and west, and others extending north and south connect Bethel and Chilo in the southeastern part of the county with Batavia and New Richmond in the western part. New Richmond and Cincinnati are connected by a pike which extends along Ohio River. Improvement of the north-and-south roads would be of great advantage to local transportation. Roads finished with macadam or limestone fragments reach almost all parts of the county. When dry, the dirt roads are usually smooth and are suitable for automobile traffic. Almost all parts of Clermont County are reached by rural mail routes and telephones. Because of its proximity to Cincinnati, Clermont County has an excellent market for all farm products.

#### CLIMATE

Clermont County has a temperate climate and is not subject to long periods of heat or cold. Although periods of high temperature are common in July, August, and September, they are rarely of long duration. Similarly, periods of extreme cold in the winter seldom last more than a few days.

From observations extending from 1860 to 1883, the average annual precipitation at Bethel was shown to be 43.76 inches and at Cincinnati 42.05; and from 1916 to 1920 at Batavia 39.26 inches and

at Cincinnati 38.81. In general, the rainfall is well distributed throughout the year. However, a study of the climatological data for the Cincinnati station extending over a period from 1835 to 1923 indicates that excessively wet springs occurred 14 times, when the total precipitation for April, May, and June, which averages 11.26 inches, exceeded 15 inches; and that severe summer droughts occurred 10 times, when the total precipitation for July and August, which averages 7.28 inches, was less than 4 inches. The average annual snowfall is about 19 inches.

According to the reports of the United States Weather Bureau, Clermont is among the counties of Ohio having the longest frost-free season, the highest mean annual temperature, the greatest average spring precipitation, the lowest average summer, fall, and winter precipitation, and the lowest average annual snowfall.

Within the limits of the county, according to the United States Weather Bureau reports, there is considerable difference in the length of the frost-free season. This variation is due to differences in location with respect to air drainage. The Camp Dennison station, which has an average frost-free season of 173 days, is about 1,000 feet west of the Hamilton-Clermont County line on a terrace in the Little Miami River Valley. Its location is favorable for the accumulation, on a freezing night, of the drainage air from the near-by valley slopes.

On the other hand, the Batavia station, which has an average frost-free season of 191 days, is 4 miles north of Batavia, on the Clermont County Experiment Farm. This station is in the undulating or gently rolling upland and is situated on the crest of a low ridge between draws, the floors of the draws being possibly 25 feet below and 200 yards distant from the observation point. This gives a gentle and gradual slope from the station down to the bottoms of the draws. The station is about one-half mile from a steep valley slope, where it would seem that the degree of air drainage on a freezing night would be intermediate between that of points at the bottom and top of a slope, occurring in any of the main valleys of Clermont County.

The Mount Healthy station of Hamilton County, which has an average frost-free season of 189 days and is located along a small draw, but is not near a deep valley, would probably represent more nearly the length of the average growing season for the upland of Clermont County; but gently undulating to flat areas of Clermont and Blanchester silt loam, which comprise 25.5 per cent of the county, have practically no air drainage on a freezing night, and would have a shorter frost-free season, perhaps averaging between 175 and 180 days.

About 30 square miles of the county are represented by upper-valley slopes or narrow ridges along the main streams and their main tributaries, where optimum conditions exist for the draining away of the cold air on freezing nights. In these positions the growing seasons are longer than at the Batavia station. On the other hand, about 15 square miles represent areas bordering the bases of valley slopes and comprising the floors of the narrow valleys where the cold air accumulates on a freezing night, and the length of the growing season is comparable to that of the Camp Dennison station.

Certain parts of the larger valleys, as well as some of the smaller valleys, are frequented by heavy fogs which modify the low temperatures so that crops escape some of the later killing frosts of the spring and the earlier ones of the fall. A body of water, such as Ohio River, also moderates the temperature of its immediately adjacent flood plains.

Other factors that tend to delay seriously the time of planting on the level or gently undulating upland soils are heavy spring rains, very poor natural drainage, and comparatively little tiling or ditching.

It is well known that corn, the leading crop of the area, will not germinate or grow at a temperature below 48° F. When the soil water changes from liquid to vapor on evaporation a very great quantity of heat is drawn from the soil, thus keeping it cold. It requires about five times as much heat to raise the temperature of water as it does of soil. Thus the reason the water-soaked Clermont and Blanchester silt loams become warm very slowly is apparent.

The following table of climatic data was compiled from the records of the United States Weather Bureau station at Batavia.

*Normal monthly, seasonal, and annual temperature and precipitation at Batavia*

[Elevation, 850 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1917)	Total amount for the wettest year (1919)
	° F.	° F.	° F.	Inches	Inches	Inches
December.....	33.4	64	-19	3.16	1.48	3.46
January.....	30.7	69	-19	3.55	4.51	1.95
February.....	33.6	74	-10	1.51	1.59	.87
Winter.....	32.6	74	-19	8.22	7.58	6.28
March.....	45.6	78	3	3.99	3.98	5.31
April.....	53.0	84	18	3.84	3.73	3.39
May.....	63.1	91	33	4.13	4.44	4.74
Spring.....	53.9	91	3	11.96	12.10	13.44
June.....	71.5	93	41	3.43	3.03	2.98
July.....	75.5	100	48	3.00	4.12	3.85
August.....	74.0	102	48	4.74	1.84	1.76
Summer.....	73.7	102	41	11.17	8.99	8.59
September.....	67.5	97	32	2.81	2.23	1.85
October.....	57.3	91	25	3.41	3.00	9.56
November.....	44.2	76	10	2.47	.63	4.64
Fall.....	56.3	97	10	8.69	5.86	16.05
Year.....	54.1	102	-19	40.04	34.53	44.86

#### AGRICULTURE

Clermont County is in the oldest agricultural section of the State. Since the early part of the nineteenth century it has been preeminently agricultural. Of necessity, the early settlers produced crops which supplied them with food, as well as material for their clothing.

Clearings in the forests were made, and crops such as corn, wheat, potatoes, tobacco, and flax were grown. Agricultural activities were rapidly increased after 1825, and in 1850, according to statistics, the total area in crops in the county had reached its maximum.

Census reports for the last 50 years show that, although the acreage of corn has remained almost the same, there has been a gradual decline in yield. State statistics<sup>1</sup> show that the average yield per acre of 30.7 bushels for the years from 1850 to 1880, decreased to 25.6 bushels for the period from 1880 to 1910, the total annual yield diminishing more than 200,000 bushels. According to census reports covering the period from 1880 to 1920, there has been little change for wheat, hay, and tobacco, either in acreage or yield; but there has been a gradual decline in wheat yields, except where the use of commercial fertilizers has been increased. The proximity of Cincinnati and its excellent market for timothy hay, from 1880 to 1910, gave a great impetus to farmers to produce timothy and haul it to this market, thus gradually depleting the soil. Since 1910, an ever-increasing number of farmers are feeding hogs on their farms, and are growing more legumes, such as alsike clover and soy beans.

In the early agricultural development of Clermont County, it was necessary for the settlers to remove the virgin forest which completely covered the region. The trees growing on the level stretches of very poorly drained, light-gray soils of the uplands were white oak, beech, white elm, hickory, and gray ash; those growing on the undulating or gently rolling and poor or fairly well drained, brown upland soils were beech, white oak, red oak, black oak, hickory, gray ash, hard maple, black walnut, and tulip poplar. The very poorly drained, dark-gray upland soil, which occurs in depressions and at the heads of streams, supported a virgin forest growth of elm, hickory, red gum, white oak, and swamp white oak. After the virgin upland forests were cut off, pin oak, red maple, and sweet gum comprised the second growth, and in many places, especially on the very poorly drained upland soils, pin oak became the dominant tree. The trees on the stream terraces were hard maple, tulip, black walnut, beech, and blue ash; and those of the stream flood plains were sycamore, buckeye, white ash, willow, swamp white oak, white oak, and wild cherry. On the steep valley slopes grew the tulip poplar, hard maple, beech, chinquapin oak, white oak, scarlet oak, blue ash, white ash, wild cherry, black walnut, and basswood. To-day, these valley slopes are mostly covered with a second growth of black locust.

A larger acreage is devoted to corn than to any other crop. The census reported 49,123 acres planted to corn in 1919, producing 1,177,565 bushels. Very little corn is sold; a large part of it is gathered and fed on the farms to hogs, and a small portion is stored in silos for dairy cattle. In the southwestern part, considerable sweet corn is produced. This is marketed at Cincinnati as green corn, or sold to canning factories. The principal varieties of corn are Reid Yellow Dent on the terraces and bottoms, and Leaming on the uplands.

Tobacco, although fourth in acreage, is second in value. The census of 1920 reports 4,725 acres of tobacco in 1919, with a production

<sup>1</sup> Ohio Agr. Exp. Sta., Bul. 326.

of 3,807,943 pounds. The most extensively grown variety is Yellow Burley. Most of the tobacco growers are members of the Burley Growers Cooperative Association which grades and markets the tobacco.

Hay is exceeded only by corn in acreage. The census report showed that in 1919 there were 28,921 acres devoted to tame or cultivated grasses, with a yield of 27,129 tons. Timothy was the most extensively grown, with an area of 18,162 acres and a production of 15,628 tons. This was followed by timothy and clover mixed, with an area of 8,033 acres and a yield of 8,107 tons; and alfalfa was third of the hay crops, covering 1,386 acres and producing 1,983 tons. A considerable part of the timothy is hauled to Cincinnati and sold. The rest of the hay is fed on the farms. To a very small extent sweet clover is grown on the same soils as alfalfa for hay and pasturage. Probably its most important use is that of opening up the compact subsoils by means of its deep roots.

Wheat, the third crop in both value and acreage, according to the last census report, was grown on 21,361 acres, producing 309,968 bushels. The leading varieties grown were Portage, Mediterranean, Red Wave, and Poole. Wheat growing in Clermont County is generally rated by farmers as commercially unprofitable, owing to the injury caused by the Hessian fly, chinch bug, rust, scab, and smut, and the frequent thawing and freezing during the winter months, which causes heaving and breaking of the roots. The value of wheat as a nurse crop for clover and as a winter cover crop seems to warrant its retention in the usual rotation of corn, wheat, and mixed timothy and clover. Most of the wheat is shipped out of the county.

The census report showed that 7,174 acres were devoted to oats in 1919, with a yield of 132,548 bushels; and 7,274 acres to rye, producing 81,479 bushels.

Potatoes and general truck crops for the Cincinnati market, are grown in the vicinity of Amelia, Withamsville, Mount Carmel, and Olive Branch. Tomatoes are grown about Amelia and Nicholasville for the local canneries. The census reported a production of 65,627 bushels of potatoes in 1919 from 1,581 acres.

The culture of soy beans is growing in favor in Clermont County. This is the only legume that has succeeded well on Clermont silt loam. In growing soy beans, not so much nitrogen is fixed in the soil as in the case of red clover or alfalfa, but the hay has a high content of nitrogen, and the beans contain as much protein as oil meal. Because of their nutritious feeding and soil-building qualities, soy beans are being introduced into the rotation by some of the more progressive farmers, the succession being corn or corn and soy beans, soy beans, wheat, and clover. They are grown with corn both for hogging down and for silage; but they are more commonly grown separately for hay. When clover fails, soy beans are sometimes sown at corn-planting time and harvested for hay or seed in the fall.

Commercial fruit growing has developed rather extensively in the southwestern part of the county. Apples are of chief importance, followed by peaches and pears. In many instances, the average yields are only fair or poor, owing to poor location or to lack of proper tillage, pruning, spraying, or fertilizing. In orchards that

are situated on upper valley slopes or on ridges, where the air drainage is favorable for escaping late killing frosts of spring and where the subsoils are friable and well drained, very good returns are realized, especially in those orchards in which the trees receive proper attention.

According to the census there were 114,099 apple trees in the county in 1919, and the production was 30,815 bushels. Of the summer apples, Yellow Transparent is the leading variety; and of the later apples, Ben Davis, Winesap, Rome Beauty, and Grimes Golden are most common. In 1919, there were 144,620 peach trees, yielding 6,603 bushels; 27,036 pear trees, yielding 351 bushels; 7,273 plum trees, yielding 1,890 bushels; and 6,805 cherry trees, yielding 821 bushels. There were 20,497 grapevines in the county, yielding 146,401 pounds of grapes in 1919. Fifty acres of raspberries produced 25,842 quarts, 115 acres of strawberries produced 171,797 quarts, and 106 acres of blackberries and dewberries produced 72,041 quarts.

Dairying is carried on by most of the farmers of Clermont County. The herds vary in size, the average numbering about five animals. The herds are composed mainly of grade Jersey and Holstein. Purebred sires are used, so that the livestock is being improved. A large part of the dairy products, which consist of milk and cream, is shipped by railroad, interurban lines, and automobile trucks to Cincinnati. When cream is shipped, the skim milk is fed to hogs.

There are few small herds of beef cattle in the county, the largest herds being pastured on the terraces along Ohio River. Shorthorn is the principal breed.

Hog raising is especially important in connection with corn growing on the bottom lands. Duroc-Jersey and Poland-China are the predominating breeds. A few farmers are engaged in raising sheep or beef cattle. Most farmers have from 100 to 200 chickens. Some on small farms specialize in poultry and favor White Leghorns.

Most farmers have given considerable study to the adaptation of soils to crops, and as nearly every farm includes more than one type of soil, it is often possible to use different parts of the farm for the crops for which each is best suited.

Although in most cases the cultural methods in Clermont County have not changed materially from long-established practice, there are many farmers who select their seed corn and make germination tests before planting. In an effort to learn which crops are best adapted to various soils and the best treatment for them, demonstration fields have been selected in different parts of the county through the cooperation of farmers and the Ohio State University.

The farm buildings in Clermont County, as a general rule, are old-fashioned, but substantially built and are kept painted and in good repair. However, there are many modern country homes thoroughly equipped with all conveniences. The barns as a rule are not large. The machinery is modern, and some farmers operate tractors and have their own shredders and silage cutters. There are a number of silos, but they are not common.

Some tiling has been done on some of the poorly drained lands; and where tile drains have been properly installed, an increase in

crop production has resulted, in various cases repaying all costs of tiling within seven years.

Gullying has been very disastrous in many fields, but is being successfully remedied by many progressive farmers. Terracing very effectively stops the working back of gullies into the level and gently sloping fields which border valleys. Where gullies have developed, stake-brush dams built in them and grass seed sown on the bare slopes, result in a gradual filling of the gullies and reclamation of the land. Where a field on a steep valley slope has been cultivated more than two years, gullying and sheet erosion become very active. In such places farmers usually abandon the fields, after which a volunteer growth of locust and grass covers them, and thus nature gradually checks the devastating work of erosion; but some farmers leave their steep slopes and gully heads in permanent pasture, reseeding them by broadcasting the trash collected from the barn floors. When these pastures become "sod bound," hogs are permitted to root up the grass. With this method, no serious gullying develops. Another method often used, which is effective in preventing slope erosion, is to crop the land for only two years and then reseed and reforest. In this way the grass and locust roots hold the soil sufficiently well for the first year, after which it is possible, with a good cover crop, to cultivate a slope the second year; but a longer period of cultivation almost invariably subjects the soil to serious gullying.

The usual method of preparing the seed bed for corn, especially on the level and undulating upland, is to cover sod with manure in the spring and then plow it to a depth varying from 5 to 8 inches. Land is bedded and furrowed for surface drainage, and deep furrows a rod apart, usually connect at one end sometimes at both ends with a ditch. The corn is planted in the beds and cultivated three or four times. Early in October, when it has been cut and is in shocks and the period of emergence of the Hessian fly has passed, wheat and timothy are sown, drilled in between the rows of corn shocks. Clover is sown in the spring. Winter wheat grows best if the moisture content is right to germinate the seed and permit a strong root growth. Too much moisture causes heaving, surface rooting, and inability to withstand cold and drought. Rye is sometimes sown instead of wheat, and when wheat fails, oats are sown in the spring.

There is no system of rotation in vogue throughout Clermont County, but there are various rotations suitable to the character of the soil and the needs of the individual farmer. On the level and undulating uplands the usual rotation is corn, wheat, and mixed timothy and alsike clover. Grass is generally allowed to occupy the land two years, sometimes three. In special cases potatoes take the place of corn in the rotation. On many steep slopes corn and tobacco are grown exclusively. In a few cases the rotation consists of corn, soy beans, wheat, and mixed timothy and alsike clover.

Fertilizers are commonly used on the upland soils and stream terraces. Flood plains are seldom fertilized. The census reports a total expenditure for fertilizer in 1919 of \$90,018 on 2,280 farms. About 25 per cent of the commercial fertilizer used is a 16 per cent acid phosphate; about 40 per cent is a 2-12-2<sup>2</sup> mixture; and the

<sup>2</sup> Percentages, respectively, of ammonia, phosphoric acid, and potash.

remainder consists of high-grade mixed fertilizers. Fertilizers are usually applied at planting time. Corn usually receives 200 pounds of commercial fertilizer an acre without barnyard manure, or 125 pounds with manure. Wheat receives 200 pounds an acre, and a light top-dressing of stable manure during the winter. The usual application for soy beans is 125 pounds per acre of a fertilizer without nitrogen. For tobacco, a fertilizer running high in potassium and phosphorus is used at a rate ranging from 200 to 500 pounds an acre. Apple and peach orchards receive 5 pounds of sodium nitrate to each tree. Special truck fertilizers are used for potatoes and truck crops.

Ground limestone is used to a small extent. Practically all the upland soils of the county are acid. In acid soils, lime has been found essential for good results with clover, and the yields of grain and other crops are often decidedly increased by its use. In many cases, the nitrogen supply is maintained principally by the growing of legumes.

There has been a scarcity of labor in Clermont County in the last few years, owing to the higher wages and other inducements offered by large manufacturing enterprises. Most of the farm laborers are white and of American birth. In 1923 monthly wages for farm hands ranged from \$40 to \$70 with board. Day laborers received from \$2 to \$4 with board during haying and harvest time, or whenever extra men were needed.

The average size of farms decreased from 81 acres in 1880 to 72.6 acres in 1920. Most of the farms range in size between 60 and 100 acres.

Farm land is rented largely on the share basis. Usually the landlord furnishes one-half the seed and receives one-half the crop. The 1920 census reported 71.5 per cent of the farms operated by the owners, 27.9 per cent by tenants, and 0.6 per cent by managers.

Land values in Clermont County are dependent upon the distance from Cincinnati, the character of the roads connecting with that city, the nature of the soil, drainage and other improvements, and the location with respect to towns, schools, and churches. The average assessed value in 1920 was \$55.39 an acre. The terrace soils along the principal streams currently sell for prices varying from \$60 to \$150 an acre; the brown and grayish-brown upland soils, from \$40 to \$80; and the light-gray and gray upland soils, from \$20 to \$50.

#### SOILS

In their distribution, the soils of Clermont County show a very close relationship to drainage. Topographically, the county consists of a very smooth plain dissected rather deeply by a number of streams, but between which there is still a considerable part of the original plain not yet dissected.

The soils are all light in color with the exception of one or two types which have developed under conditions of poor drainage. These, however, are relatively unimportant in so far as total area is concerned. All the soils have developed under a cover of forest and in a region having an annual rainfall of nearly 40 inches. The parent materials from which the soils have developed were

originally highly calcareous. In all localities where the soils have attained even approximately a mature stage of development, the carbonates have been leached not only from the topsoil and subsoil but also from a layer ranging from 1 foot to several feet in thickness beneath the subsoil, or B horizon. On the uplands, the carbonates have been removed from the soil and substratum material to a depth of about 10 feet. These soils, therefore, are typical humid soils.

*Cincinnati silt loam, typical mature upland soil.*—The type of soil in the county which has attained approximately a normal or mature stage of development is Cincinnati silt loam, an upland soil. The soil is rather extensive, occurring mostly in the southern and southwestern parts of the county, within the hilly belt along Ohio River, in narrow areas along the valleys where dissection has reached a considerable stage of advancement. This soil occurs on the rather narrow ridge tops between the smaller streams. Other areas occur in narrow belts on both sides of East Fork Miami River. In no case do the areas extend any considerable distance from the rivers or larger creeks, for on the smooth and broader areas farther back or between the larger streams, the soils have not yet reached a normal stage of development, because of poor drainage.

Cincinnati silt loam exhibits the characteristics of the other developed or more mature upland soils of the region of which Clermont County is a part. From the surface downward, the profile of this type of soil may be described according to layers as follows:

1. A thin layer of dark silty material, in places about 3 inches thick, lying beneath a thin layer of leaves and forest mold.

2. A light-brown or grayish-brown layer, about 12 inches thick, of silty material usually showing very little tendency toward granulation and often showing a laminated structure. (Layers 1 and 2 together constitute what is known in soil science as the A horizon).

3. A layer about 2 feet thick of material heavier in texture than that composing layers No. 1 and No. 2, colored brown or slightly reddish brown, and marked by a well-defined breakage, falling into small angular structural particles which range in size from one-quarter to one-half inch in diameter. When the material is moist the breakage is definite, the material falling readily into a mass of small aggregates or particles. As a rule, the color of the outside of the particles is somewhat deeper than that on the inside, the inside being somewhat yellowish. The powdered material, therefore, is more yellow in color than that of a broken surface, since in most cases the material breaks along the cleavage lines.

4. A layer a foot or more in thickness, unevenly oxidized, and the color of which is a variegation of yellowish brown and gray. The material of this layer is looser and lighter in texture than that of layer No. 3. It breaks rather indefinitely into fragments of irregular shape, and along the breakage planes there are often dark-colored stains, presumably of iron and manganese. These particles are much larger and much less clearly defined than the structure particles in layer No. 3. In some places this layer is absent. The substratum consists of unweathered, or practically unweathered, calcareous glacial drift.

*Clermont silt loam.*—On the larger, smooth areas between the larger streams occurs Clermont silt loam. Inasmuch as the parent material has been subjected, apparently, to alternate wet and dry conditions since its deposition during the glacial period, the profile of this soil is, therefore, unlike that of the Cincinnati silt loam. This profile does not show the characteristics common to the well-drained soils of the region, but rather those features which indicate that here the soil-forming forces have been limited in their activity by poor drainage conditions. The profile, or succession of layers, of Clermont silt loam may be described as follows, from an excavation made in the extreme northern part of the county:

1. A dark-colored layer of silt loam, about  $2\frac{1}{2}$  inches thick, impregnated with organic matter underlying a very thin layer of leaf mold.

2. A mottled layer of silt loam about 30 inches thick, gray and yellowish brown in color, showing no signs of granulation when moist, but when dry it is somewhat granular. This material is single-grained and shows a well-defined laminated arrangement. The material is dominantly gray, the yellow material constituting a comparatively small part of the mass. The yellowish spots have no regular distribution and no definite boundaries. This layer is full of very small pores which are apparently root channels, the roots having decayed. The fact that these root channels have remained open indicates that the soil has little or no tendency to crumble either in the wet or dry condition.

3. An 18-inch layer of material heavier in texture than layer No. 2 (the change from layer No. 2 being gradual), and above which there is no indication of a layer or concentration of gray material. This layer can not be described in any sense as a hardpan or claypan. The material breaks into irregular and imperfect columns, and the columns into irregular chunks or bodies. The color along the cracks or breakage planes, when the material is wet, is bluish gray. When the structural particles or chunks are small, they are apt to be gray throughout; but when they are large—and many of them are 2 or 3 inches in diameter—they have many gray and rust-colored spots on the inside. The material of the brownish spots is lighter in texture and crumbles much more easily than the material which is not brown. The outer shell of these chunks or structural particles may be somewhat cemented, so that some pressure is required to break them. In some cases when the rust-colored spots are almost black, the inside of the structural bodies is very dark.

4. A 12-inch layer in which a brown iron oxide material is much more concentrated, including black iron concretions. It differs, therefore, from the layer above it in being more crumbly, because of the presence of the iron oxide.

5. A 24-inch layer of material similar to that composing layer No. 4, but containing a smaller percentage of iron oxide.

Below layer No. 5 the material is softer and contains considerable iron oxide and less gray material. It is rather friable and continues to a depth of about 10 feet. Lime carbonate in sufficient quantity to effervesce in hydrochloric acid occurs in the material immediately below this.

It is to be noted that in this soil, there is no well-developed A and B horizons, i. e., topsoil and true subsoil. The clay layer, No. 3, is not heavy enough to be designated as a true B horizon, nor is it heavy enough to be described as an alkali hardpan.

*Rossmoyne silt loam.*—Associated with the Clermont silt loam but occurring as a fringe around the areas of the same, occurs Rossmoyne silt loam. Its position is intermediate between that of Clermont silt loam and Cincinnati silt loam. This soil has developed from material like that which has given rise to Clermont silt loam. At one time, undoubtedly, this soil had the same topographic position and characteristics as the Clermont soil. Its characteristics to a depth of about 2 feet are similar to those of Cincinnati silt loam, but below a depth of 2 feet the features are like those of Clermont silt loam. This soil has normal A and B horizons. The B horizon in many places is thin, and its development is the result of better drainage effected by the invasion of the region by the drainage ways which have worked their way back from the larger streams. These invading drainage ways have affected the drainage of parts of areas which were formerly Clermont silt loam, but which, because of the better drainage, have developed into Rossmoyne silt loam.

*Blanchester silt loam.*—Blanchester silt loam occurs as spots or patches in areas of Clermont silt loam, usually in the flat or slightly depressed heads of drainage lines or on extremely flat places away from drainage lines. Since this type of soil has developed under more permanent water-logged conditions than those under which Clermont silt loam was developed, it has acquired more organic matter.

*Fairmount silty clay loam.*—One other upland soil of the region is rather important—Fairmount silty clay loam. It occurs on steep slopes along the streams, and consists essentially of disintegrated parent rock material in which no soil profile has developed, excepting the surface layer in which a small quantity of organic matter has accumulated. The parent material consists of the product of the disintegration of the calcareous shales of the region which lie between the thin layer of calcareous glacial drift from which the soils previously described have developed. In addition to the accumulation of some organic matter, the lime carbonate originally present in the parent material has been leached from the surface layer. Immediately beneath this decarbonated and humus-bearing layer is material that consists of disintegrated calcareous shale which effervesces readily on treatment with hydrochloric acid. The shale rock occurs rather near the surface, rarely at a depth of more than 2 feet.

*Fox and Wheeling soils.*—Along the valleys of the county are a number of soils developed on deposits of old alluvium which now lie well above overflow, including the Fox and Wheeling soils. The Wheeling soils occur on terraces along Ohio River, whereas the Fox soils occur on the terraces along East Fork Miami River. In the latter soils highly calcareous gravel occur near the surface, the gravel originating largely from limestone. The profiles of the Fox soils have well-defined A and B horizons. The B horizon continues to a depth of about 2½ or 3 feet, and is underlain by calcareous gravel. The Wheeling soils are similar to the Fox soil, except that the

Wheeling soils have developed from material not so highly calcareous and which contained a very small quantity of gravel.

*Bottom-land soils.*—The soils in the river valleys now subjected to overflow have been mapped as Genesee, Chilo, and Huntington soils. In these soils no well-defined profiles have developed. These soils, together with other soils not mentioned in this discussion are described in subsequent pages of this report.

Twenty-one soil types, representing 13 soil series, are mapped in Clermont County and are described in detail in subsequent pages of this report. Their extent is given in the table below, and their distribution is shown on the accompanying soil map.

*Acres and proportionate extent of different types of soil*

Soil	Acres	Per cent	Soil	Acres	Per cent
Cincinnati silt loam	34,560	11.6	Fox loam	704	0.2
Rossmoyne silt loam	80,384	27.4	Rodman gravelly sandy loam	256	.1
Dark phase	1,280		Wheeling silt loam	2,816	1.0
Clermont silt loam	70,336	23.6	Wheeling very fine sandy loam	128	.1
Blanchester silt loam	5,696	1.9	Chilo silty clay loam	704	.2
Edenton silt loam	26,112	8.8	Huntington loam	384	.1
Fairmount silty clay loam	53,632	18.0	Huntington fine sandy loam	640	.2
Williamsburg silt loam	4,736	1.6	Genesee silt loam	10,176	3.4
Williamsburg fine sandy loam	128	.1	Genesee loam	1,728	.6
Williamsburg loam	1,408	.5	Genesee fine sandy loam	704	.2
Fox silt loam	768	.3			
Fox fine sandy loam	320	.1	Total	297,600	-----

CINCINNATI SILT LOAM

The topsoil of virgin Cincinnati silt loam consists of a 2-inch layer of dark grayish-brown, friable silt loam under a thin covering of leaf mold. It is underlain by a thin layer of brown or dark grayish-brown, friable silt loam which grades downward into a brown layer of friable silt loam about 5 inches thick. Below this the color is lighter and the texture becomes heavier with increasing depth, until a yellowish-brown or brown heavy silt loam is reached at a depth of about 20 inches. With the exception of some very faint yellowish-gray mottlings, occurring at a depth of about 24 inches, there is scarcely any variation in the physical character of the material to a depth of about 48 inches, where there is an abrupt change to a brown or yellowish-brown, plastic, silty clay that has faint mottlings of light grayish yellow.

Underlying this, at a depth approximating 72 inches, is a 24-inch layer of tough, plastic, impervious clay which is faintly mottled with brown and yellowish brown and which contains some fine gravel. This rests upon a similarly mottled silty clay loam material, which merges at a depth of about 120 inches into a brownish-yellow, calcareous clay or heavy clay loam material containing irregular fragments of limestone. Throughout the soil, there are occasional pebbles, consisting mainly of granite gneiss, quartz, quartzite, and chert. The surface soil to a depth of about 12 inches is slightly acid; it is more acid at greater depths; but at 5 or 6 feet the material is neutral in reaction.

Throughout certain areas of Cincinnati silt loam, particularly those west of Batavia, a very heavy, compact, impervious silty clay occurs at depths ranging from 10 to 20 inches and in patches varying in size from one-tenth acre to 2 acres. Where soil of this type occurs on very narrow ridges extending back from the larger valleys erosion has removed the original brown or dark-brown topsoil, so that now a yellowish-brown silt loam constitutes the surface soil. In such places the heavy, compact silty clay layer may occur at depths ranging from 30 to 40 inches. In places where Cincinnati silt loam and Rossmoyne silt loam are closely associated, a faint degree of mottling may appear at a depth of 20 inches, which increases with depth and becomes rather pronounced at a depth of 30 inches.

About 95 per cent of this soil in Clermont County is cultivated. The cultivated soil differs from the virgin soil in having its surface layers mixed and its organic matter much reduced by cropping. In other places the soil has been greatly modified by the addition of manure and commercial fertilizers. Under average moisture conditions the tilled soil to a depth of 7 inches is brown, friable silt loam. When wet, the color is dark grayish brown or dark brown. This is the warmest and earliest of the upland soils in Clermont County, and because of its mellow nature it can be worked into a very good seed bed.

Cincinnati silt loam occurs in large bodies in the more dissected regions near Ohio River and East Fork Little Miami River. A number of small areas lie adjacent to the valleys of the larger tributaries of these streams. Soil of this type commonly occurs on ridges and gentle slopes. The drainage is good.

The virgin tree growth consists largely of hard maple, beech, red oak, and white oak. Other trees of less importance are black gum, black oak, shellbark hickory, butternut, pignut hickory, black walnut, gray ash, and tulip poplar.

The acreage in corn, the chief crop, is about 15 per cent greater than that of mixed timothy and alsike clover, the next most important crop. Wheat, soy beans, tobacco, oats, and rye are minor crops. Orcharding is important in the southwestern part of the county, where apples and peaches are grown. Tomatoes are grown extensively on this soil in the vicinity of Amelia and Newtonsville. The agriculture consists of general farming in conjunction with hog raising and dairying, but the dairies are usually small. Corn yields from 25 to 40 bushels an acre, the average being about 33 bushels; wheat from 8 to 15 bushels, with 12 bushels as an average; tobacco averages about 1,000 pounds, and hay about 1 ton an acre.

Most farmers use a 2-12-2 or a 16 per cent acid phosphate fertilizer at the rate of 200 pounds an acre for both wheat and corn, and they follow a rotation consisting of corn, wheat, and mixed alsike clover and timothy. Tobacco receives from 200 to 500 pounds an acre of a fertilizer containing a high percentage of potassium and phosphorus; and tomatoes about 250 pounds of 3-10-4 or 3-12-4 fertilizer in addition to some barnyard manure.

The current value of Cincinnati silt loam ranges from \$40 to \$150 an acre, depending on improvements and location with respect to good roads, transportation facilities, towns, and schools.

Owing to its occurrence in locations favored with good air drainage, Cincinnati silt loam is fairly free from late spring frosts, and

fall frosts are from two to four weeks later than on the lowland soils.

One of the essentials in the management of this soil is the increase and maintenance of organic matter. The organic matter tends to prevent the soil from "running together" and lessens washing on the more rolling areas. It also warms the soil by the absorption of heat, retains moisture, results in better tilth, and in its decomposition supplies nitrogen and renders available other elements of plant food. Organic matter can best be supplied by growing such leguminous crops as soy beans, clover, and cowpeas. Because of the acid condition of the soil, it is well to mix thoroughly with the soil about 2 tons of finely pulverized limestone to the acre, by applying it on plowed land either in the fall or in the spring. The ground limestone will greatly assist in obtaining a good stand of clover. A rotation that has been particularly effective in increasing and maintaining the productiveness of this soil is corn or corn and soy beans, soy beans, wheat, and alsike clover.

Erosion offers very serious difficulties on this soil, especially where the surface is sloping and adjacent to steep valley slopes. Unless great care is used when such a field is plowed, it will be completely destroyed by the gullies which quickly work their way back from the valley sides. Probably the most effective measures for the prevention of erosion in cultivated fields are contour plowing and the construction of terraces. As soon as gullies start to form, stake-and-brush dams should be constructed to stop their development and to cause them to fill up with sediment. In fields where the danger from erosion is great, it would be best to maintain permanent pasture.

The table below gives the results of mechanical analyses of samples representing different portions of Cincinnati silt loam:

*Mechanical analyses of Cincinnati silt loam*

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		<i>Per cent</i>						
272643	Soil, 0 to 2 inches.....	0.1	0.4	0.2	0.4	2.9	78.8	17.0
272644	Soil, 2 to 5 inches.....	.2	.4	.2	1.0	5.6	75.2	17.6
272645	Soil, 5 to 10 inches.....	1.0	.6	.4	1.8	6.6	73.7	16.0
272646	Subsoil, 10 to 16 inches.....	.4	.6	.4	2.0	7.8	72.2	16.8
272647	Subsoil, 16 to 20 inches.....	.0	.5	.3	1.7	7.4	70.9	19.0
272648	Subsoil, 20 to 24 inches.....	.2	.8	.6	3.2	8.4	63.4	23.5
272649	Subsoil, 24 to 32 inches.....	1.0	1.8	1.2	6.1	10.0	54.2	25.8
272650	Subsoil, 32 to 48 inches.....	1.9	3.0	1.8	9.2	11.6	50.8	21.8
272651	Subsoil, 48 to 72 inches.....	1.4	2.2	1.8	10.2	13.0	34.9	36.7
272652	Subsoil, 72 to 96 inches.....	.8	2.2	1.8	9.9	11.3	32.4	41.6
272653	Subsoil, 96 to 120 inches.....	.3	.8	.8	4.0	10.6	48.8	34.9

ROSSMOYNE SILT LOAM

The topsoil of virgin Rossmoyne silt loam consists of a very dark brownish-gray layer of friable silt loam about 3 inches thick, which is underlain by a dark grayish-brown, friable silt loam that is lighter in color with increasing depth. This, in turn, is underlain at a depth of about 10 inches by a firm though friable silt loam of variable color, generally yellowish brown, tinged or mottled with gray and containing small iron concretions. At a depth of 21 inches yellowish-brown mottlings appear; at 25 inches the material is slightly

heavier; and below 27 inches the color is yellowish brown with light grayish-yellow and grayish-white mottlings. This grades at a depth of about 47 inches into a layer of brown or yellowish-brown silty clay loam material having iron concretions and pronounced mottlings of yellow, light gray, and grayish white. At a depth of about 59 inches the color is a yellowish brown, mottled with brown, light gray, and yellow. At depths ranging from 65 to 80 inches the parent material is encountered—a calcareous, yellowish-brown silty clay loam material with brown mottlings.

When tested for acidity the surface soil gives only slight, if any, reaction. Below a depth of 14 inches the material is rather acid, and this condition prevails to a depth of 50 or 60 inches.

The surface and upper subsoil layers of Rossmoyne silt loam vary considerably in color, grading on the one hand toward Cincinnati silt loam and on the other hand toward Clermont silt loam. In places on narrow ridges where erosion has been active the surface layers are gone, and instead a yellowish-brown, friable silt loam, unusually low in organic matter, occurs at the surface. Where Rossmoyne silt loam is associated with Clermont or Cincinnati silt loams, mapped areas include patches of the latter soils.

Rossmoyne silt loam is a very important soil. About 90 per cent of it is cultivated. In cultivated fields the original surface layers have been mixed, the organic matter has been more or less depleted, and other modifications have been brought about through cultivation. With average moisture conditions the soil to a depth of 7 inches is a grayish-brown, friable silt loam, which, when wet, takes on a dark grayish-brown color. It is moderately productive, easily tilled, and has a rather low content of organic matter.

Rossmoyne silt loam is found in all parts of Clermont County. Where Clermont silt loam is the predominating type, the Rossmoyne occurs adjacent to the valley slopes; but where Cincinnati silt loam predominates, the Rossmoyne is in the intervalley areas.

These areas vary from undulating to gently rolling. The surface drainage may be fair or good. The internal drainage is fair in the upper subsoil, except where the plastic clay layer is within 18 inches of the surface, but it is invariably poor in the lower subsoil.

Named in order of importance, the principal trees in the virgin forests on this soil were beech, white oak, gray ash, hard maple, black walnut, tulip, and hickory.

Farming operations center for the most part around the production of feed crops for use on the farms. Corn is the principal crop, with timothy hay second in importance. Wheat is grown less extensively, and soy beans, tobacco, rye, potatoes, oats, and cowpeas are minor crops. Tomatoes have become a very important special crop in the vicinity of Mount Carmel, Gleneste, Amelia, and Tobasco. Corn is grown for silage and grain, the former being used as feed for the dairy cattle and the latter for fattening hogs. Sweet corn is grown in the vicinity of Gleneste and Amelia, being pulled green and sold as roasting ears in Cincinnati. Corn yields average about 32 bushels an acre, hay about 1 ton, wheat 12 bushels, soy beans from 8 to 13 bushels of seed or from 1 to 1½ tons of hay, and tobacco 1,000 pounds.

Many farmers are adopting systematic practices, such as deep plowing, rotation of crops, and the growing of legumes, particularly soy beans with the corn. Soy beans are also grown alone and are harvested for hay and seed. About 200 pounds of a 2-12-2 fertilizer or 16 per cent acid phosphate are used for wheat and corn, about 125 pounds of a fertilizer without nitrogen for soy beans, and from 200 to 400 pounds of a fertilizer containing high percentages of potassium and phosphorus for tobacco.

Farms located on Rossmoyne silt loam range in value from \$50 to \$125 an acre, depending on the improvements, character of roads, distance from Cincinnati, shipping facilities, schools, and towns.

The restoration and maintenance of the supply of organic matter by growing legumes, turning under green-manure crops, and applying stable manure, is a very important step toward the improvement of Rossmoyne silt loam. Tests for acidity indicate that the soil is in need of about 2 tons of pulverized limestone to the acre. A rotation recommended for this soil consists of corn or corn and soy beans, soy beans, wheat, and mixed alsike clover and timothy.

Where this soil borders valley slopes, it is subject to severe erosion which results in the development of gullies that work back into it from the valleys. Terracing will prevent the development of these gullies; and if staked-brush dams are constructed and the gullies are seeded where the soil is exposed, in the course of time the smaller ones will be filled with sediments and the larger will become much less detrimental to cultivation. The undulating and gently rolling areas of this soil will have to be tilled before the best results can be realized. Farmers who have succeeded with tiling say that, at current prices for labor and materials, when tile are properly laid they will pay for themselves within eight years by increasing crop production.

*Rossmoyne silt loam, dark phase.*—The surface layer of dark-phase Rossmoyne silt loam when dry consists of about one-half inch of very dark gray, friable, smooth silt loam containing considerable humus and a mat of fine grass roots. The color becomes lighter with depth, grading at a depth of about 2 inches into a dark olive-gray, friable, smooth silt loam which, at a depth of about 11 inches, merges into a 9-inch layer of light-gray or light yellowish-gray loam. This is underlain to a depth of 34 inches by a light-yellow or light yellowish-gray silt loam material mottled with brownish yellow. The color and texture of the materials below this depth may be described, respectively, as follows: Between depths of 34 and 84 inches, deep yellowish-brown silty clay loam; between depths of about 84 and 90 inches, light-gray silt loam; and below 90 inches, yellowish-brown silty loam.

About 95 per cent of the dark-phase Rossmoyne silt loam in this county is cultivated. In this condition the surface soil differs from the virgin soil, owing to an intermingling of the upper layers by plowing, in having less organic matter, and in being modified in other ways by farming. In cultivated fields under normal moisture conditions, the surface soil to a depth of 8 inches is dark-gray or dark grayish-brown, friable, smooth silt loam. During wet periods the color becomes decidedly darker. The soil has a fair content of

organic matter, is retentive of moisture, and is comparatively easy to till, but warms up rather slowly in the spring.

This soil occurs mainly south and west of Newtonsville and south of Monterey. It also occurs in small, slightly elevated areas dotting the rather extensive tracts of Clermont silt loam and Blanchester silt loam in Jackson Township. The land is gently rolling, and the surface drainage is fair, but the internal drainage is poor.

The tree growth, principal crops, yields, methods of treatment and improvement are practically the same as for typical Rossmoyne silt loam.

#### CLERMONT SILT LOAM

The surface layer of virgin Clermont silt loam, when dry, consists of  $1\frac{1}{2}$  inches of very dark gray, smooth silt loam, containing considerable humus and a mat of fine grass roots. This is underlain to a depth of 10 or 12 inches by rather firm, gray or pale yellowish-gray silt loam, which is mottled slightly with yellowish brown, and becomes lighter in color with increasing depth. This layer has a platy structure, and the lower part contains some gravel. Below this the material changes rather abruptly in texture to rather plastic, granular, silty loam and in color to grayish yellow mottled with yellowish brown. Below depths varying from 18 to 24 inches, the material is heavy, plastic clay containing iron concretions, gray or grayish yellow in color and mottled with yellowish brown. This clay is locally termed hardpan. At a depth of about 28 inches, the color changes to a mottled light gray, grayish yellow, or yellowish brown. Between 40 and 66 inches the material consists of grayish brown or deep yellowish-brown, mottled gray, plastic clay containing gravel composed of chert, quartz, various crystallines, and iron concretions. Beneath this is an 18-inch layer of deep yellowish-brown silty clay or silty clay loam material, containing considerable gravel, and changing at a depth of 84 inches into a mottled gray, grayish-yellow or yellowish-brown material. At 90 inches the parent material is reached. This is a grayish-yellow or yellowish-brown calcareous loam. Tests indicate that this soil is very acid from the surface to depths varying from 75 to 84 inches.

In almost all areas of Clermont silt loam, particularly those west of Batavia, a distinct variation has developed. This is found where the heavy, plastic clay occurs at a depth of a foot or less below the surface. Where this soil is associated with Blanchester silt loam both its surface soil and upper subsoil are decidedly darker than the typical soil. Probably one-fourth of Clermont silt loam has better surface and subsurface drainage than the typical soil; in such cases the material at depths varying from 6 to 12 inches is yellowish, pale yellowish gray or gray and mottled with yellowish brown.

About 60 per cent of this soil in Clermont County is tilled. The cultivated soil is different from the virgin soil because of the comingling of the surface layers by plowing, the depletion of the virgin humus by cultivation, and the modification of texture, structure, and fertility by the application of stable manure, commercial fertilizers, and tiling. To a depth of 7 inches, the cultivated soil consists of light-gray silt loam which is gray when wet. This soil

is "cold," is particularly deficient in organic matter, and is very acid.

In acreage Clermont silt loam ranks second in the county. It occurs mainly in the eastern half of the county, although numerous small areas occur throughout the northwestern part.

This land is level or gently undulating, and is sloping where it is contiguous to valleys. Owing to its level surface the drainage is very slow, and the compact subsoil greatly impedes the movement of the ground water and makes successful artificial drainage difficult. Farmers report that where the 4-inch tiles have been set at intervals of 2 rods and at depths of 24 or 30 inches, fair underdrainage has been obtained.

In the wood lots of Clermont silt loam pin oak is now the predominating tree; but in the virgin forest white oak constituted the principal tree growth, with beech second in importance. White elm, hickory, and gray ash were other important trees.

Agriculture consists of general farming. Corn, timothy, and wheat are the principal crops grown, corn taking precedence in acreage. Soy beans are grown successfully on this soil by a number of farmers. Corn yields average about 25 bushels per acre, but where the best methods of farming are followed yields of 35 or 40 bushels an acre are not uncommon. Wheat averages 10 bushels, timothy hay 0.8 ton, and soy beans about 11 bushels of seed and 1½ tons of hay.

Clermont silt loam is a soil naturally of low productivity, but with good methods of cultivation the fertility may be increased and maintained. A three-year rotation is generally practiced; corn is grown one year, wheat one year, and the third year alsike clover and timothy. The stand of clover is usually light. Many farmers cut the hay one year and use the field for pasture the following year. Some farmers have introduced soy beans into the rotation, giving a succession of corn, soy beans, wheat, and mixed alsike clover and timothy. The soy-bean acreage is being rapidly increased. This crop is a good soil builder and is very nutritious. In many cases soy beans are grown with corn and used for hog pasture and for silage. When clover fails soy beans are sown at corn-planting time and harvested for hay or seed in the fall. Practically all farmers use commercial fertilizer for wheat and corn. The fertilizer most commonly used is a 2-12-2 mixture, which is usually applied to both wheat and corn at a rate varying from 125 to 175 pounds to the acre. Large quantities of stable manure are applied to corn land.

The current value of Clermont silt loam ranges from \$20 to \$50 an acre, depending on improvements and location with respect to good roads, transportation facilities, towns, and schools.

In the improvement of Clermont silt loam the most essential requirements are tiling, liming, and the maintenance and increasing of the organic matter. The organic matter tends to prevent "running together" of the surface soil, helps to retain moisture, warms the soil by absorption of heat, favors better tilth, supplies nitrogen as it decays, and renders other nutrient elements more available. The supply of organic matter may be increased by growing legumes and plowing under green-manure crops. A good rotation to increase the organic matter is corn and soy beans, then soy beans, wheat, then

mixed alsike clover and timothy. An application of 200 pounds of 3-12-4 fertilizer in conjunction with a light winter dressing of manure is recommended for wheat. In addition to applying 125 pounds of 2-12-6 fertilizer for corn, the sod should be well manured before breaking, or a green-manure crop should be plowed under. Where the land has not been previously limed a liberal application of ground limestone will, with tiling, aid greatly in obtaining better stands of soy beans and alsike, red, and mammoth clovers in improving the quality of hay and pasturage, and in increasing soil fertility in general.

Farmers who have tiled this soil report that in less than seven years the increase in production resulting from tiling had reimbursed them fully. As the land is level and the slope very slight in areas of Clermont silt loam, it is well to employ an experienced surveyor to determine the grades. Laterals placed at intervals of 40 feet and at a depth ranging from 24 to 30 inches have been found very satisfactory. Where tiling is not considered advisable at present, great care should be exercised to develop as complete a system of surface drainage as possible. Some farmers eliminate the dead furrow by throwing the furrow slices one way, and then they open up furrows with the plow to take care of the surface drainage. Where this soil borders valley slopes, gullies will frequently work their way back from the valley sides for a quarter of a mile or more unless preventive measures are taken. By constructing terraces to control the drainage in the field, by installing staked-brush dams at various points in the gullies, and by sowing grass seed on the exposed surfaces, the gullies ultimately become filled with sediments and no further difficulty is experienced if due care is exercised.

#### BLANCHESTER SILT LOAM

The surface layer of Blanchester silt loam consists of very dark brown or very dark grayish-brown friable silt loam, merging at a depth of about 6 inches into a 2-inch layer of dark grayish-brown, mellow granular silt loam. Below this the soil, to a depth varying from 12 to 24 inches, assumes a dark olive-gray color with pale-yellow mottlings. This is underlain by a compact silty clay loam material from 10 to 36 inches in thickness, which is light gray with gray and yellowish-brown mottlings. The next layer is a very heavy, pasty, granular clay material light gray or gray in color with yellowish-brown mottlings, which at depths ranging from 40 to 50 inches contains iron concretions and changes in color to gray or dark gray with yellowish-brown mottlings. From 54 to 70 inches the material is gray or very dark gray, tough, plastic clay, mottled with dark brown or dark reddish brown, and having many iron concretions. This merges into a 6-inch layer of friable clay which contains considerable gravel and iron concretions, and which may have a mottled deep yellowish-brown or dark-gray color. At a depth of approximately 76 inches there is found friable clay loam of deep yellowish-brown or deep brownish-yellow and mottled with gray. At 88 inches one finds a sandy clay loam material and at about 92 inches a mottled deep yellowish-brown and light yellowish-gray plastic clay. At a depth of about 96 inches the material is a

yellowish-brown friable clay mottled with gray and light gray, which rests at a depth of about 100 inches upon an 8-inch layer of dark-gray or gray plastic clay mottled with yellowish brown. Below this is the parent material of calcareous gray clay mottled with yellowish brown. In some cases the bedrock, usually a limestone, but sometimes a shale, is reached at depths ranging from 100 to 120 inches. The soil within a depth of 100 inches is very acid.

Probably 90 per cent of the Blanchester silt loam in Clermont County is tilled. Cultivation has modified the virgin soil by mixing the surface layers and by reducing the organic matter. Other changes have been brought about through tiling and the application of commercial fertilizers, barnyard manure, and green manure. Under normal moisture conditions, the cultivated surface soil consists of a 7-inch layer of very dark grayish-brown, mellow silt loam. When the moisture content of the soil is above the average, the color becomes darker. This is a very desirable soil, and when properly drained it is very fertile. It has a good supply of organic matter, and the moisture-holding capacity is such that crops rarely suffer seriously from lack or excess of moisture.

Blanchester silt loam occurs in swampy areas at the heads of streams and in depressed places within areas of Clermont silt loam.

The land is flat. Both the natural run-off and the internal drainage are slow on account of the absence of slope and the compactness of the subsoil layers. Artificial drainage is rather difficult to effect.

The predominating virgin tree growth was elm. Swamp white oak, white oak, and sour gum were other important trees. Corn, mixed alsike clover and timothy, and wheat, ranking in acreage in the order named, are the leading crops. Soy beans are planted alone or with corn. All these crops yield better than on Clermont silt loam. In the production of crops Blanchester silt loam is treated in about the same manner as Clermont silt loam. This land ranges in value from \$50 to \$75 an acre.

The recommendations regarding tiling and liming made for Clermont silt loam, are applicable to this soil. Although it is fairly well supplied with organic matter, continuous cropping and the removal of practically all of the crop residues quickly reduce the quantity until it becomes deficient. It is therefore important that stable manure and green-manure crops, especially legumes, be incorporated with this soil and a rotation well suited to it consists of corn, soy beans, wheat, and mixed alsike clover and timothy.

#### EDENTON SILT LOAM

Edenton silt loam is a soil having an intermediate position between Cincinnati silt loam and Fairmount silty clay loam. It resembles Cincinnati silt loam to a depth of 2 or 3 feet, but below this depth it resembles the Fairmount soil. In its virgin state there is a 2-inch surface layer of dark grayish-brown silt loam underlain by a layer of a brown silt loam material approximately 8 inches thick. This merges into a yellowish-brown material having a silty clay loam texture which with depth becomes heavier in texture and mottled with shades of gray, yellow, and brown. Below a depth of 24 inches is a yellowish-brown, friable clay underlain at 30 or 40

inches by a heavy, plastic, brown clay which in places is slightly calcareous. Deeper down the material is more calcareous, and contains some limestone fragments.

Owing to its intermediate position, this soil resembles on the one hand Cincinnati silt loam, and on the other Fairmount silty clay loam. For example, on some of the more gentle and smaller valley slopes the topsoil to a depth of 3 feet, is essentially the same as that of Cincinnati silt loam; but below this it becomes heavy and is calcareous at a depth of 4 feet. On the steeper slopes the surface soil is similar to that of the third, or lowest layer, of Fairmount silty clay loam.

Edenton silt loam, under cultivation, differs from the virgin soil. The more important differences are a thinner surface layer as a result of sheet erosion, mixed surface layers, and a decreased supply of organic matter as a result of cropping. Under normal moisture conditions the cultivated soil to a depth of 8 inches consists of a brown, friable silt loam. Where the moisture content exceeds the normal, the color ranges from brown to dark brown. This is a warm, early soil with a fair content of organic matter.

Edenton silt loam occurs in practically all parts of Clermont County, particularly in the smaller valleys and hollows. The land may be level as on the floors of the small valleys, or steeply sloping, as on the valley sides. The drainage is usually adequate.

The tree growth on the valley slopes is similar to that on Fairmount silty clay loam, but on the bottoms it is like that on the Genesee silt loam. About 5 per cent is in cultivation. Corn, tobacco, and mixed alsike clover and timothy are the principal crops, the acreage in corn being greatest. Soy beans, red clover, and alfalfa are grown to a limited extent and with success.

This soil is cultivated and fertilized in practically the same manner as Fairmount silty clay loam. Because of its supply of lime it is adapted to red clover, alfalfa, and sweet clover, but these legumes do not grow well on the main upland acid soils of the county. This land is sold only with larger tracts of other soils.

In cultivating the valley slopes, special care must be constantly exercised to prevent erosion. Contour plowing, terracing, and setting a staked-brush dam wherever a gully begins to develop, have proved effective measures in maintaining these slopes while under cultivation. It is well, however, to keep these slopes a large part of the time, and the steeper slopes all of the time, in soil-binding crops such as alfalfa, or in permanent pasture either with or without a tree growth of locust.

#### FAIRMOUNT SILTY CLAY LOAM

The dry, virgin topsoil of Fairmount silty clay loam consists of a dark-brown silt loam, grading at a depth of 1 inch into a brown silty clay loam, which at a depth of 4 inches is underlain by yellowish-brown silty clay loam. At depths varying from 8 to 12 inches, this is underlain by a yellowish-brown, calcareous silty clay which contains numerous irregular fragments of limestone.

Throughout the northern half of the county, and especially in the smaller valleys and on the less steep slopes, the profile shows a dark-brown silt loam, underlain at a depth of 2 inches, by a brown silty

clay loam which becomes heavier with depth, and merges into a brown or yellowish-brown, plastic silty clay at a depth ranging from 15 to 24 inches. This rests upon a calcareous, yellowish-brown silty clay, containing a considerable quantity of limestone fragments at a depth of 30 or 40 inches. In many places the soil material is friable, and the deeper layers have much fine gravel, some fine gravelly clay loam material being found at depths varying from 18 to 40 inches. In the southern part of the county, on the slopes of the Ohio River Valley and of tributary valleys, the soil is heavier, being ordinarily a silty clay loam, but in places where sheet erosion has been most active it is a silty clay.

There are many areas of colluvial soils at the bases of valley slopes, ranging in length from 100 to 400 yards and in width from 50 to 250 feet, but because of their small aggregate area they are included in mapped areas of Fairmount silty clay loam. These represent largely the accumulations of sediment washed from areas of Fairmount silty clay loam. Soils of a similar nature, which are also included in areas of Fairmount silty clay loam, occur north of Owensville in the valley of Stonelick Creek on a few isolated remnants of a high terrace 60 feet above the present stream. These terrace remnants have been entirely covered with material washed from the limestone slopes above them.

About 10 per cent of the Fairmount silty clay loam in Clermont County is tilled. Cultivation has modified the virgin soil by the mixing of the surface layers, depletion of the humus by cropping, application of commercial fertilizers and barnyard manure, and by green manuring and tiling. The cultivated surface soil under normal moisture conditions, consists of brown silty clay loam 8 inches deep. When the moisture content is above the average, the color is darker. Fairmount silty clay loam is fairly well supplied with organic matter and is very productive. It may be cultivated only under certain moisture conditions, for it tends to puddle if worked when wet and dries very hard and cracks, breaking into large lumps on plowing.

Fairmount silty clay loam occurs principally on the steep valley slopes along Ohio River and along East Fork Little Miami River. Smaller areas occur on the valley slopes of the principal branches of these rivers. The surface is steeply sloping and the drainage is good.

On virgin areas, tulip, hard maple, beech, chinquapin oak, white oak, and scarlet oak are the predominating trees; and blue ash, white ash, wild cherry, black walnut and basswood are less important. When cultivated fields are abandoned, black locust becomes the predominating tree.

Corn and tobacco are usually the most important crops grown. Alfalfa and sweet clover are grown by a few farmers, and do very well on this calcareous soil. Yields range from poor to good, depending largely on the method used in cultivating the land and on the amount of erosion that has taken place. Corn yields from 20 to 60 bushels an acre, with an average of about 30 bushels; tobacco from 500 to 1,200 pounds, with 1,000 pounds as an average; and alfalfa averages about 2 tons an acre.

The usual method of cultivating this soil is to clear and break bluegrass sod, and to put it in tobacco for one year, during which

time the grass and locust roots hold the soil in place and prevent erosion. After this the field is usually reseeded to bluegrass, in some cases to alfalfa, and left in sod for four or five years. When an attempt is made to raise a second crop of tobacco or to follow the tobacco with corn, the field is greatly damaged by sheet erosion and gullying; and if the field is cultivated for a third successive season, the surface soil is washed away and the field is completely covered with gullies from 1 to 7 feet deep.

Cultivated land of this type is currently valued at \$20 to \$100 an acre, depending on the degree of erosion, the steepness of the slope, and the location in respect to transportation, towns, and schools. Uncultivated land values vary from \$10 to \$30 an acre.

Because of the steepness of the areas on which it occurs, it is a question whether Fairmount silty clay loam should be used for growing tobacco and corn or any other crop that exposes the surface to erosion. Where these crops are grown, it would be better to construct terraces, practice contour plowing, and grow winter cover crops of rye or wheat after tobacco and corn. It would be far better, however, to seed these steep slopes to alfalfa for hay or to bluegrass for pasturage. Another excellent and profitable use for this soil is reforestation with black locust in conjunction with seeding to bluegrass for pasture. A very heavy volunteer growth of locust trees and bluegrass soon covers all abandoned fields and protects them from erosion.

#### WILLIAMSBURG SILT LOAM

The topsoil of virgin Williamsburg silt loam, when dry, consists of dark grayish-brown or dark brownish-gray, mellow silt loam underlain at a depth of about 5 inches by a grayish-brown, friable silt loam to a depth of 10 or 12 inches. Beneath this is a yellowish-brown or light yellowish-brown granular silty clay loam material which, at a depth of about 16 inches, becomes somewhat darker in color and faintly mottled with shades of gray and yellow. At about 42 inches the material may have a light silty clay loam or heavy silty loam texture and a light yellowish-brown color with faint mottlings of various shades of yellow, gray, and brown. Deeper down is a light grayish-yellow or very light yellowish-brown, calcareous silt loam material mottled with yellow and gray.

In many places, the entire soil is more friable than typical Williamsburg silt loam, in which case the subsoil layers may be loam, fine sandy loam, very fine sandy loam, or fine gravelly loam. In other places the soil is heavier than silt loam and the subsoil layers consist mostly of silty clay which may be either plastic or friable. In mapped areas of Williamsburg silt loam are patches of Williamsburg loam and fine sandy loam, and patches of gravelly loam or gravelly fine sandy loam, especially on the terrace escarpment along East Fork Little Miami River between Elk Lick and Marathon.

About 95 per cent of the total acreage of Williamsburg silt loam is cultivated. Modifications brought about by the mixing of the surface layers in cultivation, the depletion of humus, etc., cause the cultivated soil to differ from the virgin. Under average moisture conditions, the cultivated soil to a depth of 8 inches consists of grayish-brown, mellow silt loam. When the moisture content is

greater the color is darker. With adequate drainage, this is a warm, early, fertile soil which is easily tilled. It has a fair supply of organic matter and good moisture-holding power, so that crops rarely suffer seriously from a lack or excess of moisture.

Williamsburg silt loam is found mainly on the terraces of East Fork Little Miami River. Other areas occur along O'Bannon and Stonelick Creeks. The land may be level or gently sloping. The run-off is slow and the subdrainage is rather poor, but it is easily drained by artificial means, owing to the open character of the soil layers.

The predominating trees on areas of virgin Williamsburg silt loam were hard maple, black walnut, tulip, and blue ash. The principal crops are corn, mixed clover and timothy hay, and wheat. Crops less extensively grown are soy beans, rye, tobacco, and potatoes. The average corn yield is about 38 bushels an acre, hay 1 ton, and wheat 14 bushels.

A rotation of corn, wheat, and red clover is followed. This is varied somewhat to meet individual needs. In some cases potatoes take the place of corn, and in other cases soy beans take the place of wheat. An application of 150 pounds of a 2-12-4 fertilizer is usually made for wheat and corn at the time of planting. The land varies in value from \$100 to \$150 an acre.

Along Cloverlick Creek are some very high terraces 60 feet above the creek, where the surface soil to a depth of 6 inches is dark-brown, very friable silt loam underlain by a brown, friable silt loam layer about 5 inches thick. This rests upon light-brown silt loam which gradually changes to a yellowish-brown silty clay loam that occurs as a layer about 10 inches thick. At a depth varying from 28 to 60 inches, the material is light reddish-brown, friable clay containing some gravel, which becomes more abundant with increasing depth. One mile south of Marathon on the west side of the valley of East Fork Little Miami River, there is a variation of this soil where the surface soil to a depth ranging from 10 to 15 inches is very dark grayish-brown silt loam; and underlying this is brownish-gray silt loam mottled with various shades of brown, yellow, and gray.

The soil is deficient in organic matter. The application of barnyard manure and the plowing under of green-manure crops, preferably legumes, will supply this constituent, thereby improving tilth and increasing soil productivity. A rotation of corn, soy beans, wheat, and red clover will increase and maintain the fertility of this soil. Because of its supply of lime, this soil is well adapted to the production of red clover, alfalfa, and sweet clover, which can not be successfully grown on the main upland soils because of their acidity.

#### WILLIAMSBURG FINE SANDY LOAM

The topsoil of dry, virgin Williamsburg fine sandy loam consists of dark-brown fine sandy loam, but it is brown at a depth of about 3 inches. It then becomes lighter in color, so that at depths ranging from 12 to 16 inches the material is yellowish brown and at a depth of 30 or 40 inches there is a 10-inch layer of the same material, grayish yellow in color. The next layer, also about 10 inches thick, is yellowish-brown, friable, silty clay loam material. This rests at

a depth of 50 or 60 inches upon calcareous, yellowish-brown silty clay loam material.

Approximately 95 per cent of Williamsburg fine sandy loam is tilled. The cultivated surface soil differs from the virgin soil, owing to a mixing of the upper layers by plowing, to some depletion of the humus, and to other modifications brought about by farm practices. In cultivated fields under normal moisture conditions, the soil to a depth of 8 inches is brown fine sandy loam which during wet periods becomes distinctly darker in color. This soil is rather low in organic matter, but it is warm, early, and easy to cultivate.

Williamsburg fine sandy loam occurs in small areas on the terraces of East Fork Little Miami River between Williamsburg and Perintown. The land is level or gently sloping, and both surface and internal drainage are good.

The trees on this soil as well as the prevailing crops and agricultural practices are very similar to those on Williamsburg silt loam. The yields are somewhat lower.

The organic matter can be maintained by green manuring, together with the growing of legumes and the liberal use of barnyard manure. This will furnish sufficient nitrogen, will make the soil more retentive of moisture during dry periods, and will greatly improve it physically. A rotation of corn, soy beans, wheat, and clover will increase its fertility.

#### WILLIAMSBURG LOAM

The topsoil of virgin Williamsburg loam, when dry, consists of a 4-inch layer of dark grayish-brown silt loam underlain by grayish-brown loam which is yellowish brown between depths of 8 and 12 inches. This layer rests on a layer of light loam or fine sandy loam of a light yellowish-brown color that becomes more gray with increase in depth, so that at 36 or 40 inches it is grayish yellow. At a depth of 44 or 48 inches there appears a yellowish-brown silty clay loam material which is calcareous a few inches farther down. The depth of the silty clay loam layer is decidedly variable; in some places it is within 10 inches of the surface. A variation in this soil is observable in an area one-half mile north of Elk Lick where the surface layer consists of a very dark grayish-brown loam.

About 95 per cent of the Williamsburg loam in Clermont County is under cultivation. The surface soil under cultivation differs in many respects from that of the virgin soil, owing to the results of cropping. The cultivated soil under normal moisture conditions, is grayish brown, but where the moisture content is decidedly above the average, the color is a dark grayish brown. Although rather low in organic matter, Williamsburg loam is a warm, early, easily tilled soil, and fairly productive. Crops rarely suffer seriously from lack or excess of moisture.

This soil occurs in small areas on the terraces along East Fork Little Miami River. The surface is level or slopes very gently toward the stream. Usually both the surface and internal drainage are good.

The tree growth, crops, and yields on this soil are practically the same as on Williamsburg silt loam. Under cultivation the organic content of the soil may be easily depleted, and in most cases the

incorporation of organic matter in the form of green manure is desirable.

#### FOX SILT LOAM

The topsoil of Fox silt loam, when dry and in its virgin state, consists of a 7-inch surface layer of dark grayish-brown, mellow silt loam. Below this the material is a friable silt loam in four layers which differ only in color and thickness. The first is a 3-inch brown layer, the second a 10-inch dark yellowish-brown layer, the third a 24-inch yellowish-brown layer, and the fourth a 12-inch, dark yellowish-brown layer mottled with grayish yellow.

At a depth varying from 52 to 58 inches, the color is essentially the same as the material above, but the texture is that of a loam. This grades into a 4-inch layer of yellowish-brown loam tinged slightly with red, and containing much fine gravel, which runs 98 per cent limestone. Between depths of 62 and 68 inches is a layer of brown, dirty gravel which rests upon a bed of gravel.

Fox silt loam, as mapped, has many inclusions of Fox loam and a few of Fox fine sandy loam. In places the friable silt loam layers have a total depth varying from 80 to 100 inches, and in others the gravelly loam layers are reached at depths ranging from 20 to 40 inches.

About 95 per cent of the Fox silt loam in Clermont County is tilled. When plowed and cultivated the virgin soil is much changed. Under normal moisture conditions the cultivated soil, to a depth of 8 inches, is brown or dark-brown, mellow silt loam. This soil is early and warm, has a fair content of organic matter, and is easy to cultivate. The subsoil is open, allowing free movement of air and water.

Fox silt loam is confined to small areas on the terraces of East Fork Little Miami River between Loveland and South Milford. The surface is level, and drainage is fair to good.

In the virgin forests, the principal tree on this soil was hard maple, with black walnut second in importance. Tulip and blue ash were also important trees.

Corn ranks first in acreage; mixed red clover and timothy, second; and wheat, third. Soy beans, potatoes, general truck crops, alfalfa, sweet clover, and berries all do well on this soil and are grown to a small extent. Corn yields from 30 to 40 bushels an acre, hay from 1 to 1½ tons, and wheat from 10 to 16 bushels.

Practices to improve this soil should provide for increasing the organic matter and deepening the surface soil. The organic matter may be increased by plowing under green-manure crops and by growing more legumes. A rotation well suited for this soil is corn, followed by a fall sowing of wheat, then by a spring seeding with red clover. The clover is left for a hay crop a year later, and it is then turned under as green manure for corn. A light dressing of stable manure and 200 pounds of 2-12-2 fertilizer are applied to the wheat land.

#### FOX FINE SANDY LOAM

The surface soil of virgin Fox fine sandy loam, when dry, consists of a dark grayish-brown fine sandy loam, which changes in

color at a depth of 9 inches to dark brown. This is underlain by dark-brown gravelly fine sandy loam to a depth varying from 24 to 30 inches, and this, in turn, is underlain by stratified gravel and sand.

In this county about 95 per cent of Fox fine sandy loam is tilled. The material of the surface soil differs from that of the virgin soil, owing to the mixture of the upper layers, to the depletion of the humus by cultivation, and to modifications of chemical composition, texture, and structure brought about by the application of stable manure and commercial fertilizers and the turning under of green-manure crops. Under average moisture conditions the cultivated soil to a depth of 8 inches, is a dark grayish-brown or dark reddish-brown fine sandy loam. When very wet, the soil is very dark reddish brown. Because both soil and subsoil are so open, this soil is among the warmest, earliest, and best adapted of any in this area to early vegetables.

Fox fine sandy loam is found only on terraces along East Fork Little Miami River between South Milford and Loveland. The areas are level and the surface and internal drainage may vary from good to excessive.

Corn, mixed red clover and timothy, and wheat are the principal crops; but alfalfa, soy beans, potatoes, tobacco, and truck crops are successfully grown. The original timber growth was similar to that on Williamsburg silt loam.

Fox fine sandy loam is invariably low in organic matter, and this deficiency, together with the open character of the soil, permit a ready leaching of soluble mineral plant foods. Where organic matter is supplied, the moisture-holding capacity of the soil is increased and leaching decreased, and therefore, it is better fitted to nourish crops during the dry periods of summer.

#### FOX LOAM

The surface soil of virgin Fox loam, when dry, is dark grayish-brown or dark-brown loam to a depth of about 10 inches where it merges into a brown loam. At a depth of about 12 inches there occurs a reddish-brown gravelly sandy loam or fine sandy loam layer 18 inches thick, which is underlain by strata of gravel and sand. Included in mapped areas of this type are numerous patches of Fox silt loam and Fox fine sandy loam.

Probably 95 per cent of this soil is cultivated, and in this state it differs from the virgin soil in having less organic matter. When wet the tilled soil is a very dark grayish-brown loam. This is a warm soil well suited to the production of early vegetables, potatoes, berries, and all general farm crops.

Fox loam occurs on the terraces of East Fork Little Miami River between Loveland and South Milford. The surface is level and both surface and internal drainage are good.

The virgin timber and crops grown are practically the same as those of Fox fine sandy loam, but the crop yields are somewhat higher. In general, the methods suggested for the improvement of Fox fine sandy loam are well suited to this soil.

## RODMAN GRAVELLY SANDY LOAM

The surface soil of dry, virgin Rodman gravelly sandy loam to a depth of 4 inches is brown or dark-brown material which may vary from gravelly sand to gravelly fine sandy loam. This may be underlain by a gravelly layer of similar texture but lighter in color or by a bed of gravel. The gravelly sands or gravelly sandy loams may prevail to depths ranging from 6 inches to 3 feet, but they are everywhere underlain by gravel or sand.

Rodman gravelly sandy loam occurs on the escarpments of the terraces along the East Fork Little Miami River between Loveland and South Milford. The slope is very steep and the drainage is excessive. The soil is not farmed, but being calcareous it would be adapted to alfalfa and sweet clover.

## WHEELING SILT LOAM

The dry surface soil on both virgin and cultivated areas of Wheeling silt loam consists of dark-brown, mellow silt loam to a depth of 8 or 10 inches. This is underlain to a depth of 5 feet or more by mellow silt loam which may be dark brown, brown, or yellowish brown which becomes slightly lighter in color at a depth varying from 20 to 30 inches. There are fine mica particles throughout the soil. This soil is fairly well supplied with organic matter, is retentive of moisture, warms up early in the spring, and is comparatively easy to till.

Wheeling silt loam is the most common soil along Ohio River, occurring on terraces which are subject to inundation only at times of extreme flood. The surface is level or gently sloping and the drainage is good.

Probably 95 per cent of the soil is cultivated. The virgin areas supported a timber growth in which hard maple predominated, and tulip, beech, black walnut, and blue ash were next in importance.

Corn is the chief crop, yielding 40 bushels an acre. Red and alsike clover, timothy, wheat, tobacco, soy beans, and alfalfa are successfully grown. No rotation is practiced, and there are fields where corn has been grown from 25 to 35 successive years. A very small quantity of commercial fertilizer is used. The value of this land based on current sales ranges from \$75 to \$150 an acre.

## WHEELING VERY FINE SANDY LOAM

The surface soil of Wheeling very fine sandy loam in the virgin state, and when dry, consists of dark grayish-brown very fine sandy loam, which gradually grades at a depth of 6 inches into a slightly lighter-colored layer. At a depth of about 9 inches, this is underlain by a layer of similar texture and lighter color and this last at 16 inches by one yellowish brown in color. This in turn, rests on light-brown very fine sandy loam that continues to a depth of 40 inches or more. The substratum below commonly consists of laminated silt, clay, and very fine sand to a depth of 30 feet or more.

About 95 per cent of Wheeling very fine sandy loam is cultivated. It differs from the virgin soil, in that the surface layers have been

mixed, the original humus has been more or less depleted, and other modifications have been brought about through tillage. Under average moisture conditions, the cultivated soil to a depth of 8 inches is dark grayish-brown very fine sandy loam which is decidedly darker when very wet. Because of its excellent drainage, this is an especially early, warm soil which is easily cultivated.

Wheeling very fine sandy loam occurs on remnants of a high terrace 70 feet above Ohio River, near the junction of valleys tributary to the Ohio River valley. The largest area is near Point Pleasant; there are other areas near Clermontville and Rural. The land is gently sloping and both the surface and internal drainage are very good.

The crops grown are about the same as on Wheeling silt loam. Corn and tobacco are the most important and produce very good yields. Melons are grown to a slight extent and are well adapted to this soil. Grains grow better than on the lower terrace soils which are richer in organic matter. In the improvement of this soil, the inclusion of legumes in the rotation is especially important as a means of increasing the content of organic matter.

#### CHILO SILTY CLAY LOAM

The dry surface soil of virgin Chilo silty clay loam consists of rather sticky, dark olive-gray silty clay loam, which at a depth ranging from 1 to 3 inches changes into plastic, light-gray silty clay loam mottled with yellowish brown and light yellowish brown. At about 10 inches, this rests upon gray, plastic silty clay loam with dark-brown mottling which is continuous to a depth of 4 feet or more. There are variations in which the dark surface layer is from 5 to 8 inches thick. Areas of Chilo silt loam and loam are included with this type but they are too small to show on the map.

Approximately 50 per cent of Chilo silty clay loam is tilled. In this condition, the surface soil differs from the virgin, owing to an intermingling of the upper layers by plowing. Under normal moisture conditions, the soil to a depth of 8 inches is gray silty clay loam which becomes darker in color when wet. Because it is heavy this soil warms up slowly in the spring. It must be worked when the moisture content is about right for pulverization, as it is sticky when wet and clods upon drying.

Chilo silty clay loam is an inextensive terrace soil along Ohio River, occurring in long narrow depressions parallel to the river and associated with Wheeling silt loam. These areas are subject to inundation about once in six years. The surface of this land is level. Both the natural run-off and the internal drainage are slow, on account of absence of slope and of compactness of the soil layers. Artificial drainage is rather difficult to establish.

Corn and mixed red clover and timothy are the leading crops. Corn yields from 30 to 40 bushels an acre, and hay about 1 ton. Uncultivated areas are used for permanent pasture. On tilled areas alfalfa makes a very heavy growth.

One of the great needs of this soil is tile drainage. Sweet clover would greatly improve the internal circulation of water and air, if introduced into the crop rotation and left one year or more to

permit the development of a root system that would penetrate the plastic layers.

#### HUNTINGTON LOAM

The surface soil of virgin Huntington loam, when dry, consists of brown or dark-brown loam or fine sandy loam containing some gravel. At a depth ranging from 8 to 12 inches, it changes in color to light brown or yellowish brown, which prevails to a depth of 2 or more feet. The zonation in this soil is indistinct and variable. In places, beds of gravel and sand are encountered below the 20-inch depth. There is also considerable variation in the texture of the soil. In depressions, it is commonly heavy loam or clay loam and the color is darker than on the higher areas. The cultivated soil to a depth of 8 inches is brown mellow loam which is dark brown when very wet.

This soil occurs in a narrow belt, from 200 to 1,000 feet wide, on Ohio River bottoms. South and southeast of Moscow a narrow belt of Huntington fine sandy loam lies between Huntington loam and Ohio River. In this part of the county the soil is spoken of as second bottom. Northwest of Moscow it is separated from Ohio River by a narrow escarpment which has been included in mapping. In this region it would probably be considered as the lowest flood plain. This area is sloping, the elevation being highest in the direction of Ohio River where the texture is the lightest. As it is subject to annual overflow a deposit of sediment is added every year. The drainage is generally good.

Corn, tobacco, alfalfa, and truck crops are grown on this soil. Corn produces heavy yields. The timber growth is principally willow, with some sycamore and buckeye.

#### HUNTINGTON FINE SANDY LOAM

Dry virgin Huntington fine sandy loam consists of a 10-inch layer of brown or dark-brown fine sandy loam, underlain by light-brown, yellowish-brown, or brown gravelly fine sandy loam to a depth of 4 feet or more. The texture of this soil is decidedly variable, and inclusions of Huntington loam, sandy loam, gravelly fine sandy loam, gravelly sandy loam, and fine sand are numerous. In places, the material below 15 inches consists of beds of sand and gravel.

When dry, the cultivated soil is practically the same as in the virgin condition, but under normal moisture conditions the color is somewhat darker and becomes almost a dark brown when the moisture content is excessive. It is warm, early, retentive of moisture, and easy to cultivate.

The area of Huntington fine sandy loam is not extensive. It occurs on the lower flood plain along Ohio River. The surface is level or gently sloping and the drainage is good. This area is inundated once or oftener each year, especially during the spring, and destructive floods sometimes occur during the growing season.

Corn and tobacco are the principal crops on this soil. It is especially favorable for tobacco, and good yields of a product of fair quality are procured. Because of the likelihood of floods during the spring months, little grain is grown.

## GENESEE SILT LOAM

In both its virgin and cultivated state, dry Genesee silt loam consists of dark-brown or dark grayish-brown, mellow friable silt loam, which grades very gradually at a depth of 8 to 10 inches into a somewhat lighter colored material of slightly heavier texture. This is continuous to a depth of 5 feet or more, where it becomes slightly calcareous in places. Under average moisture conditions, this soil is easily cultivated and works into an excellent seed bed.

It is characterized by many textural variations which can not be shown on the map. The surface soil varies in texture from a fine sandy loam to a heavy silty clay loam. In many places on the flood plains of East Fork Little Miami River and Stonelick Creek, as well as along some of the minor creeks, the predominating texture is loam, but these areas have been mapped as Genesee silt loam because of their small extent. Along East Fork Little Miami River, the texture of all of the layers of the soil is modified by gravel, the size of which varies from that of small peas to that of hickory nuts. Small areas of both alluvial and colluvial materials occurring along the streams of the small valleys are included with this soil type. In such places the material adjacent to the stream is usually alluvial and that lying at the base of the valley slope is colluvial, but in many places in the narrowest valleys these two classes of material have become thoroughly mixed. In the flood plain of East Fork Little Miami River there are a number of spots included with Genesee silt loam where the surface soil is sufficiently dark in color to be classed with Wabash silt loam. In such places the material to a depth ranging from 10 to 16 inches is a very dark grayish-brown friable silt loam.

Genesee silt loam occurs on flood plains along all the rivers but the Ohio, along all the creeks and along many of the smaller streams of Clermont County. The surface is flat and the drainage is very poor. The spring rains and the usual overflow keep the soil wet until late in spring, and cultivation is difficult.

Near the streams tree growth consists mostly of willow and sycamore, but on the remainder of the soil the trees are beech, ash, wild cherry, black walnut, and bur oak. Corn is the chief crop, yielding from 30 to 50 bushels an acre, but at times the crop is a total loss because of floods. Wheat, mixed red clover and timothy, and alfalfa are successfully grown.

The value of this land is usually much lower than that of second-bottom land of equal productiveness, because of the loss of crops by floods. However, where this soil is subject to overflow only during extraordinarily high floods, current value ranges from \$100 to \$150 an acre.

Genesee silt loam needs most attention in protecting it from overflow, and in ample tilling. This soil, because of its neutral condition, is well suited for the growing of red clover, alfalfa, and sweet clover.

## GENESEE LOAM

The soil section of dry, virgin Genesee loam shows a layer of dark-brown, friable loam 8 or 10 inches deep, underlain by a brown or dark-brown loam, to depths ranging from 24 to 36 inches.

This rests upon brown, gravelly loam material, which is slightly calcareous. A fine or very fine sandy loam material may occur between depths of 12 and 36 inches, or layers of silt loam material of varying thicknesses. Included with Genesee loam are small areas on narrow valley floors, where the fluvial deposit along the stream and the colluvial material washed from the slopes have become mixed. Most Genesee loam, as mapped, contains patches of Genesee silt loam and fine sandy loam. The soil of cultivated fields, to a depth of 8 inches, is practically the same as that in the virgin state.

The area of Genesee loam is very inextensive, for it occurs only as first-bottom land along Little Miami River and East Fork Little Miami River.

The surface is flat, and the drainage poor. The tree growth is practically the same as that on Genesee silt loam. Corn and hay are the principal crops. Yields are somewhat smaller than are yields on Genesee silt loam.

#### GENESEE FINE SANDY LOAM

When dry and in its virgin state, Genesee fine sandy loam is a dark-brown fine sandy loam to an average depth of 9 inches. Brown fine sandy loam which contains some gravel separates this from the beds of sand and gravel which usually occur at depths ranging from 3 to 6 feet. These beds of sand and gravel are nearer the surface along Little Miami River than elsewhere in the county. An area of Genesee very fine sandy loam occurs at Milford along East Fork Little Miami River. Because of very small extent it was mapped as Genesee fine sandy loam. Genesee fine sandy loam in cultivated fields, is very similar to that in the virgin state.

Soil of this type is rare, occurring only in the flood plains of Little Miami River and along East Fork Little Miami River. The surface is flat and the drainage varies from fair to good.

Probably 20 per cent of Genesee fine sandy loam is under cultivation. The remainder is used mostly for permanent pasture and supports a growth of willow, sycamore, beech, and ash. Corn, hay, potatoes, and truck crops are grown on this soil in the vicinity of Miamiville and Milford.

#### SUMMARY

Clermont County is in the southwestern part of the State of Ohio. It has an area of 465 square miles, or 297,600 acres.

The surface features are deep narrow valleys and level interstream areas. For several miles back from Ohio River and along East Fork Little Miami River, the surface is broken and hilly.

Four State roads and several steam and electric railroad lines afford fairly good transportation facilities to Cincinnati and other points.

The principal crops in Clermont County are corn, tobacco, hay, and wheat. Commercial fruit growing is an important phase of agriculture in the southwestern part of the county.

Cincinnati soils have brown or grayish-brown topsoils underlain by yellowish-brown, and more compact subsoils. These soils have good drainage and are the warmest and earliest of the upland soils.

Rossmoyne soils have grayish-brown, friable topsoils underlain by yellowish-brown subsoils mottled with yellow, brown, and gray. These soils are the most extensively developed in the county. They are moderately productive and are easily tilled.

Clermont soils have gray surface soils underlain by plastic, light-gray or yellowish-brown subsoils strongly mottled with yellow, gray, and brown. These soils are very acid and poorly drained. They are devoted to general farm crops, but the yields are below the average for the county.

Blanchester soils have dark-gray or dark grayish-brown topsoils, from 10 to 14 inches thick, underlain by gray or dark-gray friable subsoils. With adequate drainage, these soils are very productive.

Edenton soils occur in positions intermediate between the Cincinnati and Fairmount soils. To a depth of 2 or 3 feet, they are similar to Cincinnati soils, but below this depth they resemble Fairmount soils. These soils are productive, but are subject to serious erosion. As they contain sufficient lime, they are especially adapted to alfalfa, sweet clover, and other legumes.

Fairmount soils have a brown or yellowish-brown silty clay loam surface soil, and a yellowish-brown, heavy subsoil. These are productive soils, but owing to the steep slopes, sheet erosion, and gullying they are difficult to manage. They are the leading tobacco soils of the county and are well adapted to alfalfa.

Williamsburg soils consist of grayish-brown material to depths which range from 8 to 18 inches, underlain by heavier-textured, yellowish-brown material. These soils are warm, early, and fertile. Because of their lime content they are well adapted to the growing of legumes.

Fox soils have dark grayish-brown surface soils and dark yellowish-brown subsoils. These soils are warm, early, and particularly adapted to truck crops.

Rodman soils occur on the escarpments of terraces. They are not cultivated, but being calcareous they might be used for alfalfa.

Soils of the Wheeling series are characterized by dark grayish-brown topsoils, and brown subsoils. These soils give good yields of general farm crops and are well suited for trucking.

Chilo soils have dark-gray surface soils and gray or mottled, heavy subsoils. The drainage is slow.

Huntington soils have brown to dark-brown topsoils, and brown or yellowish-brown subsoils. They are subject to inundation, and are used for the production of corn and for permanent pasture.

The Genesee series includes soil types having dark-brown or dark grayish-brown surface soils and brown subsoils. They occur on flood plains along streams.

[PUBLIC RESOLUTION—No. 9]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Ohio, shown by shading

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