The Soils of Butler County, Ohio

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The soils of a county are one of its most important assets, for the success or failure of agriculture is dependent upon the character of the soils and under present conditions the importance of a successful agriculture is recognized by everyone. The statistics showing the value of crops produced show that Butler county must have a fertile soil. According to the 1910 census the value of all crops produced in the previous year was in excess of three million of dollars, with a corn crop of over three million bushels. And the figures for the past 60 years show that Butler county ranks fifth in the production of corn in the state or Ohio; a fact that emphasizes the fertility of the soils, for corn is recognized as demanding a rich soil to produce well.

But it is a well understood fact that soils differ greatly in productive power, even within a short distance, and Butler county is no exception, several soil types being found within the county with a wide difference in value and productive ability. It is the purpose of this article to discuss some of these differences and the reasons therefore.

SOILS AND THEIR FORMATION.

In order better to understand these differences in soil a little discussion of soils, and their formation will be given here. In a broad sense we call the mantle of unconsolidated material, which covers the earth and consists of more or less ground up rock material mixed with the remains of plant and animal life, the soil. In a more restricted sense and in common usage the term soil is used to designate the surface few inches, which has been changed in color by the addition of organic matter and by the additional weathering which it has undergone, while the layer below we call the subsoil. In the following discussion the word soil will be used in the somewhat restricted sense. The term soil type includes a consideration of both soil and sub-soil, for the difference in the sub-soil may have as great an influence upon the productive capacity of the soil type as the surface soil, as many men have learned too late when buying land in a country where they were strangers.

The soil is composed of the ground up rock material of varying sized particles. However, it is not merely ground up rock, for in order to be productive it must contain organic matter the remains of plant and animal life. The soil is teeming with organic life, bacteria, in other words, and they play a large part in the fertility of the soils. So we see that the soils have changed greatly from the ground up rock material from which they have been formed.

The soils of Butler county are derived from the ground up material deposited here by the great ice sheet which covered the greater portion of Ohio. Over the greater portion of the county this deposit is so deep that the underlying rock formation has had but little influence on the character of the soil. However, in a few places the glacial deposit has been eroded away and in such places there is a true residual soil formed from the underlying rocks. Along several of the steeper gulleys this is true and a notable instance is found north of Seven Mile.

The material which the glacier brought down was practically all limestone and we find limestone soils as a result. It might be supposed that inasmuch as the material which the glacier brought down was practically the same that there would be but one soil resulting. However, such is not the case; the difference in typography causing differences in drainage and reworking of the soil material by streams has resulted in several distinct soils being formed.

The soils divide naturally into three classes; the glacial uplands, river terrace or second bottoms and the alluvial or first bottom.

GLACIAL UPLANDS.

The glacial uplands which compose the greater part of the county separate into two distinct soil groups within which several distinct types may be found. In this discussion no attempt will be made to discuss in detail the types within these groups but the discussion will be confined mainly to the two main groups. The two groups are called the Miami and Bellefontaine soils by the Bureau of Soils in its classification while they are known locally as the (white clay) and (red clay) soils respectively. The Miami or white clay group probably covers the largest area of any of the soils of the county, although a large part of the area included in this group would not be considered as "white clay" land by the farmers, being more of a gradation between the Miami and Bellefontaine soils and a more productive soil than the true "white clay."

MIAMI SOILS OR "WHITE CLAY."

The Miami soils usually have light gray or yellow gray silty loam surface soils 6 to 12 inches in depth, below that the material becomes heavier and more yellow in color, until a depth of 20 inches is reached when a heavy slightly reddish brown compact clay is encountered. This is usually penetrated before a depth of 30 inches is reached and a lighter textured yellowish material sometimes containing limestone fragments is found. In most cases this lower stratum will give a distinct effervescence when treated with hydrochloric acid, thus showing the presence of lime carbonate. In the more level areas the surface soil is lightest colored and the effervescence with hydrochloric acid is less frequent. On the more rolling areas the soil assumes more of a yellowish color and the hydrochloric acid seldom fails to give effervescence, in the deeper subsoils.

The soil has resulted from the weathering of the ground-up glacial material under conditions of deficient drainage. This has resulted in subjecting these areas to an alternate wet and dry condition which in the absence of lime, it having been leached from the surface, is unfavorable for the accumulation of organic matter.

The most typical development of the white clay is found northwest of Hamilton near McGonigle, although it is found all over this county in the uplands to a greater or less extent.

While this soil is probably the least productive of any in Butler county it is not what would be called a poor soil and under good farming methods produces good crops. In the improvement of this soil thorough underdrainage is the first step and because of the hard compact subsoil the tile drains must be laid relatively close together. The addition of organic matter in large quantities is one of the most important things to do in the improvement of this soil. The addition of lime may be necessary on this soil, even though the soil is derived from the limestone. Of course the use of barnyard manure is essential and it is probable that the use of commercial fertilizers will be profitable, especially on the wheat crop. The soil is not well suited to the growing of alfalfa although it can be grown by the application of large quantities of lime and plentiful use of manure and some carrier of phosphorous, such as acid phosphate, bone meal, or basic slag. Where the topography is more rolling and erosion has taken place the soil is more suited to the growth of alfalfa because of the better drainage and because the erosion has carried away the surface soil which has been depleted of its lime contents.

BELLEFONTAINE SOILS OR "RED CLAY."

The Bellefontaine soils or "red clay" of the glacial uplands is one of the strongest soils of the county and is valued accordingly. It, like the Miami soils, has been formed from the weathering of the ground up limestone material but under better drainage conditions so that oxidation has been more complete. And it is likely that the ground up glacial material contained a larger percentage of limestone than the material from which the white clay soil has been formed. The Bellefontaine soils includes both the silty and clay loam, but the latter greatly predominates. The surface soil is a reddish brown clay or clay loam, fairly pliable when containing the proper water content but sticky and plastic when wet. As the depth increases the material becomes heavier and fragments of limestone are prevalent, so it is difficult to penetrate the soil with an auger. On some of the knolls the soil is underlaid with pure gravel at a depth of 2 feet or more. Where this is true the soil has its brightest reddest color.

The topography of this soil is usually at least rolling and in some cases is very rolling occurring as it does chiefly in moraines and morainic hills.

The soil is stiff and hard to work but is very fertile and produces large crops when carefully handled. It is especially suited to the growth of alfalfa and seems to be naturally adapted to the growing of this crop, as well as all legumes. This is due to the large amount of lime which it contains. The acreage of this soil devoted to alfalfa should be largely increased because of the large returns that could be secured and because of the fact that this would prevent erosion, a feature that causes loss on this soil. Tobacco does well on this soil and the best quality as well as the largest yields are grown on it.

The Bellefontaine soils are found in largest extent in the northern part of the county, although small areas are found scattered all over the county on the slopes.

CLYDE CLAY LOAM, OR "BLACK LAND."

The Clyde clay loam or "black land" as it is locally known is unquestionably the richest corn soil in the county, but the area of this type in the county is so small as to be relatively unimportant. The surface soil of this type consists of a dark colored almost black silty clay loam 8 to 12 inches deep and is very sticky and plastic when wet, but granulates on drying and becomes fairly pliable. As the depth increases the material becomes lighter colored or more of a drab and the texture becomes heavier or a clay instead of a clay loam. Below two feet in depth fragments of limestone are likely to be found.

While no large areas of this soil are found numerous small areas are located throughout the county wherever the topography becomes level or nearly so. The largest area on the upland is on the divide near Pleasant Grove school east of Somerville. Other areas of the "black land" are found in the old glacial valley southeast of Middletown and also in the Milk Creek valley southeast of Hamilton. These areas have the appearance of an alluvial soil from their position in these valleys and they undoubtedly have been affected by the wash from the hills but in the main they are the same except for topographic position as the "black land" upon the high upland. The glacial material was carried into the valley by the glacier and has weathered there under the same conditions as the black land upon the upland except for its having received more or less wash from the higher land above.

The cause of the difference between this soil and the white and red clays of the upland has been the difference in moisture conditions and the amount of lime present. It has been formed under favorable moisture conditions and in the presence of lime a condition favorable for the accumulation of organic matter.

FOX SOILS OR SECOND BOTTOM.

The Fox soil or second bottoms are also known as the red clay or sandy soils by farmers of the county. Except for the difference in topography these soils have a great similarity to the Bellefontaine soils. The soil is usually a reddish brown silty loam 8 to 10 inches deep underlain by a reddish brown plastic clay. At a depth of two feet gravel is usually encountered. The depth of the gravel varies, but in practically the entire area is encountered with a three foot auger. In many cases throughout the second bottom a more sandy soil is found giving a true sandy loam. This is the case in a great deal of the second bottom south of Hamilton. A fact that is taken advantage of by truck growers to produce early crops.

The process of formation of this soil is interesting. During glacial times the flow of water through the Miami Valley was much larger than at present, and the large valley was cut out by the water from the melting glacier and built up by the material washed down. As time went on the flow diminished and the stream flow diminished and the channel was cut down into the valley. That there were several different stages of water during this period is shown by the large number of terraces present; three or four being distinctly evident in places. The material carried by the glacier was largely limestone, so that the outwash was largely ground up limestone material and a rich limestone soil is the result.

This is one of the most desirable soils of the county, although a little inclined to be drouthy especially where it is somewhat sandy. However, this drouthy characteristic is what permits it to dry out so quickly in the spring giving an opportunity for growing early crops such as sweet corn. The second bottom is well suited to the growing of all legumes and especially alfalfa. It is almost an ideal for the growing of this crop, being rich in limestone and the drainage is excellent, since it is underlain with gravel, and alfalfa is not injured readily by drouth as most other crops.

The Fox soils are found along the minor streams of the county as well as in the Miami valley.

FIRST BOTTOM SOILS.

The area of the first bottom soils in Butler county is not large and not of very great importance. The formation of this soil is about the same as that of the terrace soils and simply represents a later terrace that is still subject to overflow. However, the soils are darker colored because the more favorable moisture conditions have caused accumulation of larger quantities of organic matter. Like all first bottom soils there is considerable variation throughout the county, and in some places there is but little difference between it and the second bottom soils. When the weather conditions are favorable this is a very productive soil. It is probable that a large portion of the first bottom soil of Butler county was greatly damaged by the flood of last spring.