

# SOIL SURVEY OF WARREN COUNTY, KENTUCKY.

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## LOCATION AND BOUNDARIES OF THE AREA.

Warren County is situated in the south-central part of Kentucky and is included within the parallels of  $36^{\circ} 48'$  and  $37^{\circ} 11'$  north latitude and the meridians of  $86^{\circ} 10'$  and  $86^{\circ} 42'$  west longitude. The county has an irregular outline, but is approximately hexagonal in shape. It is bounded on the north by Edmonson County, on the northwest by Butler County, on the southwest by Logan County, on the south by Simpson County, and on the east by Allen and Barren counties.

Bowling Green, the county seat, is the largest town of the area,

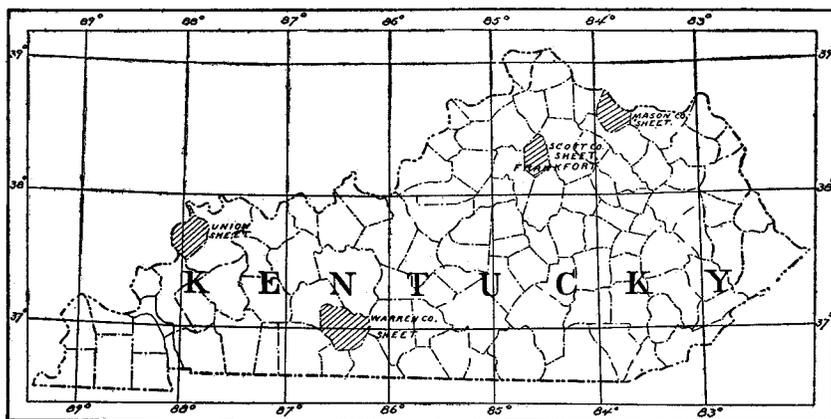


FIG. 21.—Sketch map showing location of the Warren County area, Kentucky.

having a population of about 8,000. Smiths Grove and Woodburn are prosperous hamlets. There are no other villages of any size in the area.

## HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The first settlers of this part of Kentucky were of the daring and restless class of pioneers that found life in the more thickly settled States too confining, and pushed out in this direction to find a new home. These frontiersmen, finding game plentiful, and being en-

gaged in almost constant warfare with the Indians, had up to the time of the Revolutionary war, done little to develop the agricultural resources of the region. The first permanent settlement was made at the present site of Bowling Green, and the historical records of Warren County show that the famous backwoodsman Daniel Boone was one of the early settlers of this region. The increase in population was very slow until the close of the Revolutionary war, after which immigration became more rapid.

In 1796 Warren County, with its present boundaries, was formed from a part of Logan County. Four years later the population of the new county was 4,686. Bowling Green was made the county seat, and in 1810 was incorporated. The greater part of the permanent settlers came from Virginia and North Carolina. They found the northern and western parts of the county well timbered with oak, hickory, red cedar, and other valuable woods, while the whole southern and central part of the county was bare of trees. At first the treeless lands, or "barrens," as they were called, were avoided by the settlers, as it was supposed that the lack of forests was due to some deficiency in the soil. It was soon found, however, that corn and tobacco would yield better in the barrens than in the forested areas, and the former, being more easily brought under cultivation, were quickly taken up by progressive planters.

The course of agricultural development in Warren County has been uneventful since the first settlement. The settlers from Virginia, having grown tobacco before their emigration, took up this industry in their new home with profitable results. Corn and wheat were also grown at an early date. As soon as conditions would permit, the raising of live stock was begun, and this industry has been continued with success ever since.

The conditions which prevailed in this part of Kentucky prior to the civil war were those common to nearly all other southern communities. On the limestone soils of the southern and western parts of the county it was found profitable to employ slaves, but on the thinner soils of the hills it was not found economical to utilize slave labor. After the emancipation of the negroes most of them remained in the limestone areas. In Warren County, therefore, the character of the soil has not only determined the crops grown, but has to a large extent influenced the social life and political affiliations of the inhabitants.

#### CLIMATE.

The appended table, compiled from the records of the Weather Bureau, shows the normal monthly and annual temperature and precipitation for Bowling Green, near the center of Warren County, and Franklin, 5 miles south of the Warren County line. The figures for

the two points differ but little, and may be taken to represent conditions throughout the area. It will be seen that the county has a temperate climate with abundant rainfall for the year, though droughts may occur during the months of September and October.

*Normal monthly and annual temperature and precipitation.*

Month.	Bowling Green.		Franklin.		Month.	Bowling Green.		Franklin.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	Inches.	°F.	Inches.		°F.	Inches.	°F.	Inches.
January.....	36.8	4.68	38.2	3.92	August.....	79.6	3.61	76.7	3.45
February...	37.2	4.35	38.4	4.58	September..	71.6	2.91	71.1	3.17
March.....	47.8	5.34	48.3	5.90	October....	58.9	2.02	58.9	1.83
April.....	58.4	4.19	60.1	4.49	November..	46.8	4.19	48.0	4.16
May.....	67.6	4.27	67.1	4.14	December..	37.9	3.99	40.6	4.06
June.....	76.1	3.77	75.1	3.76	Year....	58.2	47.49	58.4	47.46
July.....	79.4	4.17	77.8	4.00					

PHYSIOGRAPHY AND GEOLOGY.

Warren County occupies part of a great plateau extending over central and southern Kentucky and a large part of Tennessee, and known as the Highland Rim. The approximate range in elevation of this county is from 500 to 750 feet above sea level, the land having a general slope toward the northwest, though some of the highest hills are in the northern part of the county.

The area is drained entirely by the Green River and its tributaries, and the present configuration of the country has been brought about by the comparatively rapid erosion of these streams. Green River forms the northern boundary of the county, flowing westward and finally northward to the Ohio, while Big Barren River, its largest tributary, nearly bisects the county, forming a junction with Green River in the northwest corner. Both streams have a remarkable depth in proportion to their width. Green River is navigable along the whole of its course bordering the county, and Big Barren River as far up as Bowling Green. The banks of both streams are generally high, so that only occasional dams are needed to give an ample depth of water.

Along a large part of the course of these streams rocky hills and cliffs stand up to a height of 150 feet or more above the level of the river, and are a marked feature of the landscape. When such rock outcrops cover sufficient areas to be of importance they have been indicated as Rough stony land.

In places the valleys widen out, and at a height of 10 to 50 feet above the river level are found deposits of alluvial material laid down by the stream in time of flood. Such river bottoms have been mapped

as Clarksville loam. Stretching away from the low and comparatively level tracts are the uplands, first gently undulating, then becoming more hilly as the distance from the river increases. The soils which cover this character of topography are silty and clay loams underlain by red clay, and are referred to in this report as the Clarksville clay loam and the Clarksville silt loam. In the northern and western parts of the county these rolling plains terminate in bluffs of limestone capped with sandstone. The summits of these hills are nearly flat. The soil derived from the disintegration of the sandstone is called the Dekalb silt loam.

The limestone, which everywhere underlies Warren County at a greater or less depth, belongs with the St. Louis group of the Subcarboniferous. It consists of a massive limestone varying in color from a creamy white to a dark drab. It is sometimes crystalline, and nearly everywhere highly fossiliferous. There are strata of some thickness having an oolitic structure. The limestone weathers rapidly to a red or gray soil, depending on the relative amounts of siliceous material that enter into its composition. The concretionary stone in some places produces a heavy brown clay, but such strata are not usually of sufficient thickness to influence any large extent of the surface soil.

Sink holes, characteristic of nearly all limestone countries, are abundant in Warren County and have had a marked effect upon the landscape, as they form many of the inequalities of the surface of the limestone areas. These sinks are rounded depressions, which owe their origin to the dissolution and removal of the limestone by percolating waters, and the subsequent sinking of the overlying material into the cavity produced. This process usually goes on so gradually that the sinks assume their rounded contours at the time of their formation. They vary in diameter from a few feet to more than 300 feet. Water is often found in the bottoms of these sinks, and in some places the ponds do not fail during the longest droughts. A number of caverns lead away from the sinks, but very few have been explored.

The sandstone from which the Dekalb silt loam is derived is of the Chester group of the Subcarboniferous. It is a fine-grained sandstone, and often has a shaly structure. In color it ranges from gray to light brown.

Above the sandstone occurs the representative of the conglomerate which is so widely distributed under the Coal Measures. It has a thickness of only a few feet in this locality, and does not influence the texture of the surface soil.

The Coal Measures have a slight exposure in several small areas, and coal mines have been worked on a small scale in the northern part of the county. Aside from the fact that the shale and stone frag-

ments are more abundant in the vicinity of these outcrops, there is no marked difference in the soils.

The mineral resources of Warren County, though not great, exert some influence on the prosperity of the agricultural classes. The chief mineral products are building stone, coal, and asphalt. The St. Louis limestone develops in places the qualities of an excellent building stone, and the material may be secured ready for use at a cost but little greater than that of brick. The tougher parts of the stone may be used for paving. Very ornamental and substantial fences may be constructed of the rough stone at a reasonable cost. The most important use to which the limestone has been put is in the construction of good roads. The 150 miles of excellent pike in the county are due to the cheapness with which macadamized roads can be constructed of the rock available at the roadside. Even where the stone is simply broken and scattered over the road it packs and wears into a fairly smooth and compact roadbed.

## SOILS.

The soils of Warren County have been classified into five distinct types. The following table shows the actual and relative extent of each type:

*Areas of different soils.*

Soil.	Acres.	Per cent.
Clarksville silt loam .....	232,832	68.0
Dekalb silt loam .....	89,408	26.3
Clarksville clay loam .....	9,408	2.8
Clarksville loam .....	7,552	2.2
Rough stony land .....	2,176	.7
Total.....	341,376	.....

## CLARKSVILLE SILT LOAM.

The Clarksville silt loam, by reason of its large area and its agricultural value, is the most important soil type of Warren County. It comprises 232,832 acres, or 68 per cent of the total area of the county.

The soil, to an average depth of 10 inches, consists of a whitish-gray silty loam. When wet it is loamy, and if plowed when too wet it clods slightly, but after drying the clods are easily broken down into a floury white powder. The subsoil is a red clay loam containing a large percentage of silt and having a compact structure. Immediately beneath the soil it is yellowish red, but the color quickly grades into red. At about 3 feet the color usually becomes a deeper red, and the texture has a waxy character. Occasional chert nodules or masses of quartz that have resisted weathering are found in the

subsoil and in places strewn over the surface, but there is no uniformity in the occurrence or in the amount of these materials. The top soil is, as a rule, thinner near Big Barren River about Bowling Green, where it grades in places into the Clarksville clay loam. In the more hilly portions the soil becomes deeper, and over small areas may attain a depth of 18 inches or more.

The Clarksville silt loam occupies an extensive area in the southern and southeastern parts of the county. In the southern part the soil is more uniform and the area is almost unbroken, but as one proceeds northward the area is broken by stream valleys, and by hills capped with sandstone, which give rise to other soil types. The soil is everywhere marked by more or less stone, but the outcrops and stone fragments are more plentiful in the valleys where the limestone under the sandstone has been exposed by erosion.

The topography of this type varies from the gently undulating country near the center of the county to the more rolling hills in the northern part of the county. The hills usually have a gentle slope that permits cultivation to the summits. The sink holes are numerous in this type of soil, and to them is due much of the inequality in the surface.

The Clarksville silt loam is of purely residual origin, having been derived from the St. Louis limestone by a process of weathering in which the carbonated waters have dissolved and carried away the calcium carbonate of the limestone and left behind the siliceous and other less soluble constituents. Where this process has gone on undisturbed the proportion of insoluble material present in the original rock has determined the present depth of the top soil. The thin belt of highly crystalline limestone has left a heavy soil with little sandy or silty top soil, but such areas are of limited extent and unimportant from an agricultural standpoint.

This type of soil has been in general cultivation for about one hundred years, and much of it is now spoken of as worn-out and exhausted. The present productiveness depends on the character of the cultivation to which it has been subjected and to the care which has been taken to maintain the crop-producing power of the land. In recent years more attention has been paid to the restorative systems of farming, and many of the old farms that a few years ago were considered worthless have regained their former value. The Clarksville silt loam is naturally a strong soil, and should stand an almost indefinite period of the proper kind of farming without any deterioration. Crop rotations are practiced to some extent, but usually in a haphazard manner. The farmers should adopt some systematic rotation that by experiment has proved to be best suited to this type of soil.

Tobacco is the money crop on this soil. The yield is on an average

about 800 pounds per acre, though good crops may run to 1,200 pounds or more per acre. A good yield of corn is from 30 to 40 bushels per acre. Wheat and oats are grown to some extent. The yield of wheat is about 25 bushels for average years. Timothy and clover are grown to some extent for hay. This soil is not adapted to bluegrass, but there are valuable native grasses to furnish pasture for the horses and cattle raised on nearly every farm.

The following table gives the results of mechanical analyses of the fine earth of typical samples of the Clarksville silt loam:

*Mechanical analyses of Clarksville silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
11660	1 mile E. of Green Hill.	Loose silt, 0 to 8 inches.	0.1	1.0	0.4	2.4	5.9	78.1	12.1
12190	1 mile S. of Bristow	Gray silty loam, 0 to 10 inches.	.3	1.4	1.5	4.5	3.8	67.6	20.6
11661	Subsoil of 11660	Silty clay, 8 to 36 inches.	.4	.5	.1	1.6	3.9	68.2	25.2
12191	Subsoil of 12190	Red silty clay, 10 to 36 inches.	.4	1.4	.7	5.5	2.0	59.5	30.0

CLARKSVILLE CLAY LOAM.

The Clarksville clay loam consists of a heavy red silty loam, with an average depth of 8 inches, underlain by a heavy red clay. The soil contains almost as much silt as the soil of the Clarksville silt loam, but the percentage of clay is greater and the percentage of sand is less. This proportion gives a soil of more plasticity, which forms into clods more readily when plowed wet. The subsoil is tenacious and even waxy in places. It becomes heavier with depth to 3 feet, where the finest texture is attained, and no further increase in heaviness takes place before the unweathered rock is reached. The influence of this heavy subsoil is the principal reason for classing this soil with the clay loams, instead of with the silt loams.

The largest areas in which this type of soil is well developed are an area lying south of Bowling Green and including a part of the town, and a long, irregular strip beginning about 3 miles northeast of Bowling Green. There are a number of small patches of the type scattered throughout the Clarksville silt loam areas, but they are not representative of the type, being due to the rapid erosion of hillsides and the partial weathering of the exposed clay.

The typical development of this soil occurs on the more level portion of the ridges of the Big Barren Valley, formerly known as the "Barrens," on account of the lack of timber growth when first discovered by the pioneers. In some areas south of Warren County difficulty is experienced in securing proper drainage for this type of soil, but here the country is sufficiently rolling to insure adequate drainage in the rainy seasons.

The Clarksville clay loam has the same origin as the Clarksville silt loam—namely, it has been derived from the weathering of the St. Louis limestone. The difference in texture of the two soils may be due to a difference in the amounts of siliceous material in the original rock.

This is considered the best soil of the area for general farming. The principal crops are wheat, clover and the grasses, and corn. The heavy soil is especially adapted to the production of wheat and clover, but tobacco does not attain so fine a quality as on the Clarksville silt loam. Some of the finest farms of the county are to be seen on the Clarksville clay loam, which, on account of its adaptation to grass, is highly esteemed for cattle raising.

The following table gives the result of mechanical analyses of typical samples of the Clarksville clay loam:

*Mechanical analyses of Clarksville clay loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
12186	¼ mile W. of Bristow.	Red silty loam, 0 to 8 inches.	0.1	0.6	0.6	2.0	1.0	74.3	20.7
12188	1 mile NE. of Bristow.	Red heavy silt loam, 0 to 8 inches.	.3	1.2	1.2	7.9	2.7	62.9	23.4
12187	Subsoil of 12186 .....	Red heavy clay, 8 to 36 inches.	.6	1.2	.8	3.3	1.2	53.4	39.4
12189	Subsoil of 12188 .....	Red heavy clay, 8 to 36 inches.	.5	1.0	.9	7.2	2.3	45.8	41.7

CLARKSVILLE LOAM.

The Clarksville loam is the only sedimentary type of the area. The soil, to an average depth of 18 inches, is a dark-brown silty clay, containing more than 65 per cent of silt and nearly 30 per cent of clay. Although the proportion of sands of all grades is very small.

the soil is granular and friable, which gives it some of the characteristics of a fine sandy loam. The subsoil, in places extending to a depth of 30 feet or more, is lighter in color than the soil, but there is no difference in texture between soil and subsoil. The areas of this type of soil are remarkably uniform, the only variations occurring where sand bars have been deposited near the streams.

The larger areas of the Clarksville loam are found as narrow strips in the bends of Green and Big Barren rivers, but all the smaller streams have more or less extensive alluvial deposits, and on Drake and Gasper creeks the bottom lands are of sufficient size to be shown in the map. The width of the areas varies greatly. In some places the hills rise abruptly from the water's edge; in other places the bottoms widen out to one-half mile or more.

The areas of Clarksville loam have an elevation of from 10 to 50 feet above the level of the rivers. They are terracelike and gently undulating, and there are no areas of perfectly level land more than a few acres in extent. The bottoms merge so gradually into the upland areas that it is difficult in places to define the exact boundaries of the alluvial deposit. The drainage is usually adequate in seasons of ordinary rainfall. In times of flood the lower bottoms are subject to overflow, and about once in five years the overflows result in damage to the crops over perhaps one-third of the bottom lands.

The Clarksville loam is plainly an alluvial deposit laid down during these floods. The deposits along the Big Barren River must have been derived largely from the limestone soils, and those along Green River from the sandstone, but there is no difference in texture to indicate this. This is due, perhaps, to the fact that all the materials in suspension in the flood waters were fine and there was no assorting of the different soil grains by currents of varying velocity. As a general rule, the soils along Big Barren River are more productive than those along Green River.

The Clarksville loam is considered the most desirable land in the county for the production of corn and grasses. The average yield of corn is from 25 to 40 bushels per acre, but 65 bushels per acre are secured on the better portions of this soil. Grasses are grown both for pasture and hay. Wheat is not grown to any great extent on the bottom lands. The quality of the tobacco grown on this type of soil is not good, and very little is produced. The Clarksville loam is so valuable for farming purposes that practically none of it is now in forest.

The following table shows the results of mechanical analyses of the soil and subsoil of the Clarksville loam:

*Mechanical analyses of Clarksville loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005	Clay, 0.005 to 0
			mm.	mm.	0.25 mm.	mm.	0.05 mm.	mm.	
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
12178	2 miles N. of Bowling Green.	Brown silty clay, 0 to 18 inches.	0.0	0.0	0.2	3.3	4.3	64.5	27.3
12180	1 mile N. of Riverside.	Brown silty clay, 0 to 20 inches.	.0	.0	Tr.	.5	2.3	67.6	29.4
12182	2 miles NW. of Riverside.	Brown silty clay, 0 to 18 inches.	.0	.2	.1	.4	.8	67.4	30.5
12183	Subsoil of 12182 .....	Brown silty clay, 18 to 36 inches.	.0	.0	.1	.2	.6	68.9	29.8
12179	Subsoil of 12178 .....	Brown silty clay, 18 to 36 inches.	.0	.2	.3	1.5	2.3	64.2	30.9
12181	Subsoil of 12180 .....	Brown silty clay, 20 to 36 inches.	.0	Tr.	.2	.7	1.4	61.4	35.8

DEKALB SILT LOAM.

The soil of the Dekalb silt loam, to a depth of 14 inches, is a whitish-gray silty loam. The silt content ranges from 55 to 75 per cent, and there is usually from 10 to 20 per cent of fine and very fine sand, and about the same proportion of clay. The subsoil is a silty loam carrying a larger percentage of clay than the top soil. This material may range in depth from a few feet to 20 feet, or until the bed-rock sandstone is encountered. In color the subsoil is a yellow or light brown, passing in places into a light red.

The Dekalb silt loam occupies a large, irregular area in the northern and western parts of Warren County, and several smaller areas at the summits of hills and ridges where it has not been removed by erosion.

The type is derived from the Chester sandstone, which immediately overlies the St. Louis limestone. It occurs as a cap of varying thickness over the plateaulike hills that rise above the more level limestone areas, and as a thin covering over a number of hills that rise above the general level in the northern part of the limestone outcrop.

Around the borders of the Dekalb silt loam areas the land is rough and stony, due to the rapid erosion of the limestone under the sandstone. When the top of the table-land is reached, however, the land is more level, and while erosion has gone on extensively near the streams, there are considerable areas of level land. Drainage is every-

where good on this type of soil, and owing to this fact and to the pervious nature of the soil, crops are likely to suffer from drought. It is very seldom that crops on this soil escape completely from the injurious effects of dry weather.

The crops which thrive best on the Dekalb silt loam are corn, tobacco, and oats. Corn yields well when there is sufficient rainfall, but this occurs only about once in three years. The tobacco produced has a slightly better reputation in the local markets than that grown on the heavier soils of the county. The yield is from 600 to 1,000 pounds per acre, with an average from year to year of about 750 pounds per acre. The few apple orchards on this soil produce fruit of good appearance and splendid keeping qualities. It should be profitable to grow apples on a commercial scale, though at present they are grown only for home use and to supply a small local demand.

The Dekalb silt loam is undoubtedly a strong soil, and with favorable climatic conditions should be very productive, but with the amount of rainfall in this region the greatest care must be exercised to counteract as far as possible the effects of drought. The whole system of farming should be directed to conserving the moisture supply of the soil so as to sustain the crop during the short droughts that are likely to occur through the growing season.

The following table gives the results of mechanical analyses of the fine-earth portion of the soil and subsoil of this type:

*Mechanical analyses of Dekalb silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1	Coarse sand, 1 to 0.5	Medium sand, 0.5 to	Fine sand, 0.25 to 0.1	Very fine sand, 0.1 to	Silt, 0.05 to 0.005	Clay, 0.005 to 0
			mm.	mm.	0.25 mm.	mm.	0.05 mm.	mm.	
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
11662	1 mile N. of Sandhill.	White silty loam, 0 to 10 inches.	0.3	1.5	0.6	4.6	8.9	72.1	11.7
12198	1 mile N. of Richardsville.	Gray silty loam, 0 to 16 inches.	.8	1.5	.6	9.9	9.5	55.9	21.5
11663	Subsoil of 11662.....	Yellow silty loam, 10 to 36 inches.	.2	.7	.7	6.4	13.2	61.1	17.2
12199	Subsoil of 12198.....	Yellow silty loam, 16 to 36 inches.	1.5	2.2	.8	9.3	7.6	53.5	25.0

ROUGH STONY LAND.

The term "Rough stony land" has been applied to narrow strips of hillside which are so covered by loose stones as to be unfit for cultivation. Such areas occur along the larger streams where the current has cut rapidly back into the hillside, or along the contact

between the St. Louis and the Chester formations. In both cases the surface exposures are of the St. Louis limestone.

The thin soil is usually a gray silty loam, underlain by a red clay loam, and is similar to the Clarksville silt loam. Very little of the stony land is under cultivation, owing to the difficulties of tillage. The extensive area uncultivated is not entirely worthless, since the greater part makes a fair pasture when cleared, and where it is allowed to grow up a valuable growth of cedar covers the hills to their summits.

#### AGRICULTURAL CONDITIONS.

The chief interests of Warren County have from the time of the earliest settlements been centered in agriculture, and uniform success has attended the enterprise of the farmers.

The dwellings are, as a rule, well-constructed frame buildings. Some old mansions are seen in the county, as is usually the case where the long tenure of land prevails. Farms change hands less frequently than in the more recently settled communities, and land is seldom bought by persons living in other counties and States, though the county has many advantages in the way of climate and cheap farming lands. The farm buildings are ample for the needs of the agriculture practiced. Large barns are not needed where the climate is not severe enough to necessitate the housing of cattle during the winter. Large tobacco barns are also unnecessary, as no artificial heat is required in the curing of the type of tobacco produced in this part of Kentucky.

The farms are well fenced with barbed or woven wire. The posts used are of the red cedar, which grows so plentifully in the limestone areas. Stone fences built of the square blocks of limestone are sometimes seen, and add much to the appearance of the farm. The cheapness with which these fences can be built should make them more common, especially about the dwellings and barns.

The machinery used in the farm operations is up-to-date and the best that can be applied to this character of country. Mowing machines and binders are seen on nearly every farm, and corn harvesters and shredders are being introduced.

The system of general farming and cattle raising practiced in Warren County makes it necessary that the owner of the soil should live on it, so that the tenant system does not prevail here as in some parts of the South. About three-fourths of the farmers own the land they cultivate, and less than 20 per cent are share tenants. Incumbrances in the form of debts and mortgages are very light. The price of land ranges from \$3 to \$50 an acre. The rocky land is almost worthless, except for the timber, while the most valuable

land is found in the level areas of clay loam near Bowling Green. The average value for all land, exclusive of buildings and other fixed improvements, is about \$13 an acre.

There has not been a rapid subdivision of farms as a result of an influx of new settlers, but in some parts of the county there has been a gradual breaking up of the large estates. By the census of 1900 the average size of farms in Warren County was 98.6 acres, a decrease from the average of 116 acres in 1890. The number of farms containing from 100 to 500 acres had remained about constant during the decade, but the larger holdings had been subdivided. This subdivision can go on for some time yet before there will arise any scarcity of land. It has long been the custom, however, for the surplus farming population to go west or south, where land is cheap and abundant, rather than attempt to farm on smaller places.

Both white and colored laborers may be secured for work on the farms. The colored population is confined to the southern and central portions of the county. While very few laborers are hired by the year, or even by the month, there are times, as in the planting and harvesting seasons, when the farmer must have help, so that the aggregate labor bill is no small item, amounting to more than \$100,000 per annum for the county. The laborers are of sufficient intelligence and skill to perform the class of work required. Labor is naturally becoming scarcer and higher in price as the manufacturing interests of the community are developed. There is a growing tendency, especially among the colored laborers, to flock into the towns, where higher wages and more congenial surroundings may be found.

The most important products of the soil are corn, tobacco, hay, and wheat, ranking in value in the order named. Of these only corn and tobacco leave the farms in the raw form. The 70,000 bushels of wheat grown are not sufficient to supply the needs of the county. All of the hay and nearly all of the corn is fed to live stock and sold in the form of hogs, beef cattle, and horses. The hay and forage crops are of much importance. Clover is the chief leguminous crop grown for hay, and the total yield is about 2,500 tons, or an average of nearly 1 ton to the acre planted. Other tame and cultivated grasses bring the hay product of the county to a total of about 6,200 tons. The greater part of the grass lands, however, is devoted to pasture. Sorghum is being more widely grown every year as feed. Some 30,000 gallons of sorghum sirup are also made in the county each year.

Warren County is outside of the export tobacco belt, and the tobacco grown is for domestic consumption. All of the product is

air cured in the simplest manner. The leaves are cut, strung on horizontal bars, and suspended in ventilated sheds to allow free circulation of the air. By this process the natural aroma of the leaf is preserved and no foreign flavors are added. The entire crop, which ranges from 1,500,000 to 2,000,000 pounds annually, is sold to the local dealers and manufacturers of Bowling Green. The tobacco bought by the dealers, amounting to about three-fourths of the crop, is shipped to Louisville, where it is manufactured into smoking and chewing tobacco. There are three local manufacturing establishments, which use the remainder of the crop. Two of them make twist and smoking tobacco of excellent reputation, while the third makes a cheap grade of cigars.

Notwithstanding the simple manner in which the tobacco is grown and cured, it has not proved a remunerative crop, and the acreage is decreasing each year. There are now few farmers that put out more than 4 or 5 acres each. The price obtained for this kind of tobacco ranges from  $2\frac{1}{2}$  to 6 cents a pound, and the average price is about 5 cents. When buying from the farmer the dealer does not grade the tobacco, but the market price is paid for the whole. Exceptions are made in the case of very fine lots, which may bring a fancy price.

There is so little specialization in the farming of this area that the adaptation of soils to crops has not been a subject of careful study on the part of the farmer. Corn and wheat are grown to a greater or less extent on every soil type. Tobacco is a crop usually quite dependent on the texture of the soil, but here it is not confined to any certain type of soil. Local variations of topography and accumulations of organic matter are considered of more importance than general textural differences. The newly cleared beech lands are supposed to produce a sweeter tobacco than the lands that have been under cultivation for a long period. This advantage, however, is only maintained for two or three years, and as the original "beech land" is so limited in extent, the amount of this tobacco is small, and it brings no more in the market than the bulk of the crop. There is some difference in the yield of tobacco on the several types of soil. The Clarksville silt loam and the Clarksville clay loam produce more heavily than the lighter Dekalb silt loam. From 700 to 1,000 pounds per acre is considered a good yield on the heavier soils, and as much as 1,200 pounds has been produced on the heavier soils where special attention was given the crop, while the yield on the lighter soils about Richlandville seldom exceeds 600 pounds per acre. The average yield for the county on all types of soil is about 800 pounds per acre.

Railroad transportation is furnished by the Louisville and Nashville Railroad. Bowling Green is on the main line, which runs from

Louisville southward, while the Memphis branch leaves the main line near the center of the county. The shipping by river is of considerable importance. Boats and scows of good size can be brought up to Bowling Green, and much of the timber, asphalt, and coal shipped to or from Bowling Green is carried by water.

The county is abundantly provided with good roads. More than 150 miles of pike have been improved with rock, making a road system that has few equals in the country. On account of the cheap and easily procured stone the cost of constructing these roads has been comparatively low. The main roads leading out from Bowling Green have been well graded and macadamized, and the less traveled roads have been treated in the worst places, so that a piece of really bad road is hardly to be found in the county.

Bowling Green is the natural market for the farm products of the county, and the good roads enable the farmers to come from all parts of the county to market their produce and make their purchases. Among the industries of Bowling Green are three tobacco manufacturing plants and a cannery. These depend upon the farmers for their raw material. There are also railroad shops, foundries, and machine shops. Bowling Green has long been noted as a market for horses and mules, and there are a number of feed and sale stables to meet the demands of this trade. Large shipments of mules are made to the plantations farther south, and horses, especially saddle horses, are shipped to all parts of the country.

With a productive soil, agreeable climate, and these facilities for marketing his produce, there is no reason why the farmer of Warren County should not enjoy a long period of prosperity.

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