

# SOIL SURVEY OF MONTGOMERY COUNTY, TENNESSEE.

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## INTRODUCTION.

Montgomery County is the center of the famous Clarksville tobacco district, which includes, besides Montgomery County, Robertson, Stewart, Cheatham, and Dickson counties in Tennessee and Christian, Todd, Trigg, and Logan counties in Kentucky. In Tennessee the most important county in the district is Montgomery, producing, in 1879, 8,266,461 pounds, and in 1889, 9,331,200 pounds of the total crop, all of which passed through the hands of the Clarksville tobacco board of trade. The product is wholly an export variety, and is mainly consigned to Germany, Austria, Italy, Spain and England. Little, if any, of the crop is consumed in this county.

It is to be regretted that it was not possible to secure a recent map to form the base of this soil map, but the only existing map of Montgomery County was made in 1877, and, while this was no doubt accu-

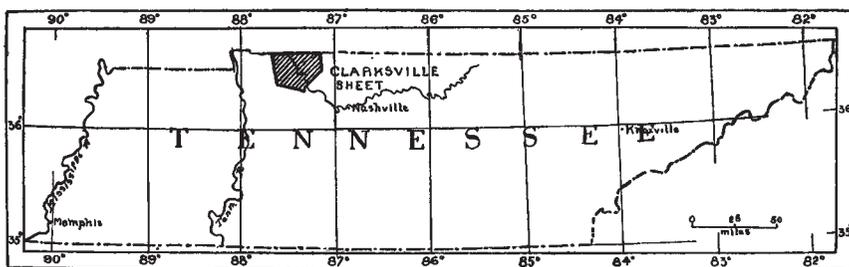


FIG. 10.—Sketch map showing area surveyed in Tennessee.

rate at the time it was made, in the twenty-five years which have elapsed since its publication many changes have taken place, particularly in the case of private roads. It was not possible in the limits of this survey to make corrections, as this would have required a very general resurvey.

## LOCATION AND BOUNDARIES OF THE AREA.

Montgomery County is located in the extreme northern part of Tennessee, in the western half of the State. Its nearest approach to the Mississippi River is about 90 miles. It lies between  $36^{\circ} 18'$  and  $36^{\circ} 35'$  north latitude, and  $87^{\circ} 7'$  and  $87^{\circ} 38'$  west longitude. It is thus on a line directly south of the southern end of Lake Michigan, and about 380 miles from Chicago. (See fig. 10.)

The county is situated upon the highlands of middle Tennessee. It is bounded on the northwest by Christian and Todd counties, Ky., on the east by Robertson County, on the southeast by Cheatham County, on the south by Dickson and Houston counties, and on the west by Stewart County.

The total area of the county is 350,210 acres, or about 547 square miles.

#### HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The history of Montgomery County began with the formation of the State of Franklin in 1784. In that year James Spencer, hunter, trapper, and settler, entered the Cumberland River region. He was closely followed by John Montgomery and Martin Armstrong, who bought land and laid out the town of Clarksville. Most of the earlier settlements in the county were made on the Red River.

Tennessee was admitted into the Union in 1796, and in the same year Montgomery County was organized. The population of middle Tennessee was then sparse, and the agriculture was limited mainly to the growing of corn and the culture of flax for home use. Wheat was then little known as a farm crop. Tobacco was grown to a small extent from the earliest settlement of the country, but did not become a staple crop until 1810. By 1820, 7,000 hogsheads were annually sent down the Mississippi River to New Orleans.

In 1840 the quantity of tobacco grown in Montgomery County had reached 2,549,484 pounds, placing that county fourth among the counties of the State in the production of the crop. About 1834, dealers began to build factories in Clarksville and to buy leaf tobacco. In 1840 there were several establishments for the stemming and preparation of tobacco for the English market. Much of the crop, however, was then pressed and shipped down the Mississippi River to New Orleans. In 1845 warehouses were erected in Clarksville, and the system of inspection and prizing was begun. In that year 900 hogsheads were sold. With the exception of Louisville, Clarksville opened the first inspection warehouse in the West. From 1850 to 1860 the trade increased, and receipts at Clarksville were from 7,000 to 8,000 hogsheads annually.

Following the termination of the civil war agriculture advanced slowly for a time, but progress along this line later became so satisfactory that between 1870 and 1880 the number of farms (averaging 133 acres each) had increased 40 per cent, and over 50 per cent of these were worked by their owners. At present the average indebtedness of the Montgomery County farmer is only 5 per cent of his assessed valuation.

In 1889 the production of corn reached 1,195,160 bushels, with an average yield to the acre of 25.36 bushels. The acreage of wheat for

the same year was 11,373 acres, the yield being 11.66 bushels to the acre. The acreage of tobacco increased from 11,591 in 1879 to 12,541 in 1889, with the yield per acre in the latter year averaging 744 pounds.

CLIMATE.

The normal annual temperature at Clarksville is given by the Weather Bureau as 58.7°, while the normal annual rainfall is 47.9 inches. The following table shows the normal monthly temperature and precipitation:

*Normal monthly and annual temperature and precipitation for Montgomery County, Tenn.*

Month.	Clarksville.		Month.	Clarksville.	
	Temper- ature.	Precipi- tation.		Temper- ature.	Precipi- tation.
	° F.	Inches.		° F.	Inches.
January .....	37.8	4.33	August.....	76.8	3.35
February .....	40.8	4.36	September .....	70.6	2.83
March .....	48.7	5.20	October .....	59.8	2.50
April .....	59.5	4.82	November .....	47.8	4.31
May .....	67.4	3.81	December.....	40.8	4.32
June.....	75.4	4.24	Mean annual .....	58.7	47.90
July .....	78.3	3.83			

From the above table it appears that the average temperature for the seasons is as follows: Spring, 58.5°; summer, 76.8°; autumn, 59.4°; winter, 39.8°. The precipitation is pretty well distributed through the year, being somewhat heavier during the months from November to April, inclusive, with the greatest rainfall in March. The snowfall amounts to between 4 and 5 inches. The practice exists among the more thrifty class of farmers of storing ice in the winter season, a crop of about 2 inches in thickness being the average.

From the following table it is seen that the average number of days free from killing frosts, during the five years enumerated, is 211.

*Dates of killing frosts.*

Year.	Clarksville.		Year.	Clarksville.	
	Last in spring.	First in fall.		Last in spring.	First in fall.
1896.....	Apr. 4	Oct. 18	1899.....	Apr. 9	Nov. 4
1897.....	Mar. 28	Nov. 5	1900.....	Apr. 1	Nov. 9
1898.....	Apr. 8	Oct. 27			

PHYSIOGRAPHY AND GEOLOGY.

The Highland Rim, one of the principal topographical features of Tennessee, once covered nearly the whole State as an extensive plateau. Out of this the central basin, measuring about 70 miles in

width by 100 miles in length, has been eroded. These highlands now form a rim about the central basin and extend from the southern boundary of the State northward as a belt 50 miles wide, bordered on the east by the Cumberland table-land. Bending to the west near the Kentucky line, the rim reaches the Tennessee River, whence it turns southward to the Alabama line. Its western exposure has an average width of about 40 miles, while across the northern part of the State its width is variable, ranging from 15 to 35 miles.

The entire area of the Highland Rim is approximately 9,300 square miles, of which 5,000 square miles lie west of the basin. In the northern part of the rim are situated Stewart, Montgomery, Robertson, Macon, Pickett, and portions of Clay, Sumner, and Cheatham counties. The average elevation of this rim in Montgomery County is 500 feet, and the general slope and direction of drainage is to the southwest.

The topography of the country near the Cumberland and Red rivers is hilly and broken. The slopes of the hills are generally long and smoothly rounded, precipitous bluffs appearing only along the streams. A few miles back the hills sometimes reach an elevation of 200 or 300 feet above the river, though a remarkably even sky line is maintained. In the southwestern part of the county the hills become more "choppy" and abrupt in outline, and between the small streams they rise by successive gradations sometimes to the height of 200 feet. North of the Cumberland River the country gradually rises and the hills become softer in outline, until at St. Bethlehem a comparatively level country called the "barrens" is reached. The gently undulating contour of this country is maintained to the Kentucky line.

The Cumberland River has its source in eastern Kentucky, flows southwestward to Nashville, and thence in a general northwesterly direction out of the State and into Kentucky, emptying its waters into the Ohio River about 60 miles from its junction with the Mississippi. It enters Montgomery County on the southwest, at the Cheatham County line, flowing northwesterly to Clarksville, where it makes a sharp turn to the southwest, continuing in this direction to Stewart County. Its length in Montgomery County is about 30 miles, and it divides the county into two unequal parts, the area lying north of the river being the larger. The Cumberland is navigable for about 500 miles of its length. Its average width is 150 yards at mean water level. Limestone bluffs, rising to a height of 100 to 150 feet above the river, are not uncommonly seen; and always upon one side of it, rarely upon both at the same point, extends a wide, rich alluvial bottom, fringed with sycamores. These bottoms are built up from 30 to 50 feet above minimum water level.

The main tributary of the Cumberland River, in Montgomery County, is the Red River, a stream rising some 50 miles to the east

and having its mouth immediately below Clarksville. This stream is about 40 yards wide and is characterized by its winding course and generally high, precipitous banks. In flood time it carries a considerable quantity of water. It is not navigable. Along it are situated several thousand acres of rich alluvial soil.

The county is also well watered and drained by numerous smaller streams and creeks, chief among which are the North and West forks of Red River, and Blooming Grove, Yellow, Bartons, and McAdoo creeks.

The underlying rock formation of the county, from its similarity to that in the vicinity of St. Louis, Mo., is called the St. Louis group of the Subcarboniferous period, and is a siliceous limestone containing many fossils. The limestone strata are very nearly in horizontal planes, and show no evidences of having been disturbed by igneous or other agencies since they were laid down on the ocean's floor. In the southwestern part of the county, along Bartons Creek, slight tilting is noticeable, and here, and along the east bank of the Cumberland in this locality, the limestone presents a more shaly appearance. The rock is a bluish-gray limestone, from which a good quality of cement is manufactured. Overlying the bluish crinoidal limestone is a grayish-white stratum having a more crystalline structure and slightly banded with dark-bluish streaks.

Wherever the limestone rock is at or near the surface in the central part of the county, and quite generally everywhere in the southern and southwestern portions, chert is a prominent characteristic. It occurs usually as flinty nodules from 2 to 8 inches in diameter. Stratified bands of it, from 4 to 6 inches in diameter, occasionally appear horizontally embedded in the limestone. Its local distribution over the county is very erratic, occurring at times along the sides of a valley and again on a hilltop. In general it is by far the most abundant in the southwestern part of the county, where it is often exposed upon hillsides and hilltops alike.

Chert is very resistant to the action of weathering and persists in its original form long after the including limestone has gone into the making of soil. In the southern part of the county the chert is often very much disintegrated, and the resulting fragments are much smaller (many of them only from one-fourth to three-fourths inch in diameter) than in other parts of the county.

Sinkholes are a prominent feature of the limestone region of southern Kentucky and northern Tennessee. These occur as basinlike depressions, varying from 15 to 300 yards in diameter and from 30 to 40 feet in depth. They are more commonly found near the line which divides the "barrens" from the river hills, though they are found in the hills themselves and to quite an extent upon the barrens. Their existence is due to subterranean streams or caves, into which the

surface soil is washed. Rapid solution of the rock in the caverns and a thinning of the roof go on until the surface rock and soil fall in, and thus the "sink" is begun. The rounding of its outlines is then easily accomplished by subsequent surface erosion and weathering of exposed rock. Flowing water is sometimes, though rarely, seen at the bottoms of the still open-mouthed sinks, but caverns are probably numerous and of wide extent throughout the county, and it is likely that with these most if not all the sinks are connected.

The bottoms of many of these depressions have become stopped, resulting in the formation of ponds that endure throughout the driest season. When a pond is undesirable for the watering of stock, or the land is wanted for cultivation, it is often effectually drained by boring a hole in its bottom.

Dunbar's Cave, 3 miles east of Clarksville, contains passages the aggregate length of which amounts to 4 or 5 miles. Bellany's, Coleman's, and Foster's caves, in the western part of the county, are also quite extensive, though not wholly explored. Many more such caves, to which no entrance has ever been found, probably exist.

Montgomery County is well supplied with springs, numerous small ones occurring in the more hilly sections. In the more level section along the Kentucky line springs are less plentiful, though larger in size.

#### SOILS.

Owing to the fact that all the soils of Montgomery County are derived from one geological formation, they are few in number and are not so markedly distinct in physical and chemical differences as in areas where greater diversity in geological features exists.

Five soil types have been recognized in Montgomery County, to which the following names have been given: Clarksville silt loam, Clarksville stony loam, Clarksville clay loam, Clarksville loam, and Guthrie clay. The table subjoined gives their areal extent in the order of importance:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Clarksville silt loam.....	233,410	66.6	Clarksville loam.....	17,090	4.9
Clarksville stony loam.....	66,450	19.0	Guthrie clay.....	5,800	1.7
Clarksville clay loam.....	27,460	7.8	Total.....	350,210	.....

#### CLARKSVILLE SILT LOAM.

This soil covers about 67 per cent of the total area of the county, or 365 square miles, and is the one of principal importance. It is present in nearly all parts of the county, with the exception of a strip along the northern border and a few square miles in the southwestern por-

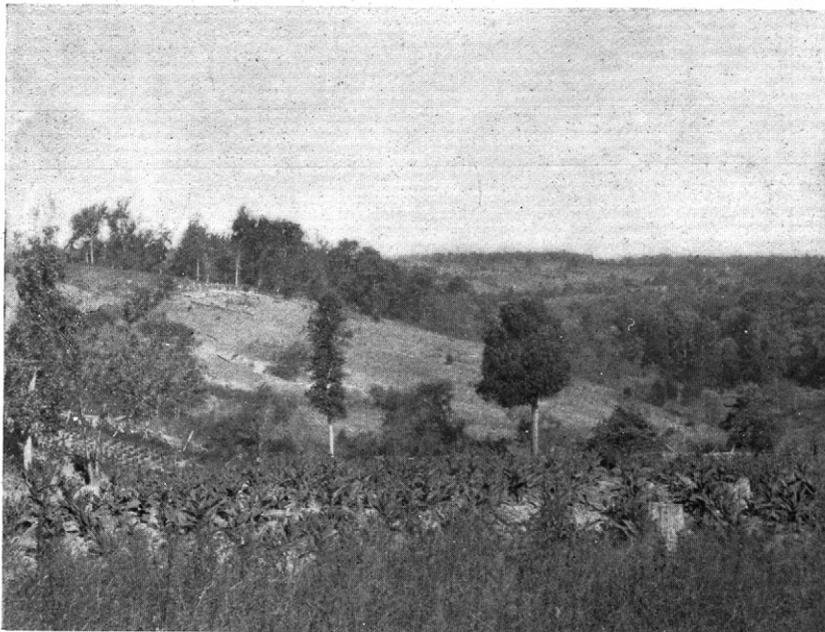


FIG. 1.—GENERAL TOPOGRAPHY OF THE CLARKSVILLE SILT LOAM.

The Clarksville silt loam area occupies a hilly, rolling section of the country, although as a rule the hills have gently rounded contours, rendering them easily cultivated. It is the best tobacco soil in the area.



FIG. 2.—ILLUSTRATION OF THE EXCESSIVE EROSION OF THE CLARKSVILLE SILT LOAM. Where the slopes are left without suitable covering, or where the cultivation is superficial, the lands are liable to wash badly.



tion. Its most typical development is seen in the vicinity of the Cumberland River throughout the whole extent of its course through the county, and also to the north and south of the Red River. Its greatest area away from the river is found near Jordan Springs, in the western part of the county, where it extends quite to the Kentucky line. It occupies also nearly all of the area lying between the Red and Cumberland rivers.

In general, the Clarksville silt loam occupies a hilly, rolling section of the county, considerably broken by the large streams and their smaller tributaries. Sinkholes are of common occurrence and are a marked feature of the general landscape, many of the undulations of the land surface being due to their existence. The hills, though often from 40 to 75 and 100 feet in height, as a rule possess gentle, rounded contours, rendering them easily cultivated. In some of the more broken and deeply eroded sections of the county this type of soil is found only upon the hilltops, though often forming here considerable areas.

This type is a residual soil derived from solution of massive, horizontally bedded St. Louis limestone. This is accomplished through the action of carbonated atmospheric waters, which dissolve away the calcium carbonate, the principal ingredient of limestone, leaving behind as soil the siliceous and other insoluble particles of the rock.

The surface 7 inches of Clarksville silt loam is a whitish-gray soil of a fine, silty texture. Dry, it forms an almost impalpable powder; in a normally moist condition it easily crumbles, and when rubbed between the fingers the presence of fine, gritty particles is felt. The underlying subsoil of this type is a yellow loam, containing some clay and much silt. It possesses a somewhat heavy, homogeneous texture, showing little change until a depth of 24 inches is reached, when it becomes slightly more stiff and tenacious. Broken pieces of chert are then often present, and the mass takes on a reddish tinge. The presence of the chert is variable in geographical distribution and in quantity, sometimes occurring as a band or bed 4 inches in thickness and again being a foot thick. Large areas of this soil type occur from which chert is almost entirely absent, and in the vicinity and to the northwest of Jordan Springs there is an area in which the soil is rather less silty, more clayey, and tinged a red or yellow color.

Lying beneath the yellow loam subsoil, whether the cherty band be present or not, is a bed of heavy, impervious red clay. The depth at which this occurs varies from 30 to 40 inches. Where the chert appears at about 24 inches, extends to a depth of 30 inches, and is then underlain by the heavy red clay, an ideal soil is present. The cherty band furnishes excellent drainage, while the clay substratum serves to hold the water in reserve for the use of the growing vegetation in times of drought.

On this type of soil an average crop of 800 to 900 pounds of tobacco, to the acre is grown, and corn, wheat, hay, and other cereal and forage crops yield abundantly. Garden vegetables are grown to a small extent, and at present only for home consumption, but nearly all of them yield well. Peaches do excellently, but some difficulty has been experienced in raising pears, owing to injury from insect pests.

The natural forest growth is white oak, red oak, beech, sugar maple, hickory, walnut, tulip, and dogwood.

The crop that takes precedence over all others in Montgomery County is tobacco, and it reaches its highest perfection upon the Clarksville silt loam. The soil seems to possess in the proper proportion the requisite physical and chemical properties, moisture, and fertility, and these combine with a natural and perfect drainage to render possible the production of the rich, heavy leaf so much prized for exportation to foreign countries.

The drainage of this type of soil is secured without artificial means. Rarely is a hilltop so flat as not to allow of perfect drainage of surface water. Basinlike depressions, the sites of old sinkholes, are nearly always porous enough at the bottom to allow the water to drain off.

The following table gives the mechanical analyses of this soil:

*Mechanical analyses of Clarksville silt loam.*

No.	Locality.	Description.	Soluble salts, as deter-	Organic matter and com-	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 0.0001 mm.
			mined in mechanical analysis.	bined water.							
			<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>	<i>P. ct.</i>	<i>P. ct.</i>
6022	2 miles N. of Woodford.	Silty loam, 0 to 7 inches.	0.02	3.22	0.54	1.08	0.56	1.52	5.08	74.44	12.68
6018	¼ mile W. of New Providence.	Silty loam, 0 to 7 inches.	.01	2.62	1.24	1.40	.88	2.88	5.52	71.08	14.35
6016	5½ miles E. of Clarksville.	Friablesilty loam, 0 to 9 inches.	.01	2.14	.68	1.28	1.00	3.40	4.52	70.70	15.27
6019	Subsoil of 6018....	Silty clay, 7 to 36 inches.	.01	2.68	1.20	1.70	1.00	3.14	5.04	65.20	20.23
6023	Subsoil of 6022....	Heavy yellow clay, 7 to 24 inches.	.01	3.78	.78	.72	.42	1.04	4.26	60.90	26.89
6017	Subsoil of 6016....	Heavy yellow clay, 9 to 36 inches.	.01	5.52	.66	1.20	.82	2.70	5.04	45.38	37.01

CLARKSVILLE CLAY LOAM.

This type of soil is found in the northern and northeastern parts of the county and covers about 27,460 acres, or 7.8 per cent of the total

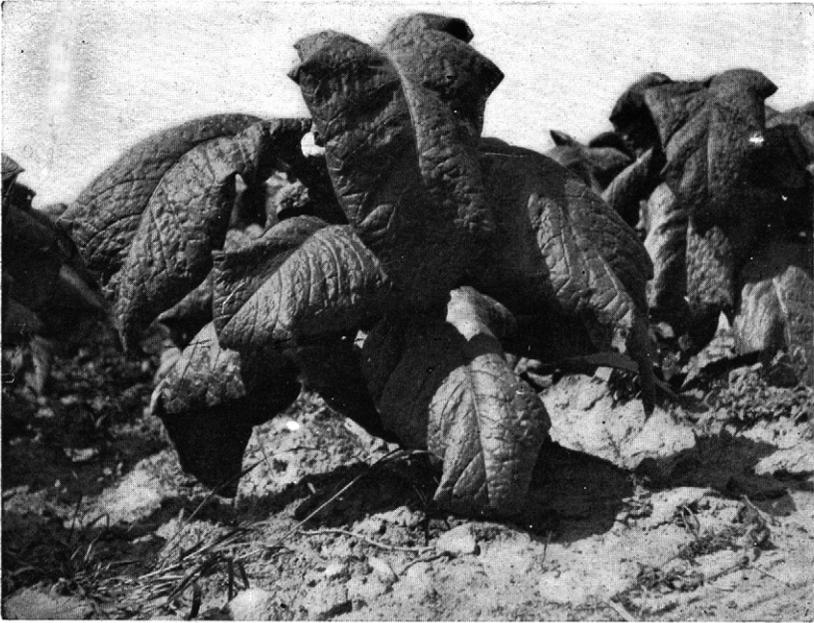


FIG. 1.—TYPICAL TOBACCO PLANT OF THE CLARKSVILLE EXPORT TYPE.



FIG. 2.—METHOD OF HARVESTING THE CLARKSVILLE TYPE OF EXPORT TOBACCO.

In harvesting the crop the stalk is cut and hung for awhile on a scaffold in the field until the leaves are thoroughly wilted, when it is hauled to the barn.

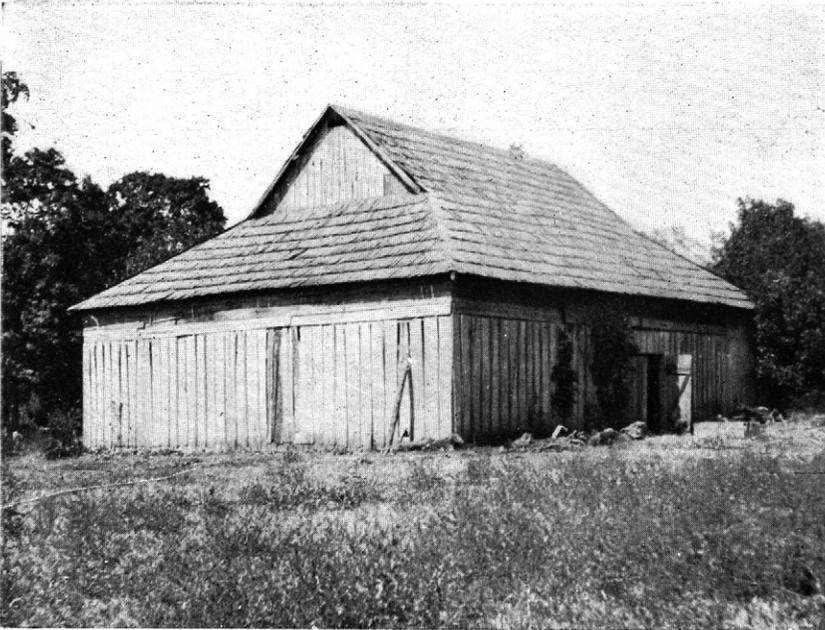


FIG. 1.—TYPICAL TOBACCO BARN IN THE CLARKSVILLE DISTRICT.

The barns are cheaply constructed of undressed lumber, the side boards being vertical and without battens, leaving spaces between them which contribute to the ventilation.



FIG. 2.—METHOD OF CURING TOBACCO IN THE CLARKSVILLE DISTRICT.

Hard-wood fires are maintained on the floor of the barn during the curing, not only for the heat afforded but for the smoke, which adds a desirable aroma and flavor particularly demanded by the English market.

area. In the northeastern area it approaches to within about a mile of the Red River. It is not usually found quite so near large streams, and seldom is its surface broken by hills. In the main it occupies that part of the county which was found by the early settlers in a treeless or prairie state. From the fact that it supported little forest growth, except a fringe along the stream courses, it was called the "Barrens." The area is generally comparatively flat, or only very gently undulating, and over it one can often see for many miles.

The soil, which is derived from the siliceous group of the St. Louis limestone, is a mellow, reddish-brown, clayey loam, having a depth of from 6 to 9 inches. From its color it is often locally called "chocolate land." It is friable and easily cultivated, the clods which form when the soil is worked under moist conditions being readily broken up. The subsoil is a comparatively heavy red clay loam, somewhat waxy in consistency. At 3 feet the subsoil shows little difference in physical properties from that immediately under the soil, except that it is somewhat more heavy and tenacious. It is remarkably retentive of moisture, and crops grown upon it endure drought well. The color gradually deepens downward and finally grades into a dark, rich red. Chert is rarely present.

The principal crops grown are tobacco, hay, corn, and wheat. Most kinds of fruit and vegetables yield well. Cowpeas are largely raised for stock, and soy beans have proved successful in many cases. The forest growth is red and white oak, sweet gum, walnut, locust, maple, persimmon, and hickory.

Tobacco, while not yielding leaf of as fine texture as upon Clarksville silt loam, produces generally a heavier crop, and the slightly lower market price is offset by the greater quantity. One thousand pounds to the acre is not an unusual yield, while a yield of 1,200 pounds is sometimes obtained.

This soil seems to be better adapted to wheat than the one previously described, and upon well-manured and carefully tended farms a yield of 20 and even 25 bushels to the acre is easily produced, though the average is about 15 bushels.

The drainage of this soil is not as perfect as that of the Clarksville silt loam. Some of the areas are so nearly level that the surface water does not run off readily, and wet, cold spots sometimes result. These spots are locally termed "crawfishy," and where the acreage in them is large enough to be easily indicated on the map they have been given a separate type name. These wet spots could easily be reclaimed by the expenditure of a little time and money in tile or open draining.

The following table shows the texture of representative samples of both soil and subsoil of this formation:

*Mechanical analyses of Clarksville clay loam.*

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.		Organic matter and combined water.	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 0.0001 mm.
			P. ct.	P. ct.								
6012	2 miles N. of Ringgold.	Clay loam, 0 to 8 inches.	0.01	2.94	0.50	0.68	2.16	2.40	2.12	75.12	13.45	
6008	1 mile SE. of Hampton Station.	Red clay loam, 0 to 9 inches.	.01	3.32	.18	.50	.68	3.58	3.82	67.80	19.05	
6013	Subsoil of 6012 ....	Red clay, 8 to 36 inches.	.01	3.42	.36	.50	.36	1.36	2.16	69.30	21.11	
6009	Subsoil of 6008 ....	Red clay, 9 to 36 inches.	.01	3.72	.44	.38	.30	2.48	2.44	61.58	28.35	

CLARKSVILLE LOAM.

An important soil in Tennessee is that on the river bottoms. In Montgomery County this type of soil, Clarksville loam, is found upon the Cumberland and Red rivers principally, although a good many acres of it lie along some of the smaller streams. In the case of the small streams the bottom is generally very narrow, and where its width does not approach one-eighth of a mile, or where it is much interrupted along its course, it has been omitted from the map. Along the Cumberland River the bottom varies from one-eighth to five-eighths of a mile in width, with an average of three-eighths of a mile. The average width along the Red River is one-fourth of a mile.

The soil is alluvial in origin, having been transported in flood time and deposited as mud. This has gradually been built up into broad, rich alluvial flats which now in the aggregate amount to about 27 square miles. On some of the smaller streams this alluvium is more or less mixed with wash from the near-by clayey hillsides and is then much redder in color and somewhat heavier in texture. Agriculturally, however, the value is nearly the same as in the case of the wider, deeper bottoms.

The bottoms are very flat and level, with no marked undulations, except occasionally along the Cumberland River, where transverse ridges of a height of from 4 to 6 feet are sometimes seen. The middle of the bottom is always a little lower than that immediately along

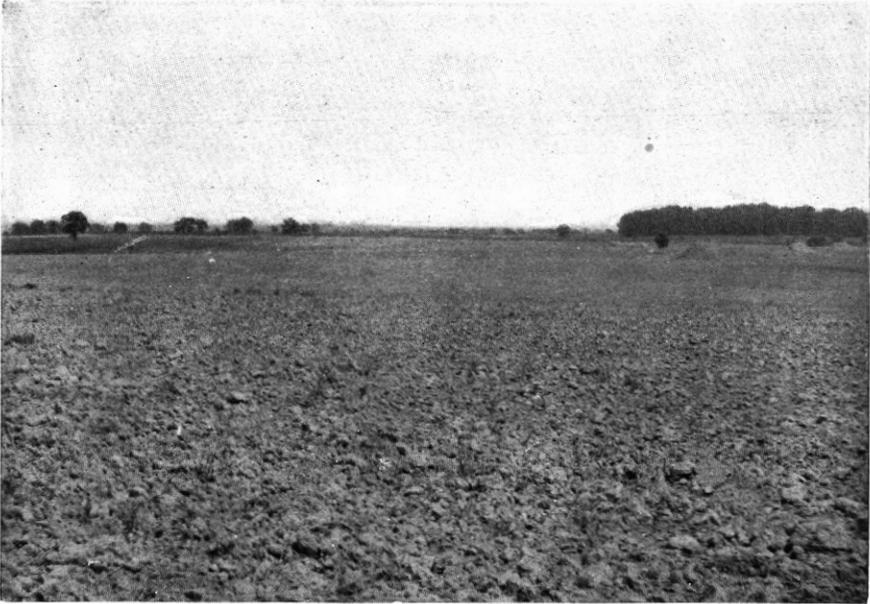


FIG. 1.—CHARACTERISTIC LEVEL TOPOGRAPHY OF THE CLARKSVILLE CLAY LOAM, LOCALLY KNOWN AS "THE BARRENS."

The area covered by this type has generally very level surface, which interferes somewhat with the proper drainage of the soil.



FIG. 2.—SINKHOLE—A FEATURE FREQUENTLY SEEN ON CLARKSVILLE CLAY LOAM.

These sinkholes are common in this as in most limestone formations. These ponds can usually be drained by simply boring a hole down into one of the subterranean passages which ramify throughout the limestone area.



FIG. 1.—HAY AND CORN ON CLARKSVILLE LOAM IN CUMBERLAND RIVER BOTTOMS.



FIG. 2.—CHARACTER OF THE CLARKSVILLE STONY LOAM AS SHOWN IN THE ROADSIDE WASH.

This type is very stony, often difficult to work, and is not a productive soil for general farm crops.

the stream or at the base of the hills. Small streams cutting across the bottom of gullies, which have worked inward from the river, allow the overflowing of the surface at times of ordinary floods when the river does not rise high enough to overreach its naturally diked bank.

The soil is a rich dark-brown loam, about 12 inches in depth, and is of a somewhat sandy appearance when dry, though the particles are as a rule extremely fine. Along the immediate banks of the Cumberland River occasional stretches of bottom land are to be seen, composed largely of fine sand, but these are of small area and extend only a few yards back from the river. The subsoil is essentially the same as the soil above it, except that it is heavier and contains a little more fine silt. The depth of this alluvial soil, or its height above the minimum water level of the Cumberland River, is from 30 to 50 feet. On the small inland streams the depth is not more than from 3 to 6 feet, and here the subsoil is in places more or less intermixed with fragments of chert, washed down from the contiguous hillsides. The soil supports a natural forest growth of sycamore, gum, willow, and walnut, with, in many places, a thick undergrowth of cane.

This type of soil is held in high esteem for the production of corn and hay, and there are few uncleared areas of bottom land in the county. Corn yields very large crops in favorable seasons, and is planted year after year upon the same ground without any manuring or fertilization of the soil other than what naturally comes from the occasional flooding. On some of the smaller streams, and on some parts of the lower bottoms along the Cumberland and Red rivers, this flooding is annual, and even more frequent, but the higher land is covered with the water only in exceptionally high floods. Hay yields on an average about  $1\frac{1}{2}$  tons to the acre, and under favorable conditions a second, lighter crop is secured. Tobacco is rarely grown upon the alluvial soil of the Cumberland River, for the reason that the plant grows and matures too rapidly, producing a leaf coarse in texture and having too little of the desired gummy property. Along some of the higher, drier bottoms of the small streams, however, where the subsoil is heavier and intermixed with chert, the crop produced is little, if any, inferior in quality and yield to that grown upon upland soil.

It is difficult to control the drainage of this type of soil for the reason that it is so subject to overflow. The flooding of the Cumberland bottoms is quite as often the result of heavy rains at the river's source as of local precipitation, and when the high-water mark is approached much damage to crops is caused by the backing up of the water into the mouths of the smaller streams. The Cumberland River has been known to rise 14 feet in a single night, and to fall nearly as rapidly.

The following table gives mechanical analyses of samples of this soil:

*Mechanical analyses of Clarksville loam.*

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.		Organic matter and combined water.	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 0.0001 mm.
			P. ct.	P. ct.								
6006	3 miles N. of Southside.	Dark-brown loam, 0 to 10 inches.	0.01	4.30	0.06	0.12	0.40	16.26	22.54	37.62	18.13	
6007	Subsoil of 6006....	Friable brown loam, 10 to 36 inches.	.01	5.58	Tr.	.44	.28	2.80	9.10	48.68	32.87	

CLARKSVILLE STONY LOAM.

The Clarksville stony loam is characterized by the presence of chert (or flint). The principal areas of it are found in the southern and southwestern portions of the county, in the type of country known as "coaling lands," and especially in that part of it where ore beds formerly existed. Very small areas of it have also been found irregularly distributed throughout the central three-quarters of the county. Such areas usually occur in conjunction with Clarksville silt loam, where it borders on streams or occupies the steeper hillsides. The area of this type amounts in all to about 66,450 acres, or 19 per cent of the area of the county.

The physiography of the territory in which this type is located is characterized by abrupt, "choppy" hills and deeply cut valleys. In the southwestern portion of the county, where the greatest area lies, these hills taken together form a series of ridges which often rise to a height of 200 feet above the thickly wooded valleys below. They are fairly well watered by swiftly flowing streams and are covered with a growth of small red and black oak and chestnut, with an occasional beech. They were formerly heavily timbered with red and white oak and chestnut, which was cut off some fifty years ago and made into charcoal for the use of the iron furnaces then existing. Much of the present growth of black and red oak does not exceed 6 inches in diameter. A second growth of white oak does not appear to have sprung up to any extent.

The soil is from 5 to 7 inches in depth, and consists of a yellowish-white, silty loam, derived from the degradation of the St. Louis limestone. It contains a large amount—from 20 to 50 per cent—of irregular, angular fragments of chert, ranging in size from one-fourth inch to 6 inches in diameter, and in varying stages of decomposition. In some few localities these hills contain waterworn pieces of chert, together with a few rounded quartz pebbles. In the vicinity of the

ore beds the chert is generally much more finely broken than elsewhere and contains much of the nodular variety. The subsoil from 7 inches downward consists of a stiff clay ranging in color from a yellowish red to a deep, dark red, interbedded with chert in about the same proportion as in the soil. Little use is made of the greater part of the area upon which this type of soil is found. It seems poorly adapted to the production of the type of tobacco in demand in the Clarksville market, though from virgin land two or three fair crops are harvested. The leaf, however, lacks the "body" and rich, gummy character desired. From its stony character the soil is undesirable as grass land, and corn produces but a small crop. Fruit, such as peaches, pears, apples, and grapes, it is thought, might pay well on this soil, but as yet little attention has been given to its cultivation.

Mechanical analyses of samples of this type of soil are given in the table below:

*Mechanical analyses of Clarksville stony loam.*

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.		Organic matter and combined water.	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 0.0001 mm.
			P. ct.	P. ct.								
6026	1¼ miles SE. of Oakwood.	Loam, 0 to 7 inches.	0.02	3.30	2.56	1.40	3.04	2.44	2.48	69.64	13.46	
6024	1¼ miles NE. of Louise.	Silty loam, 0 to 7 inches.	.01	2.96	1.54	2.10	1.18	3.10	7.68	65.14	15.89	
6027	Subsoil of 6026....	Heavy clay, 7 to 18 inches.	.01	3.54	4.12	2.82	1.36	3.38	3.00	61.32	20.05	
6025	Subsoil of 6024....	Clay loam, 7 to 36 inches.	.01	3.72	3.14	3.08	1.48	3.60	6.00	53.82	25.41	

GUTHRIE CLAY.

This type is best developed in the extreme northeastern part of the county and in the vicinity of Guthrie, Ky. Other areas of smaller extent are found in the vicinity of Oakwood and Woodlawn, in the western part of the county, and along the Dover road, east of Woodlawn. These areas aggregated amount to about 9 square miles.

The Guthrie clay occurs in low, flat places, and often in basinlike depressions, where there is little or no drainage. The topography of the country is usually but slightly rolling, there being few hills of any size present and not many streams. The derivation of the soil is the same as that of the other types, its peculiar color and lack of

adhesive properties possibly being due to leaching and deoxidation of the iron originally contained in the soil.

The soil is a light gray in color, almost white when dry, and though when wet it has a rather greasy consistency, when well dried it feels silty and chalky rather than clayey. The depth of the soil is about 7 inches. The subsoil is quite heavy and plastic, and contains considerable clay. Water does not easily percolate through it. In color it varies from a light gray to a dark drab or chocolate, nearly always mottled with yellow or reddish iron stains. In some cases this iron stain prevails to such an extent that yellow becomes the predominant color of the subsoil.

The soil is cold and very acid, even to the taste, and is poorly adapted to agricultural purposes. In favorable seasons corn matures, and yields in some instances a fair crop. In some of the better drained areas, to the north of Oakwood for instance, tobacco produces a vigorous growth. The application of superphosphate of lime is said to make of this type of soil fairly good wheat land. Much of the area, especially to the northwest of Hampton Station, is in forest. Hickory grows abundantly and to a large size. White and red oak are seen, together with different varieties of gum.

The following mechanical analyses of samples of this type show the texture of both soil and subsoil:

*Mechanical analyses of Guthrie clay.*

No.	Locality.	Description.	Soluble salts, as determined by mechanical analysis.	Organic matter and combined water.	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 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
6030	4 miles NE. of Peachers Mills.	Clay, 0 to 9 inches.	0.01	2.80	1.12	0.90	0.50	3.74	4.30	70.82	15.33
6028	¼ mile N. of Oakwood.	Clay loam, 0 to 9 inches.	.01	3.32	.10	.42	.36	1.34	2.98	74.02	16.89
6031	Subsoil of 6030....	Brittle clay, 9 to 36 inches.	.01	3.12	.40	1.42	.76	4.32	3.22	66.32	20.23
6029	Subsoil of 6028....	Sticky clay, 9 to 36 inches.	.01	3.20	Tr.	.34	.42	1.54	1.82	60.78	31.29

#### AGRICULTURAL CONDITIONS.

It is not uncommon in the South to see the agriculturist specializing in favor of some one crop. This he calls his "money crop." It may be cotton, or peanuts, or tobacco, or rice, according to the peculiarities of

soil and climate that render one crop more profitable or easily raised than another in his locality.

The money crop of Montgomery County is, and has been for nearly one hundred years, tobacco, and in point of acreage and production this county stands first in the State.

The tobacco of Montgomery County, like all that of the Clarksville district, is as a whole an export type, almost none being used in this country. The leaf is characterized by its heavy, oily properties, richness in nicotine, strong, elastic, silky texture, and freedom from coarse veins and fibers. In color it ranges from a light brown through a chestnut to a rich, dark reddish brown, approaching a wine color. It is in good demand in Europe for the manufacture of smoking tobacco and cheap, strong cigars, and the product is mainly sold in Germany, Austria, Belgium, Switzerland, Italy, and France. From a considerable quantity of it the midrib is removed, and it is then sold in England as "strips." The tobacco of the Clarksville district is cured by open fires, which imparts to it a smoky flavor fancied by its foreign consumers.

The seed is grown by the farmer each year. Little attention is paid to the introduction of new varieties or to seeds from other localities, the experience being that new varieties give no better results, and become mixed and lose their characteristics after the first year. No great difference in variety exists, save some variations influenced by soil. On bottom land and virgin land, wherever a large amount of undecomposed organic matter is present in the soil, the leaf is apt to grow rank and coarse fibered, and to lack the elastic and oily essentials. The second or third crop on new land comes nearer to the requirements.

The use of bone meal and other commercial fertilizers is very common, and on some of the poorer soils and soils which have become impoverished through a misapplication of fertilizer their use has come to be almost a necessity.

Since the early settlement of northern middle Tennessee tobacco culture has been extensive, and the industry has kept pace at all times with the increase in population. In the early days more care was bestowed upon the selection of seed, cutting, curing, and assorting, and an article of quite superior quality was the result. The raising of larger and larger quantities by the farmer, which means lack of proper attention to details of curing, etc., has deteriorated the quality materially, and the product at present offered, while in greater quantity, brings low prices. There is little doubt that better attention to a smaller crop would be more profitable to the grower. The prices which this tobacco brings vary greatly, according to quality, appearance, and condition of the crop. The best leaf sells for from 9 to 15 cents, the medium for from 4 to 8 cents, and lugs for from 1 to 3 cents per pound.

The former conditions of labor, no doubt, had something to do with the superior quality of the tobacco grown. At present labor, though comparatively cheap and ordinarily abundant, is not always to be had at critical times in the growth and care of a crop, so that where a farmer or planter could formerly conveniently grow and harvest a crop of 40 acres of tobacco, he can not now be certain of doing justice to a crop of more than 10 acres.

More diversified farming is strongly to be recommended. Too little attention is paid to the raising of stock and to dairy husbandry. Hay and corn yield prolifically upon both the bottoms and the uplands, though a rather better quality of the former is produced upon the uplands. The upland soils seem well adapted to the growing of cow-peas—a crop that has already proven its value as food for stock. With the successful growth of these crops stock raising and dairy farming should be both feasible and profitable. Sheep thrive, and the seasons are favorable to their raising. Little or no shelter is needed for them in the Tennessee winter. Many more of them would be raised if it were not for the constant danger to which they are subjected from the depredations of dogs. In some instances the Angora goat is raised, and with profit. Being stronger and hardier, they are much less liable to attack by dogs. They are said to be more economical grazers than sheep.

The Irish potato at present is not cultivated in sufficient quantities to supply the home demand, the supply being less than a bushel to each inhabitant. This crop does remarkably well upon the uplands and its cultivation should be extended. The market is already provided.

Garden vegetables are raised for home consumption, but, except perhaps in the case of melons, no interest seems to have been shown in their production for market. Even the Clarksville market is largely supplied through Nashville commission merchants. Market gardening should prove highly remunerative, as upon the rich uplands peas, beans, tomatoes, beets, turnips, radishes, asparagus, lettuce, onions, salsify, okra, and eggplant all give abundant yields. Such products find a ready local market at Clarksville, while at Nashville and other railroad points a quick sale awaits the producer.

Nearly all kinds of fruit yield well, and the product is usually of good quality, with the exception, perhaps, of some of the Northern varieties of apples. Peaches grow well, but are occasionally caught by late frosts. Grape culture has proven successful along the Red River, and this, together with peach growing, should be tried in the hills in the southern part of the county.

The total tobacco crop and the greater part of all farm produce of Montgomery and some of the adjacent counties are hauled to Clarksville. The building and maintenance of good roads leading to that city

should appeal to the farmers as the one most desirable and necessary public improvement. Several good roads already exist, but more are needed.

The Cumberland River is crossed on ferries, no bridges existing in the county. These ferries are inadequate to present needs, and the construction of at least one bridge near Clarksville would greatly facilitate traffic.

The Louisville and Nashville Railroad connects Clarksville with Nashville, via Guthrie, Ky. A direct line, the Clarksville and Nashville, is now being built between the two cities. Branch lines of the Louisville and Nashville system connect Clarksville with Gracey, Ky., and also with Dickson County.

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