Issued April 7, 1910.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE STATE OF ALABAMA, B. B. COMER, GOVERNOR;
J. A. WILKINSON, COMMISSIONER OF AGRICULTURE AND INDUSTRIES.

SOIL SURVEY OF JEFFERSON COUNTY, ALABAMA.

BY

HOWARD C. SMITH, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND E. S. PACE, OF THE ALABAMA DEPARTMENT OF AGRICULTURE AND INDUSTRIES.

[Advance Sheets—Field Operations of the Bureau of Soils, 1908.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1910.

[PUBLIC RESOLUTION—NO. 9.]

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

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

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

Approved March 14, 1904.

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

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., August 31, 1909.

SIR: During the field season of 1908 a soil survey was made of Jefferson County, Ala. This work was done in cooperation with the Alabama department of agriculture and industries, J. A. Wilkinson, commissioner, and was indorsed by Hon. O. W. Underwood, within whose district the county lies.

I transmit herewith the manuscript report and map covering this survey and recommend their publication as advance sheets of the Field Operations of the Bureau of Soils for 1908, as authorized by law.

Very respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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MAP.

Soil map, Jefferson County sheet, Alabama.

SOIL SURVEY OF JEFFERSON COUNTY, ALABAMA.

By HOWARD C. SMITH, of the U. S. Department of Agriculture, and E. S. PACE, of the Alabama Department of Agriculture and Industries.

DESCRIPTION OF THE AREA.

Jefferson County, named in honor of our third President, is located in north-central Alabama, on the southern extension of the Appalachian system and in the center of the rich iron, coal, and limestone belt of the South. The county contains 719,360 acres, or 1,124 square miles, and is an irregularly shaped parallelogram, with its longer dimension, 46 miles, from east to west, and its shorter, 38 miles, from northeast to southwest.

Parallel 33° 51′ north latitude lies just within the northern boundary, while the southern extremity is crossed by parallel 33° 15′. The meridian 86° 30′ west from Greenwich touches the eastern side and 87° 20′ crosses the western tip. The county is bounded on the north by Walker and Blount, on the east by St. Clair and Shelby, on the south by Tuscaloosa, Shelby, and Bibb, and on the west by Tuscaloosa and Walker counties. The base map used by the surveying party was made by the United States Geological Survey.

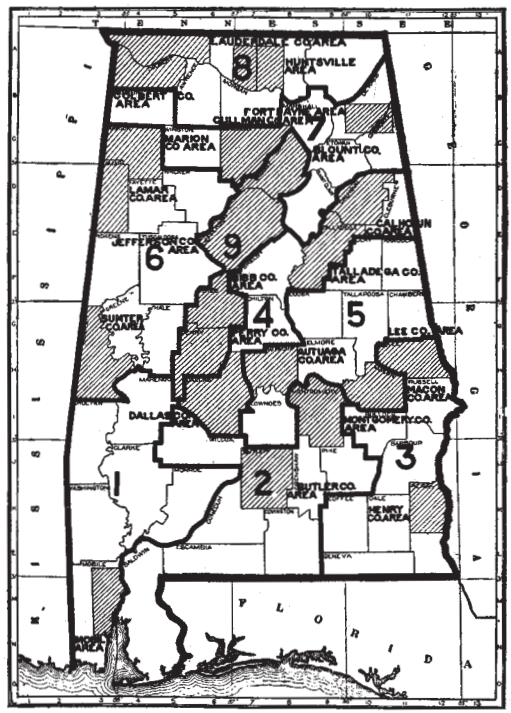

FIG. 1.—Sketch map showing location of the Jefferson Caunty area, Alabama.

The surface of the country is mainly mountainous to hilly and the drainage is well developed, as shown by the numberless rounded hills, valleys, and the much dissected surface.

In 1817 Alabama was organized as a Territory, and in 1819 admitted as a State. At the first session of the legislature Jefferson County was formed from the southern portion of Blount County. Since 1890, however, a part of Jefferson has been annexed to Walker, and a portion of Shelby joined to Jefferson. In 1815 a fort had been erected near Old Jonesboro and a colony of Tennesseans had settled near Woodlawn. Most of the early settlers were from Tennessee, Kentucky, and the Carolinas. The land was then in forest. Jones and Opossum valleys were cleared first and necessaries like corn, oats, wheat, beef, and pork were produced.

The mild climate, fertile soil, and river communication caused the population to increase rapidly. The following table shows the remarkable development since 1830—a development due mainly to the commercial exploitation of the great deposits of limestone, red and brown iron ore, and bituminous coal.

Population of Jefferson County, Ala., 1830 to 1900.

Year.	Population.	Year.	Population.	Year.	Population.
1830	6,835	1860	11,746	1890	88,501
1840	7,131	1870	12,345	1900	140,420
1850	8,989	1880	23,272		

At present the population is chiefly in the cities. The inhabitants are cosmopolitan, including Europeans, most of whom labor in mines and public works, and people from all States who have been attracted by the varied industries and rich possibilities of the country. Birmingham, the county seat, has now an estimated population of 150,000, while Bessemer and Ensley are flourishing cities that have doubled their population during the last few years.

At present there is no water communication to the sea, but the transportation of the county is carried on by nine main railroad lines that cover all the county except the extreme western portions, in the mountainous districts. The following railroads enter Birmingham: Alabama Great Southern; Alabama, Birmingham and Atlantic; St. Louis and San Francisco; Central of Georgia; Mobile and Ohio; Louisville and Nashville; Seaboard Air Line; Illinois Central; and Southern. A well-developed system of street and interurban freight and passenger electric lines connect all points between Birmingham and Bessemer. There are many jobbing and wholesale houses that import foodstuffs and the varied necessities of a densely populated industrial center. It is asserted that about 28,000 carloads of alfalfa and other classes of hay are annually shipped in from a dozen near-by States. In spite of the fact that two good crops of Irish potatoes

can be raised annually, these and other vegetables are shipped in from Wisconsin and other northern States. These fruits and vegetables necessarily bring high prices and could be more cheaply grown at home.

Nearly all the county has rural free delivery. There is a good system of rural schools, high schools, and several colleges. The county is traversed by over 1,100 miles of wagon roads, 220 miles of which are macadamized. Other roads are being rebuilt, and this work will be continued until all the main roads are improved. With the abundance of limestone for cement, and accessible sandstone and chert, road improvement is easily and cheaply carried on.

CLIMATE.

Jefferson County has a mild climate, usually free from extremes of heat or cold. The extreme range of elevation is from 1,400 feet on Butler Mountain to 240 feet above sea level at the junction of Locust Fork with the Warrior River in the southern part of the area. On the majority of farm lands, which lie at elevations ranging from 500 to 800 feet, there are no marked climatic differences due to elevation. On the low-lying Huntington soils, however, late spring and early fall frosts come later and earlier than in the higher areas, and may interfere with the ripening of cotton.

On the higher mountains near Birmingham the elevation produces a refreshing coolness, making those places favored for summer resorts. On only two occasions in thirteen years has the temperature exceeded 100° F, and only once during this time has the thermometer registered below zero. It is not unusual for the temperature to approach 15° or 20° below freezing, but even such extremes are of short duration.

The average temperature for December, January, and February is 48°, which gives frequent frosts, slight freezes, or quickly disappearing flurries of snow. It is only rarely that field crops or fruits are damaged. The average dates for killing frosts at Birmingham for the last thirteen years are March 19 and November 5, giving an average growing season of 231 days, or nearly 8 months, although there may be considerable seasonal variations. The mild, equable climate thus permits the maturity of nearly all the great staple crop produced farther north, and in addition many suited to semitropical latitudes may be grown.

At Birmingham the average annual rainfall is about 57 inches, which is ample for all crops. While it is normally well distributed, there are occasional dry periods in August or September. Unless carefully and frequently cultivated, so that a crust does not form on the soil, late-sown crops may have their yields diminished. However, cotton when well cultivated seldom suffers from drought.

In winter it is common to have several warm bright days followed by a rain and colder weather, which gradually becomes warmer. On account of the cloudy nights it is not unusual for several weeks to pass without a frost. The climate permits the growth of the hardier garden vegetables during all the winter. With a ready demand, high prices, and cheap fuel, and this climatic adaptation, the production of tender plants under glass would seem to be an industry that might well be introduced.

High winds are rare and do little damage. During the spring, summer, and fall thunder showers are frequent, usually coming from the southwest. The dry air, sunshiny weather, and absence of damp foggy days operate to make the climate exceptionally healthful.

Normal monthly, seasonal, and annual temperature and precipitation at Birmingham.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inch.*
December	48	73	5	5.1	1.1	4.0	Trace.
January	46	75	10	5.7	3.4	5.2	Trace.
February	49	81	−10	4.2	4.4	6.2	0.6
Winter	48	.....	.....	15.0	8.9	15.4	6
March	57	87	12	6.4	4.4	6.8	Trace.
April	64	90	28	6.2	4.9	13.1	.0
May	73	97	40	3.9	3.2	2.3	.0
Spring	65	.....	.....	16.5	12.5	22.2	Trace.
June	79	100	49	4.8	4.3	12.1	.0
July	81	104	59	5.4	3.4	7.9	.0
August	80	101	61	5.5	2.3	2.0	.0
Summer	80	.....	.....	15.7	10.0	22.0	.0
September	75	100	42	2.8	.7	3.8	.0
October	65	93	31	3.0	1.3	7.2	.0
November	54	84	18	3.8	3.8	5.8	Trace.
Fall	65	.....	.....	9.6	5.8	16.8	Trace.
Year	64	104	−10	56.8	37.2	76.4	.6

AGRICULTURE.

The first settlers in Jefferson County began farming on the Decatur and Hagerstown soils. The farms were obtained from the Government, under what was known as the " 'Bit' law," by the terms of which 12½ cents per acre was paid for the land.

With the clearing of the virgin forest of pine, cedar, gum, and hardwoods, the pioneers grew crops of corn, wheat, and oats. The mild climate and fertile soil made the region attractive, and wealthy planters soon bought the cheap lands. Other settlers flocked in, and by 1850 the population was 8,989. However, the large landowners began an agricultural land monopoly that absorbed the smaller holdings, and gradually the agriculture came to be carried on by slave labor. Many of the planters owned several thousand acres of land. Cotton was generally grown, although large numbers of cattle and hogs and quantities of sweet potatoes, corn, and wheat were grown for sale and home consumption.

Cotton was marketed in Tuscaloosa and Mobile. Corn has always been a leading crop and the census reports show the acreage to have been double or treble that of cotton. While the first crops of cotton were large, the yield is universally claimed to be greater now than in antebellum days, owing to improved methods of handling and fertilizing the soil and to better seed selection. In the early days it was the custom to plow the land 2 or 3 inches deep and to give little attention to the maintenance of the lands in a productive state, consequently the fields rapidly declined in yield. They were then allowed to "lie out" or to become reforested. During the late sixties and for some time thereafter agriculture was much depressed, but gradually a new system of farming was evolved. One prominent feature has been the division of the vast estates into smaller tracts—a change still in progress—and another has been the development of the tenant system of farming.

In 1880 the average sized farm was 132 acres; ten years later 116 acres. In 1900, 76 acres is given as the average size, but in this census the area cultivated by each tenant was classed as a separate farm, so that the average size of individual holdings is larger than the figure given. Owing to the development of the trucking industry and the scarcity of labor which forces farmers to operate only such tracts as they can care for themselves, it is likely the farms will be still smaller in the future. Each census has shown an increase in the acreage of improved land, the increase in the last decade being from 75,706 acres in 1890 to 103,570 in 1900, a gain of over 25 per cent. It seems certain that the past decade has shown a still greater increase, though no definite figures are available. The change in tenure in recent years is shown by the census figures. In 1890, 79.2 per cent of farms were operated by owners; in 1900, 57.7 per cent. In view of the decrease in size of farms, and in the number operating their own farms, the increasing tendency toward renting is apparent.

During the early period following the war the acreage of corn and cotton increased, the latter gaining more slowly than the former,

while the growth of wheat declined, the crops mentioned being more profitable. Within the last ten years there has been an increase in the production of certain subsistence crops.

The relative importance of the staples can be apprehended by a glance at the figures given by the late censuses. In 1889 there were grown 36,499 acres of corn, producing 13.3 bushels per acre. In 1879, 14,220 acres of cotton produced 5,333 bales, or 187 pounds, of lint per acre; while in 1899, 18,224 acres produced 7,044 bales, or 193 pounds, per acre. In 1889 all farm yields were above the average, and cotton yielded 204 pounds of lint per acre. With the building of the Alabama Great Southern Railroad in 1871, fertilizers began to be used, outside markets could be more easily reached, Birmingham was founded, iron and coal were mined on a commercial scale, and a new agricultural and industrial epoch started. Thus there followed a gradual extension in the acreage of improved land and an increase in land values. The industrial development has, however, been so rapid that agriculture has not kept pace with it. In spite of the extremely high prices paid for all farm products, the county produces but an insignificant fraction of its foodstuffs. At present, even with the increasing prices for land, it is not unusual for a farmer to buy land and sell enough truck to pay for it in from one to three years. Notwithstanding this and the abundance of truck soil, the industry is in its infancy, the bulk of the vegetables coming from outside the State.

Aside from market gardening, the present farming consists of cotton as the money crop, and corn, with oats, cowpeas, sweet and Irish potatoes, and sorghum or sugar cane as secondary crops. While improvement in the character of farm machinery used and in cultural methods is in progress, the present farm practices in general do not differ materially from those in other cotton States. The land is generally plowed in the fall or winter to a depth of 2 or 3 inches only, and allowed to lie till planting time. The common practice is to turn the last season's row into the middle furrow, thus changing the position of the rows each year. A practice productive of better results on a few farms is to plow deeply in the fall, using a two-horse turning plow, and to sow oats as a winter cover crop. In the spring the beds can be made in the usual manner. This gives a deeper, better seed bed, two cultivations instead of one, a winter cover crop to lessen washing, and enables the soil better to withstand drought. A few farmers aim to keep the fields covered with an inch of loose soil, in order to stop evaporation, thus giving the water to the crops, but with the majority the aim is simply to keep the weeds down. In the case of the heavier types of soil, cracks several inches deep may form, and the loss of moisture is rapid. Such soils should never be allowed to form a crust.

At present many farmers in preparing the old field for plowing drag a log across the rows, breaking down the cotton stalks, which are then raked into piles and burned. As nearly all of the soils have an insufficient supply of humus, this practice is wasteful and should be stopped. A modern stalk cutter should be used, after which the stalks can be readily plowed under, thus adding needed organic matter to the soil.

Unfortunately for the cattle, and the soils also, winter cover crops are not grown, neither are the steep hillsides terraced, and more or less erosion is the result. Deep fall plowing and planting of rye, oats, wheat, hairy vetch, or bur clover, which quickly cover the soil, would lessen washing and result in other benefits. Much of the land, especially where the subsoil is heavy, should be subsoiled, and in general a gradual increase in depth of plowing up to 8 or 10 inches is desirable. This deeper tillage also lessens gullying, making the soils more absorbent, and diminishing the injury from drought.

During the last five years the market-gardening industry has become a leading feature on the soils within driving distance of Birmingham. The gardens are from 1 to 3 acres in extent, and while not farmed as systematically as in older localities where the industry has been long established, in proportion to labor and capital invested they are extremely profitable. Truck land can be rented for from $1 to $5 an acre. The demand for sweet corn is great and two crops can be produced, the first being sold in June and the second in the fall. Watermelons are a general crop on many farms, where the owners make a practice of having something to sell whenever they go to the city. Melons are extremely profitable and succeed best on the sandy soils, though heavy applications of fertilizer are required, and but one crop can be grown in the same field without rotation or a rest of several years. Two crops of Irish potatoes can be grown in seasons of sufficient rainfall. The first crop averages 125 to 175 bushels an acre; the second is expected to yield about 100 bushels. Only one crop can be produced from southern-grown seed.

Sweet potatoes succeed well on all the lighter soils. The yield ranging from 150 to 250 bushels per acre. Although prices are never less than 75 cents a bushel, and often more than $1, only small patches are planted. The "bunch yam" and Dooley are favorites. There is room for the farmer who understands the crop and soil adaptation to grow both kinds of potatoes on a large commercial scale.

Tomatoes do well on all soils, but succeed best on well-fertilized heavier types. In July and August, during market gluts, they may sell as low as 30 cents a bushel, when some may be shipped south. Even at this price they sould be profitable, as yields of over 200

bushels per acre are often reported. Very early or late tomatoes often bring $1 a basket of less than one-half bushel capacity,

Cabbage should be more generally grown, especially on the Decatur, Upshur, and Hagerstown soils. In July and August there is often a scarcity, large consignments being shipped in from the north.

The Dekalb and limestone soils are well adapted to strawberries and blackberries, although few are grown, and berries are imported from the south and from Cullman County. The price is always high and the culture of these fruits would prove profitable. Large quantities of cantaloupes are grown and marketed at profitable prices. Beets, peas, peppers, cucumbers, kale, spinach, and cauliflower find a ready sale and are well adapted to the lighter sandy Dekalb soils. Turnips are universally grown as a winter crop.

The culture of tree fruits is in a neglected condition. Several years ago many pear orchards were planted. These did well for a time, but have lately been damaged by blight. The Kieffer and the Garber seem most resistant to this disease. Peach culture has been tried, the prevailing opinion being that peaches are not adapted to the soil or climate. Judging from the present lack of care, past failures have been due more to a lack of knowledge concerning the culture and care of the trees than to soil or climatic conditions. The soil survey reports of Blount and Talladega counties,[a] where the climate and soils are similar to those of this county, state that success has been had in growing the Elberta peach. There is little doubt that when the proper cultural methods are understood it will be found that the slopes of the Dekalb shale loam and the stony phases of the silt loam and sandy loam will produce well. Healthy growing trees were often seen on these types. The Clarksville stony loam will also produce a high quality of fruit.

Climate and elevation do not adapt the county to the growing of long-keeping winter apples, but they can be grown and kept until January. Hackworth is a favorite summer fruit, while Ben Davis on the Clarksville and Winesap on the Hagerstown stony loam should do well.

Judging from the abundance of wild plums and grapes, certain of the tame varieties should do well, especially at higher elevations. Few cultivated grapes are seen, but the vines were thrifty and productive. The stony, gravelly, and shaly phases of all soils will produce scuppernongs and muscadines of good flavor.

On the whole, Birmingham, with its increasing population, furnishes one of the best markets in the South for all soil products, and the soils are so well adapted to truck and other subsistence crops that many times the area now devoted to their production could be profitably utilized.

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[a] Field Operations of the Bureau of Soils, 1905, p. 407; 1907, p. 401.

Although the soil will produce all the standard forage crops, the dairy interests are not extensively developed. The farmer keeps one or two cows for family use. Near Birmingham numerous small dairies of six to twelve cows supply milk for city use. The dairies are frequently examined by a sanitary inspector and the milk is of good quality and meets a ready sale at 25 cents a gallon wholesale or 10 cents a quart retail the year round.

A dairy farm near Birmingham is a model and is equipped with the first cement silo built in Alabama. The owner finds the production of corn ensilage on his Dekalb and limestone soils very profitable, and plans to grow two crops of silage corn annually. On the ordinary soils this should easily be done in good seasons, and the land be greatly improved by the stock kept. Most of the dairy stock consists of grade Jerseys, which under the present system of pasturage and feeding seem to do better than pure-bred stock.

The work stock consists of mules and horses, the former being better adapted to farm work. Such stock is shipped in from farther north and must first be acclimated. With soils well adapted to pasturage there is no reason why mule breeding should not be profitable.

On all farms some poultry is kept. As the price of eggs and broilers is usually low, poultry raising has not been as profitable as other branches of farming.

It is recognized that the lighter soils are better adapted to cotton than the heavy red soils. Good yields are obtained on the latter soils, but the lint is apt to be stained during fall rains. On many farms containing both upland and bottom land soils it is common to grow corn almost exclusively on the bottoms and cotton on the uplands. However, cotton does well on the bottom lands if the crop is planted early and the growth of stalks is not too great. The sandy and light loam soils are preferred for market gardening. The slopes of the Dekalb shale loam are the best fruit soil, and good peach orchards were seen on the Dekalb fine sandy loam. These general adaptations are now usually recognized by the farmers.

The need of crop rotation is beginning to be realized. Many farmers sow cowpeas between the rows of cotton and corn, and all report very beneficial effects. A rotation should be followed not only to keep the soil in the best possible condition, but also to provide food for home use and forage for the live stock. The following rotation, embodying all the desirable features, has been tried and found valuable on Alabama soils: First year, corn, with rows wide apart, cowpeas, soy beans, hairy vetch, peanuts, or crimson clover being sowed between rows at the last cultivation; second year, cotton, in order to get the benefit of the humus and nitrogen added to the soil from the previous year's legume crop. The cotton rows should be spaced so as to cover the previous year's rows of legumes. The cot-

ton rows should be at least 5 feet apart, in order to give ample room for branching, and some legume should be sown between the rows. Oats should be sown in the fall after the cotton is picked. These are cut in June and cowpeas are sown, giving an additional crop of forage. With this rotation, four crops will be grown in three years and the area farmed will be divided into three parts, with cotton occupying one-third; but abundant experience has shown that a farm thus treated will in a few years give the grower from two to three times as much cotton per acre as under the old management. In addition, the yields of other crops will still further augment his profits. Although local modifications of the rotation may be necessary, the productiveness of the soil can not be kept up by any rotation that, in the absence of barnyard manure, omits the replacement of humus by the growing of green or leguminous crops.

The use of low-grade fertilizer is quite general and has increased from a value of $22,573 in 1879 to $37,040 in 1899. The opinion is that the next census will show that the consumption has doubled in the last ten years. From 100 to 200 pounds an acre is the usual application for cotton. A few farmers who have used 400 to 600 pounds report yields that show greater profits than where a smaller amount is used. The universal verdict that fertilizers are used most profitably where there is an abundance of humus should stimulate all farmers to grow green manuring crops. No efforts have been made to adapt the fertilizer to the crop or to the needs of the soil. The farmer usually buys the brand supplied by his dealer.

Owing to the scarcity of farm labor and the high prices paid in mines and public works, many renters with families have gone to the cities, and this has had a tendency to retard the development of the country agriculturally. Another factor working to the same end is the large land holdings of some of the largest corporations in the United States. The greater part of the area of the country is so held by industrial concerns that will not sell land, but rent it, and only on a cash basis. Naturally these tracts show little farm improvement, and in many places are entirely in second-growth timber. As some of the soil is best adapted to forestry this withdrawal from agricultural occupation is timely. Another reason why agriculture has not kept pace with the industrial development is the natural conservatism of the farmer, which keeps him from changing to more modern systems of farming.

The main dependence for labor is upon negroes and exchange of farm labor between farmers. Wages are higher near the mines, where the farmers must pay nearly as much as the miners receive, although deduction is made for board and lodging. From 75 cents to $1.20 per day is a common wage, and $15 to $18 a month are ordi-

narily paid for farm labor. The conditions emphasize the great need for the introduction of modern labor-saving farm tools.

Land rents vary from $1 to $4 an acre. This affords a good return on the capital invested. With such a low rental and the high price paid for produce the renters are quite prosperous. Many tenants work the land on a share basis, and on the cotton and corn farms the rule is to pay a third of the cotton and a fourth of the corn. The majority of the farmers, owners, and tenants are white.

Many of the Dekalb soils have two values—the agricultural and the mineral—the latter including coal and iron, or, in the case of the Hagerstown soils, limestone. The agricultural values range from $5 per acre for Rough stony land to $150 to $175 for improved tillable land near the centers of population. Higher values than these are usually due to the desirability of the land for residential use. Owing to the rapid industrial development the county has great agricultural possibilities and farming land in consequence is rising in value.

Turning now to the question of suggestions for the betterment of agriculture, perhaps the greatest benefit will result from the diversification of crops and the practice of systematic crop rotation. Under this system the farmer would be more independent of fluctuations in the price and yield of cotton, and his income would be distributed more evenly through the year. The soils at present are producing but half what they will yield if crop rotation, deep plowing, and more thorough tillage are practiced. But a small amount of hay is produced in the county. Fortunately this hay is largely made of the vines of cowpeas, a crop which is of the greatest benefit to the soil, but the acreage of this and other forage crops should be larger, and on every farm the number of live stock should be increased. The number of mules should be two to each hand instead of one, as at present. Mules and horses are costly, good farm animals bringing from $375 to $400 a team. As stated, these are imported from other States, but there is no reason why they should not be produced at home. Some farmers keep from one to three grade Berkshire hogs, but most of them buy more or less meat for home consumption. They could not only produce enough to supply their needs, but would find it profitable to raise them on a commercial scale. Where hogs have been allowed to graze on peanuts it has been shown that the soil is greatly improved, and this is another reason for increasing their number on the farms. In the rougher lands of the county the grazing of cattle, sheep, and goats would be the best adaptation for the soil.

Few farmers use lime, as they claim the price is prohibitive, but with the abundance of cheap fuel there is no reason why many farmers who have suitable limestone on their farms should not burn it at a reasonable outlay. Contrary to the general opinion of farmers

on the limestone soils, experiments have repeatedly demonstrated that soils derived from limestone are as often benefited by applications of lime as are soils derived from other kinds of rocks. There is no doubt that applications of 1,500 to 2,000 pounds per acre would prove profitable for all crops. The use of lime will be found especially valuable where alfalfa is to be grown. Owing to the high prices—$18.50 to $23 per ton—paid for alfalfa, there is a desire to grow this crop. Some have attempted it and failed, assigning as the reason a lack of suitable soil. Alfalfa should thrive on deep, well-drained limestone soils, of which there are a number in the county, and it is probable that the failures have been due to improper methods of preparing and seeding the land.

Owing to the dip of the stratified rocks, the soils of the county are, on the whole, well drained. There are, however, many low-lying tracts that are in a wet, cold, unsanitary condition and not producing their greatest yields. Where the soil has a mottled appearance the need of drainage is generally indicated. The conditions can be improved by tile or open drains.

An important problem in the agricultural development of the area, and one which should receive more attention, is the correction of erosion of the fields and hillsides.

SOILS.

The striking topographic features presented in the county are the parallel mountainous ridges and the narrow intervening valleys, all trending in a northeasterly-southwesterly direction. Nine different geological formations, ranging from the variegated shales of the Cambrian to the fine-grained sandstones and shales of Carboniferous age, are seen, and give rise, either directly or indirectly, to thirteen distinct soil types, related in eight soil series, in addition to areas of Rough stony land and Rock outcrop. The youngest of these formations, the Coal Measures of Carboniferous age, covers by far the larger portion of the county and gives rise to the Dekalb soils. Remote from the ridges and valleys of the older formations, the original horizontal bedding of the strata of this formation is in a general way preserved. Near the ridges and the edges of the troughs, where the older underlying formations appear, the sandstones and shales of this formation have been more or less broken, crumpled, and folded. The plateaulike surface of this formation to the north of the parallel valleys has, in many instances, been eroded by streams, with the result that deeply-cut valleys have been formed. The erosion of these streams has not, however, proceeded far enough to expose the older underlying formations, nor has much alluvial material accumulated, so that in general none other than the Dekalb series are developed in this section of the county.

The geological details in connection with the formation of the valleys of the area are quite complex and will not be entered into here.[a] Briefly, however, the exposure of the limestone and other rocks of the older formations has been effected by an upthrust in long parallel ridges of the earth's crust, elevating all of the formations hundreds of feet above their original position. This upward-bending process cracked and weakened the crests of these anticlinal arches, so that subsequent agencies of weathering and erosion have the better been enabled to attack and wash away the material of the protecting Carboniferous formation. This exposed the softer shales and more soluble limestones of the older formations, and with the weathering and transportation away of masses of this material the valleys of Jones and Opossum creeks and Cahaba River were formed. The comparatively great thickness of the soils of the Decatur and Hagerstown soils of these valleys represent the decay of probably many hundreds of feet of the limestone rock. These valleys, with elevated rims reaching to an average altitude of 600 to 900 feet, have basin-shaped bottoms which are higher than the drainage of much of the surrounding plateau country. The elevation of the Birmingham Valley is 591 feet, while in the western boundary the Locust Fork drains nearly one-third of the county and flows into the Warrior River at an elevation of only 240 feet. About one-fourth of the county south of Red Mountain is drained by the Little Cahaba River, into which flow Patton and Shades creeks; the northern portion is drained by the Warrior River and Locust Fork, into which flow Short, Fivemile, Trouble, Crooked, and Black creeks, and other smaller branches.

The great diversity of the soils of Jefferson County, with their accompanying variations of elevation, slope, drainage, etc., adapting them to a considerable range of agricultural use, results largely from their formation from these rocks of widely varying textural and mineralogical characteristics. The resulting soils range in their texture from the excessively stony members of the Dekalb and Clarksville series, which contain in many places from 50 to 75 per cent of sandstone and chert fragments, through the light-textured Dekalb fine sandy loam, to the heavy Wabash and Conasauga clays. The depth of the soil material varies from a few inches in the rougher portions of the county to many feet in the case of the Huntington, Decatur, and Hagerstown soils.

In topographic position the soils range from the level Huntington silt loam to the mountainous Rough stony land and the knolls

[a] The reader interested in these geological details is referred to the report upon the Coosa Valley Region, by Dr. E. A. Smith, state geologist of Alabama, and to other reports by the state and national surveys.

and ridges of the Clarksville stony loam. As already stated, the Dekalb series is derived from the Carboniferous rocks, the silty and sandy members occurring where the topography is smoothest and conditions for the accumulation of a comparatively deep, fine-textured soil most favorable. Among these Carboniferous rocks are found irregular knobs, narrow droughty ridges, and long trough-shaped valleys.

The Clarksville stony loam owes its origin mainly to the Fort Payne chert formation of the lower Subcarboniferous and to the cherty inclusions in the Knox dolomite formation of the lower Silurian. The greater proportion of this type occupies the cherty hills and ridges northeast of Birmingham between Red Mountain and Sand Mountain, ending in mountains of Rough stony land farther north.

The Upshur stony loam is derived from the Clinton iron ore of the Red Mountain formation, which, upon weathering, gives rise to a soil along the exposed narrow ridges.

The Conasauga clay and certain phases of the Hagerstown soils are derived from the Flatwoods or Coosa shales of Cambrian age, which are characterized by shales and interbedded limestones of nearly vertical inclination.

The Knox dolomite and the Trenton limestone contribute most largely to the formation of the Decatur and Hagerstown soils occupying the Jones and Opossum valleys, though in the case of the Hagerstown stony loam more or less of the stony material comes from the cherty formations giving rise to the Clarksville stony loam.

The Huntington silt loam, Huntington gravelly loam, and Wabash clay are alluvial soils derived from sediments deposited by streams at times of high water, and are still in process of formation.

The following table gives the names and areas of the several soil types shown on the accompanying map:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb shale loam	253,632	35.3	Hagerstown stony loam	11,392	1.6
Dekalb silt loam	210,816	29.3	Upshur loam	4,608	.6
Clarksville stony loam	73,664	10.2	Upshur stony loam	2,368	.3
Dekalb fine sandy loam	60,672	8.4	Huntington gravelly loam	2,304	.3
Hagerstown loam	24,768	3.4	Wabash clay	512	.1
Rough stony land	24,320	3.4	Rock outcrop	320	.1
Decatur clay loam	21,184	2.9			
Huntington silt loam	16,896	2.4	Total	719,360	.....
Conasauga clay	11,904	1.7			

UPSHUR LOAM.

The surface soil of the Upshur loam to a depth of 8 inches is a deep Indian-red or brown loam or silt loam, containing numerous iron concretions and decomposed fragments of iron ore and sandstone, with a large number of bowlders scattered over the surface. The subsoil to a depth of 36 inches is a heavy clay loam or clay containing an increasing amount of crumbly ferruginous sandstone with depth.

The type is the result of the decay of highly ferruginous sandstone. It occurs as a relatively narrow area on the high ridges which form a part of Red and Shades mountains, and contains numerous iron mines. On account of its rough and mountainous topography, very little of the type is under cultivation. However, when farmed, good yields of cotton and corn are secured, and it appears to be a strong soil. At present it is mainly forested with longleaf and shortleaf pine and oaks. It is probably best adapted to fruit growing and forestry.

As the type is held mainly for its mineral rights, it is difficult to estimate its agricultural value. When capable of cultivation, however, it should bring $10 or $20 an acre.

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

Mechanical analyses of Upshur loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20270	Soil	8.0	14.1	4.5	11.4	11.0	38.6	12.6
20271	Subsoil	7.2	16.1	4.7	11.0	9.4	29.9	21.6

UPSHUR STONY LOAM.

The soil of the Upshur stony loam to an average depth of 9 inches is a red sandy loam, the immediate surface being gray when dry. The subsoil is a heavy sandy clay tending to a clay loam at 36 inches.

The surface is hilly and mountainous, consisting of long ridges with steep slopes on each side. Some of the type is very stony, while a portion is rock outcrop. It is derived from a brown sandstone belonging to the "Coal Measures," the rock not being exposed to form soil, except in steep areas on the crest of Shades Mountain.

The native growth on this type consists of oak and other hardwoods. When tillable the soil seems naturally strong, being able to hold moisture and fertilizers well. Yields of truck, cotton, and corn above the average are reported. The growing of cowpeas with the corn and cotton would be profitable. The only field of alfalfa seen in the county was on this type, and it appeared to be mak ing a satis-

factory growth. The more stony areas should be allowed to remain in pasture.

The building of summer cottages and hotels on this type of soil outside of Birmingham has stimulated the growing of truck, to which it is particularly suited in certain areas because of a loose, open, granular structure, caused by the particles of clay tending to adhere to the sand grains, giving it the appearance of a sandy loam.

Owing to the limited area of this soil and its distance from market, it has a rather low value, from $5 to $15 an acre.

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

Mechanical analyses of Upshur stony loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20266, 20268.....	Soil.....	0.1	2.9	9.8	34.9	11.7	21.1	19.3
20267, 20269.....	Subsoil.....	.0	2.9	7.9	33.0	12.8	18.6	24.8

DEKALB FINE SANDY LOAM.

The surface of the Dekalb fine sandy loam to an average depth of 8 inches is a light grayish yellow fine sandy loam when wet, becoming gray when dry. On the flat-land areas it contains few, if any, stones, while on the high mountain ridges and slopes it may carry a variable percentage of flat sandstone, with occasional bowlders. On the ridges south of Jones Valley and in the southern part of the county near the Tuscaloosa County line the increased amount of flat shale results in a stony loam phase. This does not differ greatly from the true type.

A peculiarity often noticed is the large amount of clay and silt around each grain of soil, and frequently this gives the soil the appearance of containing a much higher percentage of sand than is really the case. On the slopes the percentage of sand is greater and the soil deeper than in the more level areas.

From 8 to 36 inches the subsoil is a brownish-yellow fine sandy loam to sandy loam, which becomes heavier with depth, tending toward a loam in texture. In some places, notably near Warrior, the subsoil is red, but no appreciable difference in crop yields could be detected in areas of this phase. In other cases the subsoil may be mottled yellow and red or grayish and red. In some cases the subsoil at 36 inches becomes a sandy clay.

The Dekalb fine sandy loam is naturally well drained, is not considered droughty, and the retentive subsoil is not so compact as to prohibit the passage of gravitational water downward or the upward rise of capillary moisture in times of drought. It is generally easy of

cultivation, can be plowed when quite wet, and does not bake. Much of the type is located north of Opossum Valley and is within easy reach of market or shipping points. This location, together with its adaptation to market gardening, make it a favorite with truckers.

The Dekalb fine sandy loam is a residual soil derived from the disintegration of the underlying stratified sandy shales and sandstones composing the "Coal Measures."

Originally the type was heavily forested, mainly with longleaf pine, with a tendency for different species of oak to predominate in the second growth.

From 10 to 15 bushels of corn and from one-fourth to one-third bale of cotton per acre are average yields on this soil, although occasionally larger yields are reported where fertilizers are used and deep tillage and crop rotation practiced.

Although the above crops give profitable yields, the land is better adapted to truck than any other crop. During seasons of average rainfall two crops of Irish potatoes can be grown on the same soil. The yield of the second crop is usually about one-half of the first, but even then it is profitable. When well fertilized, yields of 100 to 150 bushels per acre are secured. But one crop of sweet potatoes can be produced, yielding from 150 to 200 bushels per acre.

Spanish peanuts have been grown to some extent with profitable results. When fertilizers are used excellent yields of watermelons are reported. Growers receive from 10 to 20 cents for the melons, according to size.

Some truckers raise two crops of corn. Adams Early is ready for marketing in June, and a second crop may be sold for eating or matured for seed. With this intensive culture rotation is necessary, especially in the case of watermelons, which will not grow well on the same soil for two years in succession. In addition to the crops mentioned the other market garden crops succeed well.

Where the intensive garden systems prevail 2 or 3 acres is all one man can manage without hired labor. The truckers usually haul manure from the city and also have a farm compost heap. Large amounts of commercial fertilizers are used with good results. Little attention is paid to adapting the fertilizer to the soil or the crop, any kind of mixture handled by the local dealers being used.

In July and August the yields of truck are often seriously lessened by dry weather. If the land were plowed three times as deep as at present and stable manure applied, the water-holding capacity of the soil would be increased to a point where crops would suffer little in ordinary droughts. On truck lands cowpeas need not be grown unless the supply of humus can not be maintained by the use of stable manure.

Land of this type, excepting areas close to Birmingham, is held at $10 to $15 an acre, depending on location, improvements, and nearness to market.

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

Mechanical analyses of Dekalb fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20246, 20248.....	Soil.....	0.2	4.5	13.1	33.4	13.4	25.3	9.5
20247, 20249.....	Subsoil.....	.2	5.2	10.8	25.4	10.9	23.1	24.3

DEKALB SILT LOAM.

The soil of the Dekalb silt loam to a depth of 4 to 6 inches is a gray or ash-colored silt loam. When dry it has a very floury texture and a loose, open structure. In certain flat areas, notably south of Red Mountain, the soil has a higher percentage of subangular shale fragments and silt than elsewhere. This phase, while not largely developed, on account of its low situation is better able to withstand droughts than the more uneven areas. The proportion of sand of the finer grades is somewhat greater in areas where erosion has not been active.

The subsoil, from 8 to 36 inches, is a mottled reddish-brown and yellow heavy silt loam or in areas limited to a few acres a clay loam. Often on eroded areas the subsoil grades into a mass of disintegrated shale fragments at from 3 to 4 feet below the surface.

It is often hard to determine the boundaries between the shale loam and silt loam. However, the subsoil of the silt loam is always deeper and contains less shale chips than the shale loam. On high knobs or long ridges the subsoil may be red, but no agricultural difference could be noted in this phase, excepting that in wet seasons on account of its location it is better drained.

The Dekalb silt loam as a rule is not stony, but on the steep slopes there are outcrops of rock and areas with rough broken surface. Such areas are shown on the map by symbols.

In certain areas in the valley south of Leeds the coloring matter from the higher lying Upshur soil seems to have leached over the Dekalb, giving the soil a red color closely resembling, according to depth, that of the Upshur or Decatur soils. These areas were mapped either as the one or the other type in accord with the predominating characteristics.

While the Dekalb silt loam does not gully like the shale loam, on the steep slopes there is always a constant removal of surface soil to

lower levels, which occasions considerable variability in the depth, and consequently in the productivity of the soil.

The soil has the greatest area of any type in the county, and with others of the Dekalb series covers nearly the entire county outside of Jones, Cahaba, and Opossum valleys. The topography is mountainous to hilly and consists of highlands cut by streams into knobs and troughlike valleys. Most areas are situated near Birmingham or on railways or macadamized roads and the diversified products can be placed in good markets.

The Dekalb silt loam owes its origin to the breaking down of rocks of the Carboniferous age. These are mostly fine-grained sandstone and finely bedded shale. In places where the type joins the limestone soils fragments of chert and silicious limestone also occur, but the admixture of such material is too limited to have any influence on the agricultural value of the land.

Forests of oak, longleaf pine, and gum, with a scattering of beech, chestnut, and hickory, cover much of the type. The forested areas are utilized for pasture and afford fair grazing for seven months in the year.

As a rule, the Dekalb silt loam is easily cultivated, showing little tendency to pack and clod. It is used for general farming, cotton and corn being the staple crops. Sorghum, oats, and cowpeas do well. On the sandier areas all kinds of truck crops yield profitably, and the areas near markets are now used in market gardening. The same methods of cultivation are practiced as on the Dekalb fine sandy loam, the yields being about the same. A complete fertilizer is used with good results, and where peanuts or cowpeas have been plowed under or stable manure applied the fertilizer effects are even more striking. On the better farmed areas, one-third to one-half bale of cotton and 15 to 20 bushels of corn per acre are grown. Potatoes yield from 150 to 200 bushels per acre. With deeper plowing, crop rotation, and the growing of winter cover crops and cowpeas the yields would be considerably increased.

In common with other types of the county this soil, except in newly cleared fields, is deficient in humus. Many fields should be terraced to prevent washing. The construction of terraces in connection with deeper plowing would control to a large extent, or entirely prevent washing, and reduce the injury from drought. In growing late crops of corn or potatoes such changes in the methods of tillage would be especially valuable.

Considering the rapid industrial development taking place in the county, this type should be used more extensively for the production of fruit and vegetables for the local market and for growing cowpea hay and other forage crops as a basis for dairying. As in the case of the other Dekalb types, the hillier portions should be kept in pasture

or used for systematic forestry. The lower lying portions of areas adjoining streams are not in all cases well drained. These may generally be reclaimed by open ditches with tile laterals. Near shipping points and within a radius of 20 miles of Birmingham the market gardening has already come to be of some importance, but the possibilities have by no means been exhausted, the growers contenting themselves with small fields of 1 to 3 acres, on which the labor is nearly all done by the grower and his family. With the introduction of modern tools and the hiring of labor, larger areas could be planted and the profits increased in proportion.

This type is badly in need of organic matter. This deficiency, at least in the vicinity of Birmingham, can be supplied with stable manure, which can be had for the hauling. In fact, many stable keepers now make annual contracts for the removal of the manure, paying a fair price for the service.

At present much of the area of the Dekalb silt loam is held by large corporations as mineral lands and is not for sale. Near the trucking region in the vicinity of Birmingham it often sells for $150 an acre. In the hillier and more remote areas the value sinks to $10 an acre, although even here prices have an upward tendency. A common rental is $1 to $2 an acre, or a third of the cotton and one-fourth of the corn. The rent for trucking soils is low, being entirely out of proportion to the cash returns to the farmer.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Dekalb silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
18690,18692,20254...	Soil.....	0.6	1.6	0.9	7.9	9.3	65.1	14.3
18691,18693,20255...	Subsoil....	.5	1.4	.8	5.4	8.2	58.6	25.3

CONASAUGA CLAY.

The Conasauga clay to a depth of 4 inches is a gray or yellowish-gray clay or heavy clay loam of compact structure. The subsoil to a depth of 36 inches is a grayish-yellow clay. Throughout there are outcrops of the gray Coosa shales and in many places such outcrops are so numerous as to prevent cultivation.

The type occurs in portions of Jones Valley near Birmingham and is especially important about Bessemer. It is formed by the solution and disintegration generally of Coosa shales. Sometimes the weathering has been so perfect as to leave level areas having the appearance of extended stream bottoms. The elevation and character of

the soil, however, leave no doubt of its residual origin. Certain small areas, notably near Canastota and Ketona, are without surface soil, there being a level outcrop of rock sufficiently disintegrated to support a forest of cedar. These low places are spoken of as "flat woods"—a term applied also to similar places having more soil. Often on leaving the lowlands the type merges gradually into the Hagerstown loam.

The Conasauga clay where not cleared for building is mainly in forest of cedar, oak, and gum. On some portions of it wild clover seems to thrive and there are areas used for public pasture. Very little of the type, however, is under cultivation. When cleared it will probably be utilized as pasturage.

The following table gives the average results of mechanical analyses of samples of soil and subsoil of this type:

Mechanical analyses of Conasauga clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20240,20932.....	Soil.....	6.4	9.4	2.9	6.5	4.3	39.6	31.0
20241,20933.....	Subsoil.....	1.2	3.8	1.5	3.6	1.8	32.0	56.1

HUNTINGTON GRAVELLY LOAM.

The surface soil of the Huntington gravelly loam to a depth of 8 inches is, when dry, a light ashy-gray very silty loam, having a floury feel and containing a high percentage of angular chert fragments. The subsoil to 36 inches is a brownish-yellow very heavy silt loam mottled with gray and containing much cherty material and gravel.

The description given applies to the area found near East Lake. In the northern portion of the county, however, there are small areas near the Hagerstown loam which are generally composed of wash from the Clarksville stony loam. These often contain larger fragments of chert and both the soil and subsoil are redder. This phase is similar in origin to the Huntington soils, the main difference being that it is derived from stonier and more gravelly soils. The type as a whole is an alluvial wash from higher lying areas of Clarksville, Hagerstown, and Decatur soils, with a predominance of Clarksville material, and the color and texture vary according as the material of one or another of these soils predominates.

The Huntington gravelly loam when well drained and fertilized produces good yields of cotton and corn. Owing to the high percentage of siliceous material and the insufficient supply of humus, the soil is not as productive as the other near-by limestone soils. Much of the type is not well drained and in consequence the crop

yields are low. On the better drained areas corn yields from 10 to 15 bushels per acre and cotton about one-fourth bale per acre.

Much of the type is located near Birmingham, where, if it were properly drained, it would become a profitable trucking soil. Reclamation may be accomplished by open ditches and lateral tile drains to remove the surplus water and to lighten and warm the soil. With this treatment and the addition of both stable manure and fertilizers, corn and a number of trucking crops could be profitably grown.

Areas of this soil near East Lake, being desirable for building sites, sell at prices in excess of their agricultural value. In other places the price is regulated by the remainder of the farm, usually ranging from $8 to $15 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Huntington gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20256	Soil	1.6	5.1	3.2	8.4	9.0	61.0	12.1
20257	Subsoil	.9	3.0	2.0	5.9	4.8	63.9	19.8

HUNTINGTON SILT LOAM.

The surface soil of the Huntington silt loam, to a depth of 10 inches, is a light-brown friable loam or silt loam of relatively high organic matter content. From 10 to 36 inches the subsoil is usually a light-brown or brown mottled with yellow, and the texture is heavier than the surface soil. Owing to the high percentage of silt, it is friable and breaks readily on boring. It has few stones, except along boundaries near the valley sides, and it does not crack badly in dry weather. The texture is variable, occasional sandy areas being found, but these are not extensive enough to constitute a separate type. In Shades Creek bottom the soils are often whitish or gray in the undrained and untilled areas. Portions of the creek valley mapped as the Huntington series have many characteristics of Dekalb soils, and in many instances it was difficult to separate the types in a satisfactory manner.

The Huntington silt loam is an alluvial type formed by the deposition of material held in suspension by streams at high water. It is found in narrow strips along some of the streams in nearly all parts of the area. Without doubt, the type is the most durable soil in the county. Corn, the principal crop, yields from 25 to 35 bushels per acre, and from one-half to three-fourths bale of cotton can be secured in favorable seasons. In the valleys near cities truck is an

important product. The soil is adapted to all the staple garden crops. Two crops of sweet corn and a succession of other crops can be raised each year.

Although subject to overflow, the higher lying areas of this type have good drainage, and there are many tracts that could be easily improved by straightening stream channels and installing some drainage system. In many instances irrigation, using a hydraulic ram or steam pump, coal being very cheap, could be profitably carried on. With the development of market gardening on more intensive lines, irrigation will undoubtedly follow.

Fertilizers are not generally used, and it has been found that, notwithstanding the natural fertility of the soil, corn can not be grown in succession more than two or three years without a serious diminution of the yield. When some other crop is alternated with the corn the yields are maintained for a much longer period. Judging from the rank growth of stalk made by both corn and cotton, the soil contains an abundance of nitrogen and consequently only phosphate and potash should be applied. Deeper plowing, since it permits a more extensive root system and the storage of more water, will be found to greatly improve the soil where corn or truck crops are to be grown.

As the type is generally sold in connection with other soils, its agricultural value can not be given.

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

Mechanical analyses of Huntington silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20264	Soil	0.7	1.4	1.9	10.2	12.0	59.0	14.9
20265	Subsoil	2.1	5.6	3.6	8.5	8.9	48.1	23.7

DECATUR CLAY LOAM.

The soil of the Decatur clay loam to a depth of 6 inches or less is a dark reddish-brown clay loam. It has few stones, but a small amount of sand and a variable amount of iron concretions are found. The soil is slightly granulated and consequently is not so adhesive as the subsoil. Nevertheless it is plastic when wet and shrinks greatly on drying, forming surface cracks.

The change from soil to subsoil at about 6 inches is distinctly marked. The reddish-brown color of the soil stops abruptly and is replaced by a light-colored red to reddish-yellow heavy clay loam or clay. The subsoil may extend to a depth of several feet with little

variation in color and texture. The content of iron concretions and stones is greater than in the surface soil. The deep red color, which becomes lighter with depth, is due to an excess of iron in the soil, some of which may have come from higher lying areas of the ore-bearing rock that gives rise to the Upshur soils.

The deep surface cracks which extend several inches in the subsoil afford an ingress for water during rains. This loosens the soil and aids erosion—a prevailing feature of the type on the slopes which are not terraced and have no vegetation to hold the soil. On all sloping fields the knolls are a lighter red where the surface soil has been washed away. In many cases a large proportion of the fields have been denuded of soil and the yields greatly diminished. In such places corn will barely produce seed, and cotton is unprofitable, until the red subsoil is plowed repeatedly and has had incorporated with it enough humus to form a new soil. With deeper plowing, a more general use of green and stable manures, and terracing, the excessive erosion would be largely stopped. The surface cracks also tend to dry the soil, and the crops may suffer in seasons of prolonged drought. Unless properly handled, the soil tends to bake in hard clods, and to secure the best tilth possible it must be plowed when in the right condition of moisture. Disk plows are recommended, as the soil does not adhere to the mold board as in the case of a turning plow. After each rain a hard crust forms, necessitating frequent cultivations in order to prevent loss of moisture.

The rolling topography promotes good surface drainage, but the compact subsoil does not readily allow surface water to escape. This defect could easily be remedied by underdrainage. The shallow plowing practiced and the small amounts of organic matter contained in the soil tend to reduce its water-holding capacity and a shallow surface root system is developed, so that crops suffer more from drought than they would under better cultivation. Subsoiling, although not practiced, would be of great benefit, as would also the plowing under of cowpeas and green manures.

The Decatur clay loam is found mainly in Jones, Opossum, and Cahaba valleys, occurring next to the Conasauga clay and Huntington silt loam. On account of its nearness to Birmingham and its location on macadamized roads and railroads, it is becoming a favorite truck soil. Its heavy texture makes it especially suited to the growing of such crops as tomatoes and cabbage, while cowpeas, garden peas, and sweet corn do very well.

This type is residual, being derived through the solution and filtration of the Coosa shales and Knox dolomite, which form the floor of the valleys above mentioned. As the rocks have only a small percentage of insoluble material, it is estimated that the solu-

tion of several thousand feet of limestone was necessary to form the present depth of soil.

The Decatur clay loam was originally forested with a heavy growth of cedars, longleaf pine, and hardwoods. It was among the first soils farmed in the county, producing large yields of corn, wheat, and cotton, though the acreage of cotton was small. At present the type is utilized largely for market gardening.

As much of the type lies around Birmingham, where it will ultimately be used for building lots, it sells in excess of its agricultural value, bringing from $50 to $100 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Decatur clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20244	Soil	1.3	3.5	3.8	12.1	11.4	46.6	21.0
20245	Subsoil	1.0	2.6	2.6	8.8	11.0	40.2	33.5

HAGERSTOWN STONY LOAM.

The Hagerstown stony loam to an average depth of 8 inches is a light-brown to reddish-yellow silt loam containing a variable quantity of small fragments of shale or impure limestone. The subsoil to a depth of 36 inches is a reddish-brown or reddish-yellow silt loam becoming slightly heavier with depth. It is often impossible to bore to a depth of 3 feet, owing to the quantity of rock fragments.

The type has a rather open, loose structure, and the stone content tends to promote aeration and drainage. It can be plowed when wetter than either the Hagerstown loam or the Decatur clay loam, as its tendency to clod and bake is not so marked. It does not gully so readily as some of the other types.

The Hagerstown stony loam is found in Jones, Cahaba, and Opossum valleys. It occurs on the foothills and often connects areas of Hagerstown loam with the Clarksville series. It is formed from the Knox dolomite and Coosa shale of Cambrian and Silurian age, and the rock fragments found in the soil are the less soluble remnants of these formations.

Where not under cultivation, the type supports a growth of scrub oak and shortleaf pine. It is well suited for pasture. Of the cultivated crops corn, and especially cotton, do very well, the former yielding from 15 to 20 bushels and the latter one-half bale to the acre. By the combined use of manure and fertilizer, together with the growing of cowpeas and deeper plowing, these yields could be greatly

increased. On the southern and western slopes peaches and all fruits should do well.

Land of this character is valued at $15 to $50 an acre, depending on location and improvements.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Hagerstown stony loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20260, 20262.....	Soil.....	1.5	6.2	5.1	9.3	6.2	57.4	14.6
20261, 20263.....	Subsoil.....	1.1	3.8	3.0	6.3	6.1	51.4	28.4

WABASH CLAY.

The Wabash clay is a very heavy black clay loam or clay with an average depth of 6 inches, underlain by a grayish-brown clay which becomes grayer to a depth of 36 inches.

The type consists mainly of alluvial material, with a slight admixture of colluvial material from adjacent soils. In times of high water it is mostly overflowed.

At present the Wabash clay is left in forest and used exclusively for pasture. If cleared and drained, it should produce good truck crops, such as cabbage, tomatoes, and sweet corn, for which there is a ready market in Birmingham.

Only a limited extent of the Wabash clay is found in the county, and as it occurs near the city it will probably be used mainly for factory and building sites.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Wabash clay:

Mechanical analyses of Wabash clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20272.....	Soil.....	1.0	3.3	2.2	6.5	5.0	48.3	33.7
20273.....	Subsoil.....	1.3	2.6	1.6	5.4	4.8	50.0	34.2

CLARKSVILLE STONY LOAM.

The fine earth of the surface soil of the Clarksville stony loam is a light gray to whitish sandy or coarse silty loam. The soil has the whitish color when dry, and in that condition the material has a floury, ashy feel. With the soil is mingled a varying amount of sand and a large percentage of gravel consisting of angular chert

fragments of a grayish color, or yellowish when stained by iron. The amount of cherty material upon the surface, where of the finer grades, varies from 20 per cent to possibly 50 per cent of the soil, while in places on ridges and slopes the accumulation is much greater. In such places there is little true soil, and the subsoil is reached at depths ranging from 5 to 35 inches. It is usually impossible to bore more than 20 inches on account of the abundance of chert.

As the Clarksville stony loam erodes very readily, it follows that the lower parts of all hillsides consist of soil derived in a large measure from higher lying areas through the agencies of washing and soil creep. Such areas often occur as a narrow grayish belt skirting a hill and are closely allied to the Clarksville gravelly loam, but it was impracticable to show such areas on a map of the scale used in the survey owing to their limited extent. In some low-lying areas where drainage is not good the subsoil may be gray and heavy with clay and silt, but as the type is generally well drained such areas are of infrequent occurrence.

This type of soil is very friable, does not bake, and can be plowed when quite wet. It is very easily eroded, however, and it often presents the appearance of a gullied waste. No effort is made to protect the land from erosion. On account of its rolling, hilly, or mountainous topography, open structure, shallow plowing, and great lack of humus, it does not retain water readily and suffers from drought as well as erosion.

The Clarksville stony loam is of residual origin, being derived through solution and disintegration from the Knox dolomite of Cambrian and Silurian age and also from Fort Payne chert of the lower Subcarboniferous age. The latter formation appears to be a dolomitic limestone with siliceous layers. Doubtless hundreds of feet of rock have been reduced in the making of 1 foot of soil. All traces of limestone have long since disappeared, only the siliceous silty material and flinty chert remaining.

Areas of this type of soil are located in the northeastern part of the county between Jones and Opossum valleys, ending in the mountain of Rough, stony land in the northern part.

The original forest growth was mostly longleaf pine. Where this has been removed it is replaced by a mixture of oaks, with some chestnut. Only the less stony areas are cultivated. Owing to its origin and high percentage of chert it is not naturally a productive soil, though when fertilized cotton yields from one-fifth to one-fourth bale per acre. Corn does not do so well, yielding from 10 to 15 bushels per acre.

To provide humus the growing and plowing under of leguminous crops is recommended. If cowpeas are sown in every crop of corn and cotton when it is laid by, the soil will soon be stocked with sufficient

humus to make the use of commercial fertilizers more profitable. The incorporation of organic matter will also lessen erosion and increase the water-holding capacity of the soil. Land of this type of soil should be plowed from 8 to 10 inches deep.

Orchard culture is beginning to be practiced in the county, and the Clarksville stony loam is well adapted to fruit. In other Alabama counties this type successfully produces Elberta peaches and apples. At Birmingham Elberta peaches retail at from 15 to 30 cents a dozen, according to size and time of season. If given proper care and fertilization, fruit trees will succeed better than any other crop for which the soil could be used. The rougher areas, however, should be kept in forest.

In Lauderdale County the result of a single fertilization test made on this type of soil by the Alabama State Experiment Station and explained in Bulletin No. 145 of that station, shows that all fertilizers give profitable yields, but that phosphoric acid combined with cottonseed meal or some other nitrogen carrier gives the best results.

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

Mechanical analyses of Clarksville stony loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20242	Soil	5.8	11.2	4.9	9.9	8.4	50.9	8.9
20243	Subsoil	10.6	13.1	5.1	9.9	8.6	39.5	13.3

DEKALB SHALE LOAM.

The soil of the Dekalb shale loam, to a depth of about 8 inches, is a light-brown or, when dry, gray silt loam or loam of fine floury texture. Interspersed with the surface soil is from 30 to 60 per cent of flat shale chips a fraction of an inch thick.

From 8 to 30 inches the material is a very heavy silt or clay loam, tending to a clay where the parent rock is finer textured. It varies in color from a yellow to a light reddish or mottled gray, being mottled red and gray in low places where the drainage is not good. The amount of shale fragments in the subsoil increases with depth until it becomes a mass of disintegrated shale, through which it is usually impossible to bore.

Where the shale fragments are abundant the soil can be plowed when wet with little danger of baking. It seldom becomes lumpy except where the surface soil has been removed by erosion and fresh subsoil is plowed up. Owing to the light nature of the soil and the high percentage of shale particles that are slowly absorbent it does

not take up water as rapidly as other soils and in consequence washes badly. It is not terraced, contains little humus, and is plowed very shallow, so that its absorptive capacity is limited and the crops are apt to suffer severely from drought. In places the material has the stratified appearance of rock, but it is so weathered that it crushes readily when bored. Where this type of subsoil prevails the soil is able to withstand drought better than elsewhere, because the soft, decomposed shale gives up water very slowly.

Owing to the hilly, rolling topography the Dekalb shale loam is well drained. In many cases it is the product of erosion, the finer material having been removed to lower levels, leaving behind the shale chips. On this account the type is found in the hilliest portions of the area and on the upland slopes. It consists of long, narrow ridges and valleys or rounded knolls, and is largely developed in the northern and western portions of the county.

The Dekalb shale loam is derived from the weathering of fine-grained rocks of the Coal Measures. These may be seen outcropping along the roads where erosion has been quite active. They vary somewhat in texture and give rise to some variation in the soil. As a result of this occasional areas are sandier than is typical. It is usually found in such areas that the amount of shale chips is less.

The virgin forests consisted largely of longleaf pine and oaks. With the cutting of the pines, oaks have largely taken their place, and some of the type is being cut the second time. Much of this type is held by large corporations for the mineral rights and little attempt is made to farm the land. For this reason, and because of its hilly topography and distance from railroads, it is not thickly settled. Most of the farming is done by tenants on shares. The average yield of cotton is about one-third bale, and of corn about 10 bushels per acre.

If the soil were plowed a little deeper year by year and crops of cowpeas turned under, and if the fields were terraced and winter vetch or some other hardy annual were sowed in the fall to prevent washing, the best areas would produce profitable crops. It is not uncommon for thrifty gardeners to buy a small farm and by careful tillage pay for it with the proceeds of a sale of truck in two or three years.

From the fact that scuppernong and muscadine grapes grew profusely, it is probable that they and other varieties adapted to the climate would do well if given proper culture. The soil is strikingly similar in texture to some of the grape soils in New York State. Occasional apple trees seen were making a healthy growth, and orchards should do well.

The results of fertilizer tests made by the Alabama State experiment station 2 miles northwest of Tidwell on soil closely allied to this

type indicate that the greatest profits follow the use of cotton seed and phosphate.

Exclusive of mineral rights land of this type of soil brings from $5 to $10 an acre, depending on improvements and location.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Dekalb shale loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20250, 20252.....	Soil.....	3.0	4.9	1.6	2.8	7.7	59.7	20.4
20251, 20253.....	Subsoil.....	1.9	4.7	2.0	4.4	1.8	53.2	31.6

HAGERSTOWN LOAM.

The soil of the Hagerstown loam consists of 6 or 8 inches of a reddish-brown loam, containing a few stones and iron concretions. It has a looser and more open structure than the Decatur loam, but is heavy enough to puddle and bake if plowed too wet. The subsoil to a depth of 20 inches is a heavy red crumbly silt loam, grading into a clay loam at 36 inches. This material may be many or a few feet deep, owing to the irregularity with which the limestone rock dissolves. In some places, notably north of Birmingham, the Coosa shales outcrop. With this exception, the type is not stony.

Owing to its level and gently rolling topography, the type does not erode badly except on knolls, where "galled spots" are a conspicuous feature. The type is usually well drained, except in a few low areas where it joins the Conasauga clay. The drainage is also good, as is indicated by the uniform weathering to a solid yellowish red. In a few instances, where the subsoil is mottled or gray, imperfect drainage is shown.

In origin the Hagerstown loam is a residual soil. It is derived through decomposition and filtration from the Knox dolomite and Coosa shales formations. The more soluble parts of the limestone have largely disappeared, leaving only the insoluble residue to make the present soil.

Originally the Hagerstown loam was heavily forested, chiefly with cedars, pine, and a few oaks. On the limestone outcrops cedars now grow, but the second growth is largely oak. At present unfarmed areas grow up thickly with dog fennel, and the bottom land is covered with a thick growth of Japan clover, which furnishes good pasture.

As the soil is naturally deep and well drained and grows clover profusely, there is no doubt that alfalfa would do well, and if inoculated, fertilized, and kept sweet with lime there is no reason why the crop should not prove profitable.

It is common practice to plow the soil in the fall in order to improve the physical condition. It would be a good plan to sow oats or winter vetch as a winter cover crop, to prevent leaching and to lessen erosion. As upon other types, no regular rotation of crops is followed on the Hagerstown loam. The soil, however, is better supplied with humus than many others, because of the custom of sowing cowpeas or peanuts in the corn. Some stable manure is used. This is obtained from Birmingham, near which city the type is developed.

Some farmers are beginning to use the disk plow. This is superior in some ways to the ordinary turning plow, although the 2-horse turning plow cuts a deeper furrow.

In farming this type of soil, the use of commercial fertilizers is general. A mixture analyzing 10–2–2 is commonly used, but, whatever the ratio, the proportion of phosphoric acid is always high. The fertilizers are used with little regard to the specific needs of the crop to be grown or of the individual field. If each farmer would make careful tests of the different brands, there is little doubt he would be able to determine upon a course of treatment that would greatly increase crop yields. Home-mixed fertilizers have proved profitable in some areas, a saving in the cost of materials adding to the net gains.

Before the war the Hagerstown loam was largely under cultivation and was recognized as a strong soil. At present corn yields 15 to 25 bushels and cotton one-third to one-half bale per acre, depending on the care in cultivation. Oats produce 15 to 20 bushels per acre, cowpeas about the same, peanuts 50 to 75 bushels, and tomatoes 75 to 150 bushels.

Farms composed of this type of soil bring from $75 to $100 an acre, the price varying with location and the character of improvements. Near Birmingham its value is too high to warrant use in the production of general farm crops.

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

Mechanical analyses of Hagerstown loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
20258	Soil	0.3	2.9	2.3	11.7	24.8	42.3	15.9
20259	Subsoil	1.4	1.9	1.5	7.0	15.9	39.5	33.1

ROUGH STONY LAND.

The Rough stony land comprises those portions of the area which are so rough and stony as to prohibit cultivation. In most cases the topography is so uneven as to make farming unprofitable because of

the tendency to excessive erosion and the difficulty of carrying on farm operations. Many large bowlders lie half buried in the soil, and the removal of most of these will probably not be accomplished until land values have greatly increased.

The areas mapped as Rough stony land should by no means be considered valueless; there are many small areas of an acre or less that can be farmed successfully, while nearly all of it may be utilized for pasturage.

On the limestone areas cedars grow abundantly and on other areas other trees grow luxuriantly. The type should be kept as far as practicable in forest, and under proper management profitable yields of lumber could be secured. In some instances valuable quarries of limestone and chert have been opened. The type has a low agricultural value, being held mainly for its mineral or timber rights.

ROCK OUTCROP.

Owing to the displacement of the strata before mentioned it happens that the more resistant rock will often resist weathering and be left as Rock outcrop. Such places have, whenever possible, been indicated by symbols, and usually occur in the form of narrow strips suited only for forestry.

SUMMARY.

The Jefferson County area lies in the north-central part of the State of Alabama and comprises 719,360 acres, or 1,124 square miles. It is the seat of the most extensive coal, iron, and limestone deposits in the South.

The county has two main topographic divisions—the Cahaba Valley and the valleys of Jones and Opossum creeks, and the much dissected upland to the north and west of these valleys. The elevation varies from less than 240 to 1,400 feet, with an average of 500 to 800 feet above sea.

The important rivers are Little Cahaba, Warrior, and Locust Fork.

Transportation facilities are good. In addition to nine main railroads there is an excellent system of macadamized roads.

The principal cities and towns are Birmingham, with its numerous suburbs, and Bessemer, Ensley, Leeds, Trussville, and Warrior.

The climate is exceptionally mild and favorable to a wide variety of staple and special crops. Snow is rare, and freezing weather seldom lasts for more than a few days each winter. The rainfall is ample for crop growth and generally well distributed throughout the year.

Industrial development has stimulated trucking and general produce farming. The staple crops in general are corn and cotton with some forage crops. Dairying interests are being extended.

Farm labor is chiefly colored and is well paid owing to competition with the mines and other industrial enterprises.

Deeper plowing and more frequent tillage should be practiced.

Winter cover crops should be sown on all cotton and corn fields in order to prevent erosion and leaching, and at the same time to add humus to the soil.

Systematic rotation should be introduced.

More hogs and farm stock should be kept. Goats and sheep will do well in forested portions and on nonagricultural land.

Thirteen soil types representing eight series were mapped in the county. As regards manner of formation these soils are of two broad classes, namely, alluvial and residual.

The alluvial soils are the Wabash clay, Huntington gravelly loam, and Huntington silt loam. The first two are important soils, but of limited extent. The last named is a very strong soil and is a favorite for the growing of corn and truck.

The residual limestone soils include the Decatur clay loam, Hagerstown stony loam, Hagerstown loam, and the Clarksville stony loam.

The Decatur clay loam is a strong soil, but the bulk of the type is located close to growing cities, and is held at high prices for building sites. It is naturally suited to a wide range of crops, and with careful tillage and the use of manures can be profitably used for trucking.

The Hagerstown stony loam is well adapted to fruit growing and to the usual farm crops.

The Hagerstown loam is a good general farming soil and its use for market gardening is increasing.

The Clarksville stony loam is the best soil for the growing of tree and bush fruits. Systematic orcharding would be very profitable here.

The Dekalb shale loam, residual from shale, occurs in the rougher upland country. Hillside areas have many of the physical characteristics of the grape soils of the Northern States. The famous scuppernong grape grows especially well on the hilly ridges and slopes. The type is susceptible of improvement and under modern methods is a profitable farming soil. Where the slope permits, Irish potatoes will succeed. It is better adapted to Irish than to sweet potatoes.

The Dekalb silt loam is of very wide extent and has certain variations of texture that make it a favorite for general farming and trucking. Market gardening will prove more profitable on this type than any other form of agriculture.

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