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SOIL SURVEY OF HALE COUNTY, ALABAMA

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COUNTY SURVEYED

Hale County is in the west-central part of Alabama (fig. 1). Black Warrior River forms its western boundary. Greensboro, the county seat, is about 100 miles northwest of Montgomery, 90 miles southwest of Birmingham, and 175 miles north of Mobile. The area of the county is 646 square miles, or 413,440 acres.

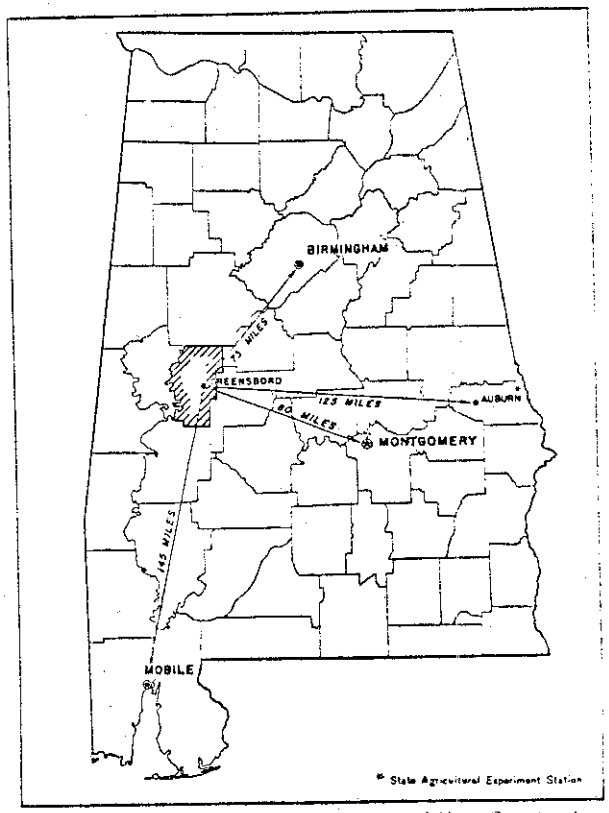

FIGURE 1.—Sketch map showing location of Hale County, Ala.

This county lies wholly within the geological division known as the Gulf Coastal Plain, the original surface of which was a smooth plain sloping to the south. This has been severely eroded to develop the present relief. The county comprises three areas, each having a distinctive relief.

The first area is the so-called sandy or hilly upland overlying the Tuscaloosa and Eutaw geologic formations. The character of these materials has been conducive to erosion, gullying, and the development of a comparatively hilly to rough broken relief, characterized by some fairly broad ridges, numerous narrow ridges, nearly level but narrow valley floors, and extensive hilly and rough intervening areas. Surface drainage and, in most places, internal drainage of the soils range from good to excessive, except in the first-bottom lands. The elevation of this hilly

upland part of the county ranges from 60 to 300 feet above sea level. The stream valley floors range from about 200 feet to about 1 mile in width. Many large areas are too hilly or rough to be well adapted to tillage.

The second area of well-defined relief embraces what is broadly designated as the "prairie land" or more specifically, the "black prairie lands" and "post oak lands." It includes that part of the county underlain by or closely associated with the Selma chalk formation. The soil materials of this area appear to have been eroded even more rapidly than have the soil materials from the Eutaw and Tuscaloosa formations. Owing apparently to the greater solubility of the Selma chalk, as contrasted with the Tuscaloosa and Eutaw formations, its greater resistance to percolation, and consequent more rapid run-off, erosion of the ridges has more nearly kept pace with drainage and stream erosion. Consequently, the relief is considerably less pronounced than that of the sandy upland part of the county. Elevations above sea level range from 40 to 100 feet. The landscape is characterized by broad undulating to gently sloping and gently rolling ridge lands with occasional comparatively narrow hilly strips or steep slopes, bordering the bottom lands of some of the larger drainageways and streams. The strips of bottom land are nearly level and range from 200 feet to 1 mile in width. Surface drainage is good except on the first bottoms. A comparatively small part of this area is classed as nontillable soil because of steepness of slope.

The third area of contrasting relief is that including the valley of Black Warrior River. This area roughly parallels the river and ranges up to 6 miles in width within Hale County. The relief in general is nearly level to undulating. The land comprises the first and second bottoms. The first bottoms lie from 15 to 25 feet above the normal water level of the river and probably occupy about 50 percent of the valley floor. The land is nearly level, broken by slight swells, numerous shallow depressions, and a few old river channel beds. Surface drainage is undeveloped and consequently slow. The second bottoms lie approximately from 30 to 55 feet above the normal water level of the river, or about 110 feet above sea level. Their relief is noticeably more undulating than that of the first bottoms, and surface drainage, although comparatively slow, has developed sufficiently to remove surface water from much of the area. Only a small part of the first bottoms is sufficiently well drained for tillage, whereas most of the land on the second bottoms or terraces is sufficiently well drained for this purpose.

All the drainage eventually reaches Black Warrior River. The larger interior streams flow in a general west and southwest direction to this river which, in turn, flows southward. Locks along it maintain a 6-foot channel for boat and barge navigation.

Throughout the sandy uplands the predominant trees are pines—mainly loblolly or old-field pines. Shortleaf (rosemary) pine is widely but less abundantly distributed, and longleaf pine is scattered throughout the northeastern part of the county. Hardwoods, principally oaks, with some hickory, grow on some of the broad ridges. Scattered here and there are such hardwoods as beech, chestnut, poplar, sweetgum, walnut, cucumbertree, and sycamore. There are a few

cedars, especially throughout the central and southern parts of the sandy uplands. The prairie land supports a growth of grass and cane. Sumter clay in places supports a forest growth of scrubby cedar, hackberry, Osage-orange, and dogwood.

The history of the white man in Hale County began in 1816, when a small group of pioneers settled near the present site of Greensboro. Other settlements soon sprang up in the northern part of the county. The southern, or prairie part, which was covered to a large extent with cane and grasses, offered an attraction to the cattle and livestock raisers. The uplands were settled for the most part by pioneers from Tennessee and northern Georgia, and the prairie land attracted settlers from the limestone counties of Virginia and the Carolinas.

Hale County was created by an act of the State legislature in 1867 and was named in honor of Lt. Col. Stephen Fowler Hale. Its territory was taken from parts of Greene, Perry, Marengo, and Tuscaloosa Counties.

The Federal census reports a population of 26,553 in 1880, an increase to 31,011 in 1900, and a decline to 24,289 in 1920. In 1930 the total population, all classed as rural, numbered 26,265, composed of 26 percent native white, 0.1 percent foreign-born white, and 73.9 percent Negro. The white population is predominantly of English descent. The density of population in 1930 was 40.7 persons a square mile. In that year Greensboro had a population of 1,795; Akron, 793; Moundville, 757; Newbern, 389. These towns serve as local trading centers and as shipping points for farm produce.

Markets for the farm products are reasonably accessible. Cotton, the principal crop, is handled by private dealers and cooperatives, but at present much is held in warehouses against Government loans. Most of the cottonseed goes to mills at Tuscaloosa and Selma. Raw milk, together with milk products, comprises the second most important farm product sold. Raw milk is handled by shipping stations for the condensery at Tuscaloosa and for the supply of raw milk for Birmingham and Tuscaloosa. A small quantity of milk is handled by a cheese factory at Uniontown. Cattle are marketed in Tuscaloosa, Birmingham, and Montgomery. Lambs are shipped cooperatively through Montgomery to the Nashville livestock market, from where most of them find their way to eastern markets. Poultry and eggs are handled by local retail dealers, by farmers' cooperatives who ship to eastern markets, and by poultry dealers who collect them by truck and dispose of them in Birmingham and Montgomery.

Hale County is well supplied with transportation facilities. The Southern Railway system serves the county, and all sections are within 18 miles of railroad shipping points. A main or trunk line connecting New Orleans with Birmingham traverses the northwestern part, and a branch from Selma passes through Greensboro and connects with the main line at Akron. A short line from Demopolis to Selma passes through Gallion in the extreme southwestern part.

All-weather highways traverse the county; one extends north and south, through Moundville, Greensboro, and Newbern, and a second extends west and east from Eutaw through Sawyerville and Greensboro. United States Highway No. 80 passes through the southwestern part, touching Prairieville. Improved county roads are well distributed, and some of them are surfaced with all-weather material.

Both bus and truck service are maintained between the main trading centers and Tuscaloosa, Birmingham, Montgomery, Selma, and other points.

The water supply is satisfactory and is sufficient for both human and livestock needs. Artesian wells are obtained throughout Black Warrior River Valley and all except the northern fringe of the lime or prairie belt. Good artesian flows are obtained at a depth ranging from 300 to 450 feet, and heavier flows are obtained at greater depths. Flows of the shallower wells generally diminish gradually, and many cease after a period of several years. These wells serve, however, as good sources of water in places where the weakened pressure is supplemented with a pump. Throughout the hilly or sandy upland part of the county water is obtained from dug wells at a depth ranging from 15 to 75 feet. Springs are also common in this section, and the larger streams serve as a permanent source of water for livestock.

School facilities for both white and Negro children are available and in general are convenient to all sections of the county except, possibly, to a few isolated farms along Black Warrior River. Practically all the schools for white children have been consolidated into single units for each school district. County-owned busses transport the pupils to and from school.

CLIMATE

The climate is characterized by short cool humid winters and long warm summers. Although the summer seasons are long, they are not characterized by maximum temperatures higher than those experienced in the Middle West section of the United States. The short winter season is variable, especially as regards temperature. Cool periods of several days duration are interspersed by shorter periods of moderate weather. The ground occasionally freezes to a depth of 1 or more inches but remains in this condition only a short time. The date of the average last killing frost is March 14 and that of the first is November 14, giving an average frost-free season of 245 days, which is sufficient to mature all the crops commonly grown. Frost has been recorded as late as April 10 and as early as October 21. Early spring vegetables can be grown, but the winter is too severe for truck crops, except collards and turnips. Fall-sown crops, such as oats, wheat, vetch, and Austrian Winter peas, ordinarily are grown successfully. Ribbon cane for subsequent planting must be buried in a pit to be preserved from the time the crop is harvested in the fall until planting time in the spring.

The average annual rainfall of 50.88 inches is fairly well distributed for most of the crops commonly grown and especially so for cotton. The heaviest precipitation takes place during winter, but the rainfall during spring and early summer is ordinarily sufficient to insure good crop growth. Late summer and early fall are comparatively dry, a condition which, although detrimental to some late-maturing crops, is very desirable for cotton and the harvesting of other crops. In general, climatic conditions are healthful and are favorable for a widely diversified type of agriculture.

Variations of the weather from the average are of considerable significance in determining the growing of crops. Infrequent early summer droughts reduce the yields of corn, hay crops, and forage

crops. Exceptionally wet periods during midsummer injure cotton by causing the squares and bolls to drop and favor the development of the cotton boll weevil and cotton wilt or anthracnose. Wet weather in late summer and fall seriously hinders the successful harvesting of most of the important crops, especially cotton, and cause such crops as peas and hay to deteriorate on the ground. Cold periods during the winter damage Austrian Winter peas and fall-sown grains, especially those sown a little late. During the spring, periods of high humidity succeeded by hot periods are conducive to the development of aphids on Austrian Winter peas and rust on oats, wheat, and other small grains. Late spring frosts or prolonged cool spells during the spring occasionally damage early planted cotton, and it is sometimes necessary to replant. Late spring frosts following mild winters frequently damage tree fruits, especially apples, peaches, and pears. Very little crop damage is experienced from wind or hail.

Certain weather variations are of value in destroying crop pests. Severe winters generally suppress the insect population of the following season, especially that of the boll weevil. They are also destructive of the adult beetle of the corn rootworm (*5*).[1] Dry summer weather is destructive of the worms in the development stage.

Important data recorded by the United States Weather Bureau station at Greensboro, which are representative of climatic conditions throughout the county, are given in table 1.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Greensboro, Hale County, Ala.*

[Elevation, 220 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1904)	Total amount for the wettest year (1929)	Snow, average depth
	° F.	° F.	° F.	*Inches*	*Inches*	*Inches*	*Inches*
December	48.3	76	10	5.34	3.77	6.48	0.1
January	46.7	78	6	5.02	5.08	6.07	.4
February	49.5	83	−5	5.03	4.62	7.97	.6
Winter	48.2	83	−5	15.39	13.47	20.50	1.1
March	56.3	91	20	5.45	2.82	13.49	.4
April	64.1	90	30	4.40	1.65	4.55	(1)
May	71.9	99	40	4.13	3.00	7.45	.0
Spring	64.1	99	20	13.98	7.47	25.49	.4
June	78.8	104	46	3.59	1.19	2.97	.0
July	80.5	105	60	4.55	6.93	2.70	.0
August	80.0	100	56	4.46	2.78	1.75	.0
Summer	79.8	105	46	12.60	10.90	7.42	.0
September	76.0	98	44	2.96	.72	4.54	.0
October	65.0	95	30	2.43	.08	4.67	.0
November	55.0	84	18	3.52	3.03	12.87	(1)
Fall	65.3	98	18	8.91	3.83	22.08	.0
Year	64.3	105	−5	50.88	35.67	75.49	1.5

[1] Trace.

[1] Italic numbers in parentheses refer to Literature Cited, p. 60.

AGRICULTURAL HISTORY AND STATISTICS

The agriculture practiced by the pioneers was primarily of a subsistence type. Corn, wheat, and rice were the important crops, and such crops as tobacco, indigo, and cotton were grown on a small scale. The production of rice, tobacco, and indigo soon diminished to insignificance, but the acreage in corn, wheat, oats, and cotton gradually increased.

By 1879, the acreage of cotton had increased to nearly 70,000 acres, which was more than one-half of the total acreage cropped in that year. The acreage in cotton continued to increase until 1900, at which time it constituted over 67 percent of the cultivated land. Shortly thereafter the acreage began to decrease, the sharpest decline taking place about 1914, the time at which infestation by the boll weevil first became serious throughout this part of the Cotton Belt. The greatest reduction in acreage owing to activity of the boll weevil occurred on the prairie or lime soils. After 1921, the production of cotton again rose until the acreage occupied about 60 percent of the total cultivated land. Since that time, the acreage has been curtailed sharply as a part of the crop-reduction program of the United States Department of Agriculture. Even while being ravaged by the boll weevil, this crop remained the most important grown in the county.

Hay, which also has largely been a cash crop, is the only other crop showing a compensating increase in acreage. It increased by 14,000 acres from 1900 to 1920. Corn, the most important subsistence crop, decreased by 10,000 acres during this period. A part of the reduced acreage of cotton and probably all the reduced acreage of corn were caused by the 22-percent drop in population between 1900 and 1920. The increased hay acreage represents a diversion of fields formerly in cotton in the prairie or lime land section to Johnson grass.

During recent years, a concerted effort to adjust agriculture to a more self-sufficing basis has met with notable success. The recent artificial reduction in the cotton acreage has been accompanied by an increased acreage of corn, forage crops, and particularly of cover crops for improving the fertility of the soil. The last mentioned crops have shown a fairly steady increase in acreage since about 1926. According to the county agent, the acreage of fall-sown leguminous cover crops in 1925 was 500 acres; in 1929, 2,180; and in 1934, 4,850.

The present-day agriculture consists primarily of the production of cotton and corn on the sandy soils. The raising of beef cattle and dairying on a commercial scale are practically confined to the lime and post-oak areas. During recent years, dairying has expanded, particularly in the prairie or lime section. According to the county agent, about 200 farmers sold milk or cream in 1926. By 1934, this number had consistently increased to 1,200. The value of dairy products sold in 1934 was approximately $300,000, or about 20 percent of the value of the 1934 cotton crop and more than 50 percent of the value of the 1932 cotton crop which was the last to be produced before the price was stabilized by the Government.

Practically all farmers grow field peas, peanuts, ribbon cane, or sorgo, and sweetpotatoes as subsistence crops. Gardens in which vegetables, greens, and some small fruits are grown, are common. A few hogs, cows, and poultry are raised for household requirements

by practically all farmers. Table 2, compiled from the Federal census data indicates the trend of agriculture since 1879.

TABLE 2.—*Acreage of the principal crops in Hale County, Ala., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Cotton	69,995	90,738	93,643	88,081	42,702	65,768	35,711
Corn	43,254	41,923	42,077	29,551	32,017	26,535	41,716
Oats	3,671	2,990	2,680	1,574	389	1,479	1,056
Dry peas			809	2,014	2,225	380	2,375
Sugarcane		289	629	351	347	305	206
Sorgo		319	155	81	606	454	(1)
Sweetpotatoes	1,214	1,358	1,247	1,427	1,328	1,286	2,042
Peanuts		47	287	858	1,043	514	2,121
Hay	36	1,425	2,064	10,679	16,792	11,726	[2] 21,709
Alfalfa						553	245
Legumes cut for hay					456	245	7,556
Other tame hay			2,052	10,406	16,161	9,943	[3] 13,928
Wild hay			12	273	175	985	

[1] Not reported.
[2] Includes sorghums for silage and fodder.
[3] Includes wild hay.

The outstanding change between 1929 and 1934 was the enormous increase in the acreage devoted to feed crops. Corn was grown on 41,716 acres in 1934, an increase of 57 percent over the acreage for 1929. The acreage and production of hay practically doubled.

Accompanying this increase in feed crops was a gain of more than 6,000 cattle and over 1,500 hogs between 1930 and 1935. A slightly larger number of mules and 44 percent fewer horses were reported in 1935 than in 1930. The number and value of livestock in 1920, 1930, and 1935 are given in table 3.

TABLE 3.—*Number and value of domestic animals and poultry in Hale County, Ala., in stated years*

Livestock	1920		1930		[1] 1935
	Number	*Value*	*Number*	*Value*	*Number*
Horses	1,987	$213,136	1,514	$104,443	843
Mules	4,167	552,580	5,130	500,593	5,157
Cattle	22,165	866,610	18,475	709,030	24,906
Sheep	4,146	46,648	2,033	8,228	1,344
Goats	1,860	4,708	1,281	2,795	845
Swine	16,955	161,091	9,771	90,627	11,327
All poultry	68,061	53,817	[2] 65,131	[2] 48,197	[2] 90,541

[1] Value not reported.
[2] Chickens only.

There were 4,666 farms in the county in 1935, with an average size of 56.9 acres. These farms occupied 64.2 percent of the total area. Of the 265,569 acres included in farms, 147,111 acres, or 55.4 percent, were available for crops. The size of farms on the sandy uplands ranges from 40 to 360 acres in the smoother parts. The smaller farms are on the more productive soils. Throughout the rougher northeastern quarter of the county and on the first bottoms of Black Warrior River, tracts of several thousand acres are held by individuals and lumber companies. Throughout the prairie section the farms range from 360 to 2,000 acres in size.

Complete commercial fertilizer has been used for many years and still is commonly and widely used. Most of it is applied for the benefit of cotton. Some is mixed at home. The most common formulas contain from 3 to 4 percent of nitrogen, 8 to 12 percent of phosphoric acid, and 4 to 5 percent of potash. Some nitrate of soda is used for side dressing cotton and corn. Nitrate and phosphate fertilizers are generally used for small grains. Legume cover crops are taking the place of nitrate fertilizer to a considerable extent. A small quantity of crushed limestone is used. The Federal census of 1930 reports an expenditure of $172,657 in 1929 for commercial fertilizer on 2,595 farms. The material is handled both by private dealers and by farmers' cooperatives.

Farm labor, mostly Negro, is plentiful. Most of the farm work is performed by tenants and their families, and the demand for hired help is not great, except for picking cotton. Wages are low and are paid mostly by the piece or day. In 1929, $98,823 was expended for labor on 1,035 farms.

Farm tenancy has shown an almost continuous increase since the census of 1880. In 1935, tenants operated 77.3 percent of the farms; owners, 22.5 percent; and managers, 0.2 percent. Most of the better land is owned by a comparatively few white people and is rented to tenants in tracts ranging from 40 to 250 acres. The farms owned by colored people are situated mainly in the more hilly sections and range in size from 40 to 300 acres. Most of the land is rented for cash or its equivalent in cotton. A small proportion is rented on shares. The terms of share renting are very flexible, varying according to the tenant and the amount and fertility of tillable land. A common arrangement is for the landowner to furnish all work animals, feed, implements, and seed; also one-half of the fertilizer and cost of ginning, and for the renter to furnish the labor and the rest of the fertilizer and cost of ginning. Under such an agreement, the cotton lint, cottonseed, and corn are divided equally between owner and tenant. In addition, the tenant ordinarily has the use of land sufficient for a garden, sweetpotatoes, peas, and pasture for a cow or two and a few hogs.

Equipment for the average rented farm is comparatively simple and inexpensive. Most of the tillage implements are of the one-mule type. A few of the larger farms operated by white farmers have tractors and tillage implements adapted to them. The county agent reports approximately 70 trench silos in the county, about 30 of which were constructed during 1934. Nearly 80 percent of the draft animals are mules. Very few draft animals are raised, but most of them are shipped in from Tennessee and Missouri.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of distinct soil layers or horizons called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is

studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil [2] and its content of lime and salts are determined by simple tests. The drainage, both internal and external, and other external features, such as the relief, or lay of the land, are taken into consideration, and the interrelation of the soil and vegetation are studied.

The soils are classified according to their characteristics, both internal and external, with especial emphasis on those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into classification units. The three principal ones are (1) series, (2) type, and (3) phase. In places two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a map, but must be mapped as (4) a complex. There are areas of land, such as swamp and mixed broken hilly land, which have no true soil; these are called (5) miscellaneous land types.

The most important of these groups is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics, the same natural drainage conditions, and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Akron, Ruston, Cahaba, Norfolk, and Oktibbeha are names of important soil series in this county.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Akron fine sandy loam and Akron loam are soil types within the Akron series. Except for the texture of the surface soil these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping and, because of its specific character, is generally the soil unit to which agronomic data are definitely related.

A phase of the soil type is recognized for the separation of soils within a type, which differ in some minor soil characteristic that may, nevertheless, have an important practical significance. Differences in relief, stoniness, and the degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, there may be parts which are adapted to the use of machinery and the growth of cultivated crops and others that are not. Even though there may be no important differences in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect

[2] The reaction of the soil is its degree of acidity or alkalinity, expressed mathematically as the "pH value." A pH value of 7 indicates precise neutrality; higher values indicate alkalinity and lower values, acidity.

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to the growth of cultivated plants. In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS

About one-third of the area of Hale County is occupied by light- to dark-colored "prairie" [3] soils and associated heavy clay timbered soils. Sandy upland and river-terrace soils are distributed throughout the rest of the county. The prairie and associated heavy clay soils are confined to the southern part; the sandy uplands are in the central and northern parts; and the river terraces lie in an irregular belt along the western edge and along the larger creeks extending into the sandy uplands.

The color, texture, structure, organic content, acidity, and drainage conditions of the soils in the sandy uplands and on the river terraces differ markedly from those features of the prairie and associated heavy clay soils. These differences are, in large measure, due to the underlying material, from which the soils have developed, and also to the subsequent aeration, oxidation, erosion, and leaching, which have taken place during their formation.

The soils of the sandy uplands have been formed from beds of unconsolidated sands and clays. In general, such parent material gives rise to acid soils characterized by a more or less sandy texture, friability, crumbly structure, and low content of lime and plant nutrients.

The prairie soils are developed from beds of soft white chalk, and they contain much lime, especially in the subsoil. The soil material grades into chalk beds. Samples from these areas have run as high as 95 percent of calcium carbonate. Associated with these prairie soils are areas of heavy clay soils, most of which were covered originally by forest. These soils appear to be developed from beds of heavy clays overlying beds of chalk. Such soils have heavy plastic clay surface soils and subsoils and are decidedly acid.

A clear relationship exists between the characteristics of the soils and the agriculture practiced on them. This will be dealt with under the descriptions of individual soils in subsequent pages. The fine sandy loams of the Akron, Red Bay, Orangeburg, Ruston, Luverne, Amite, Cahaba, and Kalmia series, because of their texture, friable consistence, and good drainage, warm early in the spring and are very easily tilled. Although these soils are low in organic matter and the mineral plant nutrients, their physical properties favor ready response to the addition of commercial fertilizers and manures. A

[3] Locally the dark-colored soils developed under a grass vegetation are called "prairie" soils. Their grass vegetation and the characteristics associated with it, are due more to the soft, highly calcareous parent material from which they have developed than to the climatic conditions. Such soils are included with the Rendzina group and should not be confused with the Prairie soils of Iowa and adjacent territory.

very large proportion of these soils is devoted to the production of cotton, and both the soils and the climate are favorable to this crop. Cotton on these soils matures early, and a fair crop is made before the boll weevil does much damage. The production of cotton meets the need of a cash crop, and it is and has always been the only crop on which both the landowners and tenants can obtain credit and security for rent, supplies, and fertilizer. The farmers understand the growing of cotton and are adverse to the substitution of another crop. It can be stored and kept for a long time, as it is nonperishable and deteriorates very slowly.

Corn is the second crop in importance. The yields throughout the county are dominantly low. The soils of the first bottoms and terraces, such as Ochlockonee, Cahaba, and Kalmia, are the best soils of the sandy group for the production of corn. In the prairie section, the Houston and Bell soils are the best. This is accounted for by the high content of organic matter and favorable moisture conditions essential to growing corn. Corn is produced to greater or less extent over all parts of the county and on all soil types, for feeding work animals, fattening hogs, and grinding into meal for household consumption.

Throughout the sandy uplands and river terraces, garden vegetables, peanuts, field peas, soybeans, oats, wheat, sorgo, ribbon cane, and a small quantity of fruit are grown for home consumption. The agriculture on the sandy uplands is more diversified than that possible on the prairie soils and associated heavy clay soils, and therefore a more self-sustaining agriculture is practiced.

Prior to the advent of the boll weevil, the prairie soils were used almost exclusively for the production of cotton and were considered some of the best soils in the State for this crop. They returned good yields without the addition of fertilizer. The prairie soils and heavy clay soils, however, warm later in the spring, and the bolls form later than on the sandy soils, so that weevils ruin much of the crop. Therefore the production of cotton on these soils is uncertain.

Prairie soils are difficult to handle; that is, they must be plowed and tilled within a narrow range of moisture conditions, as they become extremely hard when dry. Strong work animals and heavy machinery are required for their successful cultivation. They are held in fairly large tracts and are cultivated mainly by Negro tenants who have endeavored to grow cotton despite the infestation of the boll weevil. Failure of the land to return sufficient income from general farm crops to pay the rental in recent years, together with new discoveries by the agricultural experiment station regarding pasture grasses, has resulted in much of it being used for pasture. At present the agriculture of this section consists mainly of livestock raising and dairying, together with the production of Johnson grass and a small amount of cotton and corn. Cotton and corn are produced principally on the Oktibbeha and associated Vaiden and Eutaw soils, but only a small acreage is grown on the Houston and Sumter soils. Tame hay, mainly Johnson grass, covered more than 10,000 acres in 1929, and production has increased since that date. Much of the hay is sold, and the rest is fed to cattle and work animals. Some of the best developed areas of Sumter clay produce good alfalfa, black medic, oats, Dallis grass, hop clover, and sweetclover (*Melilotus*). Catalpa

clay is used mainly for pasture and to less extent for the production of corn and cotton. The most profitable system of agriculture on these prairie soils is that based on livestock raising and dairying. Cattle can graze on the pastures the greater part of the year.

One of the outstanding unfavorable features today, in connection with the soils of Hale County, is that a large proportion of the land is so rough and broken as to render it unsuitable for general farming. Such areas are included in the Guin soils, undifferentiated, and in the hilly phases of the Luverne, Ruston, and Susquehanna soils. A large part of the land once cultivated has been laid waste through destructive erosion. Much of this land is so steep that it should have remained in forest.

The large number of different soils can, according to their soil characteristics, be grouped in three general classes: (1) Soils of the sandy uplands and river terraces, (2) soils of the clay uplands and prairies, and (3) miscellaneous soils and land types.

In the following pages the soils of the county are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 4.

TABLE 4.—*Acreage and proportionate extent of the soils mapped in Hale County, Ala.*

Soil type	Acres	Percent	Soil type	Acres	Percent
Akron fine sandy loam	17,024	4.1	Oktibbeha fine sandy loam	1,536	0.4
Akron loam	1,472	.4	Vaiden fine sandy loam	4,416	1.1
Red Bay fine sandy loam	3,968	1.0	Vaiden fine sandy loam, buckshot phase	3,392	.8
Orangeburg fine sandy loam	3,136	.7	Vaiden clay loam	6,720	1.6
Ruston fine sandy loam	6,528	1.6	Kutaw clay	4,032	1.0
Ruston fine sandy loam, hilly phase	43,520	10.5	Leaf fine sandy loam	7,744	1.9
Luverne fine sandy loam	1,088	.3	Leaf fine sandy loam, high-terrace phase	2,304	.6
Luverne fine sandy loam, hilly phase	21,824	5.3	Leaf clay loam	4,800	1.2
Norfolk fine sandy loam	1,216	.3	Catalpa clay	21,312	5.1
Amite fine sandy loam	2,304	.6	Guin soils, undifferentiated	72,256	17.5
Cahaba silt loam	6,656	1.6	Susquehanna fine sandy loam	1,920	.5
Cahaba fine sandy loam	6,400	1.5	Susquehanna fine sandy loam, hilly phase	2,240	.5
Cahaba loamy fine sand	4,928	1.2	Myatt fine sandy loam	9,280	2.2
Cahaba-Kalmia fine sandy loam	512	.1	Ochlockonee fine sandy loam	8,448	2.0
Kalmia fine sandy loam	5,824	1.4	Ochlockonee-Bibb silt loam	28,416	6.9
Houston clay	6,656	1.6	Augusta silt loam	8,320	2.0
Houston clay, shallow phase	8,640	2.1	Alluvial soils, undifferentiated	30,272	7.3
Sumter clay	17,408	4.2	Swamp	2,752	.7
Sumter-Oktibbeha clay	5,632	1.3	Total	413,440	
Sumter clay, eroded phase	1,984	.5			
Heil clay	17,472	4.2			
Oktibbeha clay	9,088	2.2			

SOILS OF THE SANDY UPLANDS AND RIVER TERRACES

The sandy uplands comprise all the Akron, Red Bay, Orangeburg, Ruston, Luverne, and Norfolk soils, which have been developed from unconsolidated beds of clays, sandy clays, and sands.

The fine sandy loam types of the Akron, Red Bay, Orangeburg, Ruston, Amite, Cahaba, and Kalmia series dominate the agriculture of the county. These soils are light colored, ranging from light gray to brown in the surface layers, and are leached of most of the soluble mineral plant nutrients. As indicated by their color, their content of organic matter is small. They range from slightly acid to strongly acid in reaction.

The relief ranges from smooth broad divides and flat hilltops to narrow winding ridges and are favorable for tillage. Natural surface and internal drainage are everywhere good. The soils warm early in the spring and are the first in the county on which agricultural operations are begun. The sandy clay subsoils are sufficiently permeable that movement of moisture in the surface layer and subsoil is good. These soils can be built to a good state of productivity.

Nearly all areas of the sandy loam types of the Akron, Red Bay, Orangeburg, Ruston, Amite, Cahaba, Kalmia, and Norfolk series, and Akron loam are under cultivation. They produce a large part of the cotton, vegetables, and fruit, and much of the corn grown in the county.

Probably 25 percent of the total area of the hilly phases of the Ruston and Luverne fine sandy loams is cultivated. These soils are irregular in character and are especially subject to erosion.

The Amite, Cahaba, and Kalmia soils are on the well-drained terraces and are used largely for the production of cotton and corn.

The original vegetation on all these soils was pine. Loblolly or old-field pine predominated, rosemary pine was widely distributed but less plentiful, and longleaf pine was scattered throughout the northeastern part. Hardwoods, principally oaks, together with some hickory, grew on some of the broad ridges. Widely distributed but less common hardwoods were beech, chestnut, poplar, sweetgum, black gum, cherry, walnut, cucumbertree, and sycamore. There was a small amount of cedar, especially throughout the central and southern parts of the sandy uplands. At present, the same forest trees, with the exception of chestnut, occupy much of the hilly land and the upland soils of the miscellaneous group.

Akron fine sandy loam.—Akron fine sandy loam, Akron loam, Red Bay fine sandy loam, and Amite fine sandy loam are commonly known as "red land." Akron fine sandy loam is very similar to Greenville fine sandy loam and Red Bay fine sandy loam, but it differs from those soils in that it is heavier and slightly darker, as it has been derived in large measure from heavy clays. It is closely associated with the acid soils of the black belt, particularly Vaiden fine sandy loam, but it has developed in higher positions than the black-belt soils, consequently it is more completely oxidized and weathered.

A description of a profile of Akron fine sandy loam follows:

0 to 5 inches, grayish-brown or brown mellow and friable loamy fine sand or fine sandy loam. The thickness of this layer ranges from 3 to 6 inches.
5 to 12 inches, red heavy sandy clay which is more friable than the material in the underlying layers. In eroded areas this layer is absent.
12 to 72 inches, deep-red compact tough to brittle clay containing some sand.
72 inches+, red compact heavy sandy clay containing layers and in places streaks of white and gray. Finely laminated clay and sand of the original formation underlies most of this soil.

The reaction of the material in the surface layer in most places is slightly acid, and that of the lower layers ranges from moderately to strongly acid.

Many of the areas adjacent to the post-oak, or lime, soils are more yellow than typical, approaching and grading into Vaiden fine sandy loam. Below the surface layer in such areas is reddish-yellow stiff

compact brittle clay containing some sand that grades, at a depth of about 36 inches, into more yellow somewhat more crumbly clay or sandy clay.

The relief of Akron fine sandy loam comprises smooth broad undulating or gently rolling ridge tops. Surface drainageways, for the most part, are shallow, except in areas bordered by hilly or rough land, into which gullies or steep-sided drainageways extend. Both surface and internal drainage are satisfactory for good growth of plants.

This is one of the most extensive soils of the group. The largest body lies in an irregular belt extending from the Perry County line westward to Greensboro and Sawyerville. Less extensive and more irregular bodies are in the vicinity of Havana and northeast of New Prospect.

This is one of the most desirable agricultural soils of the county, and probably 95 percent of the land is tilled. Natural fertility is fairly high, response to fertilization is good, and a high level of productivity is comparatively easily maintained once it is created. The soil is adapted to a wide variety of crops and is easily handled. Cotton is the most commonly grown crop and normally occupies at least 85 percent of the land. Consequently this crop ordinarily is grown several consecutive years on the same land. Average yields are about one-half bale an acre, but under a good system of cropping and fertilization, yields of one bale of lint cotton are not uncommon. Corn ranks second in acreage and occupies from 5 to 10 percent of the land. Yields range from 15 to 40 bushels an acre, although occasionally yields of over 50 bushels are obtained from carefully managed fields.

Peas, peanuts, soybeans, cowpeas, sweetpotatoes, and velvetbeans are commonly grown and yield well. Small grains, mostly fall-sown oats, together with a smal quantity of winter wheat, are grown by a few farmers. Yields range from 18 to 40 bushels an acre of oats and 10 to 15 bushels of wheat. Mixed oats and Austrian Winter peas, oats alone, and mixed sorgo and field peas are commonly grown for forage, but the total acreage devoted to these crops is small. A very small acreage is in alfalfa. Areas of this soil, which are in a good state of fertility and in which acidity is corrected by an application ranging from 2 to 3 tons of lime and 500 pounds of superphosphate to the acre, should make some of the most desirable land in the county for the production of alfalfa. Further fertilization should not be necessary for several years. The soil is also well adapted to the growing of forage and pasture crops for hogs (7). A few pecan groves have been developed, and peach, fig, apple, pear, and plum trees for home use produce fairly well and are common about most farmsteads. Both yields and quality of these fruits and nuts range from fair to good. All the common truck and garden crops produce well and yield good-quality products for home consumption.

As no experimental results are available for this soil, the recommendations made for crops and fertilizers for Red Bay fine sandy loam should be followed for this soil. Akron fine sandy loam is probably better suited to the production of alfalfa than is Red Bay fine sandy loam, and yields of crops should approximate those

produced on Red Bay fine sandy loam. This soil, like all other friable upland soils, is greatly improved by the growing and turning under of cover crops. The use of vetch, crimson clover, or Austrian Winter peas is almost indispensable for the production of corn on this land, as the decayed organic material not only supplies plant nutrients but also helps to retain moisture for growing crops.

Akron loam.—All Akron and Red Bay soils having a loam surface layer have been designated as Akron loam on the soil map. The surface layer in general is deeper and darker brown and the underlying material is less hard or compact than the corresponding layers of Akron fine sandy loam.

A brief description of a profile of Akron loam follows:

0 to 8 inches, brown or dark-brown mellow and friable loam.
8 to 30 inches, dark-red clay that ranges from fairly friable to nearly as hard and compact as the clay underlying Akron fine sandy loam.
30 inches +, brownish-red clay which is lighter colored and slightly heavier than the material in the layer above.

Practically all areas of this soil are associated with or surrounded by larger areas either of Red Bay fine sandy loam or Akron fine sandy loam. The areas associated with the Red Bay soil probably are underlain by gravelly material at a depth ranging from 6 to 10 feet, whereas those associated with the Akron soil are underlain by heavy sandy clay or clay, that grades, at a depth ranging from 6 to 12 feet, into the finely laminated material of the Eutaw formation.

Few areas of this soil exceed 60 acres. The relief is less sloping than the average relief of Akron fine sandy loam. Surface drainage of the typical soil ranges from fair to good, and the land is sufficiently drained to allow good growth of plants. The natural fertility is high; in fact, this is probably the most productive soil in the county. Crop yields average somewhat higher than those obtained on the other soils of the group. The crops grown and fertilizers recommended are similar to those mentioned for Akron fine sandy loam. Possibly a higher percentage of corn is grown on this soil than on the fine sandy loam. Practically all of the land is tilled.

Included with Akron loam in mapping are several small comparatively poorly drained depressions and shallow drainageways, ranging from 3 to 12 acres in size, surrounded by areas of the Akron and Red Bay soils east of Greensboro and Stewart. The material of this included soil is variable, but it is, in most places, composed of a 4- to 20-inch layer of brown loamy material deposited by runoff water from the immediately surrounding Akron or Red Bay soils, underlain by gray, mottled with brownish yellow, clay. A few of these areas, particularly those in shallow depressions or sinks, have a very thin or no brown overwash surface layer. Natural surface and internal drainage are slow. Drainage is provided in some areas, however, by deepening or straightening the shallow drainageways, and in the depressions by cutting ditches through the surrounding higher lying soil to a natural drainageway. The depressions not so drained generally are wet during most of the year. Probably 10 percent of this included soil is cultivated. Most of the rest is pastured and supports a forest of oak, hickory, and sweetgum. The

cultivated areas are devoted mostly to corn, sorgo or ribbon cane for sirup, and sorgo and other crops for forage. Practically all of the areas are too poorly drained for the production of cotton. Yields of corn and forage crops are high on the few areas that can be cultivated, although little or no fertilizer is used. To produce cotton on these included areas, large quantities of phosphate and potash should be applied, in order to hasten the maturing and development of the cotton bolls.

Red Bay fine sandy loam.—Red Bay fine sandy loam differs primarily from Akron fine sandy loam in that the subsoil is somewhat more friable and is underlain, at a depth ranging from 3 to 6 feet, by gravelly or sandy material. In many places, the two soils grade imperceptibly into each other, but in their typical development they are distinctly different. The Red Bay soil is very similar to Amite fine sandy loam. The principal difference between these two soils is in their position with respect to stream terraces. The Amite soil occurs in a high-terrace position and the Red Bay soil in a much higher or upland position, as it is an old marine deposit.

A profile of Red Bay fine sandy loam shows the following characteristics:

0 to 6 inches, grayish-brown loamy fine sand or fine sandy loam.
6 to 50 inches, brownish-red or red heavy but friable fine sandy clay which is more friable than the material in the corresponding layer of Akron fine sandy loam.
50 inches +, red gravelly sandy material which in many places is sufficiently gravelly for use as road-building material.

This soil is much less extensive than Akron fine sandy loam. Most of the areas are in high benchlike positions much higher than the true terrace positions bordering the present valley of Black Warrior River. The largest bodies are immediately east and southeast of Moundville and east of Stewart.

Practically all of this soil is terraced and tilled. As it has a light-textured surface soil and a loose and friable subsoil, it absorbs rainfall readily, is easily tilled, and gives up moisture freely to growing plants. It is therefore well suited to all the crops commonly grown and is very responsive to good agricultural practices. It lends itself very favorably to a diversified cropping system. When cotton is fertilized with 600 pounds of a 6–8–4 fertilizer,[4] according to results obtained at the Prattville experiment field, by the Alabama Agricultural Experiment Station, on Red Bay fine sandy loam, the average yield over a period of 5 years is 1,117 pounds of seed cotton an acre. Corn, when rotated with cotton, produces an average of 34 bushels an acre in a 6-year period when 225 pounds nitrate of soda are applied as a side dressing. Other crops, including oats, soybeans, cowpeas, *Crotalaria*, peanuts, lespedeza, kudzu, and truck crops do proportionally well. More complete information relative to the different varieties of crops and their fertilizer requirements for this and related soils are contained in the section of this report on Agricultural Methods and Management. The cultural management of this and other related soils are dealt with in the same section. The use of winter cover crops or summer legumes is very beneficial to this soil, and the most economical yields generally are obtained by using

[4] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

either vetch, Austrian Winter peas, or crimson clover as a cover crop.

Orangeburg fine sandy loam.—Orangeburg fine sandy loam is recognized as one of the more friable soils of the county. It contains more sand in the surface soil and upper subsoil layer than Red Bay fine sandy loam with which it is closely related and associated. Other than being more sandy and friable in the upper two layers, it differs from the Red Bay soil in that it has a gray surface soil and a brownish-yellow or reddish-yellow upper subsoil layer.

A description of a profile of Orangeburg fine sandy loam shows the following layers:

0 to 7 inches, light-gray loamy fine sand.
7 to 10 inches, reddish-yellow or brownish-yellow fine sandy loam.
10 to 18 inches, red friable fine sandy clay loam.
18 to 45 inches, bright-red friable clay containing considerable fine sand.
45 inches +, light-red or reddish-yellow fine sandy loam splotched with gray and some yellow. The surface layer generally is slightly acid, and the lower layers range from moderately to strongly acid.

Most of the areas occupy ridge tops ranging from one-fifth to one-half mile in width. This is not an extensive soil, and few bodies exceed a few hundred acres. The largest area lies immediately east of Wedgeworth. Both surface and internal drainage are good.

This soil, like the related Red Bay fine sandy loam, has a mellow and friable surface soil and upper subsoil layer, rendering it well adapted to practically all the crops commonly grown in this locality. It also is very responsive to good management. It absorbs and gives up moisture freely to growing plants. Since it has a more sandy surface soil and upper subsoil layer than the Red Bay soil, it is easier to till than that soil, as it scours off the plows better and can be cultivated with slightly less power. With respect to crop adaptation, fertilizer requirements, and crop yields, according to results obtained on the Monroeville experiment fields, this soil does not differ particularly from Red Bay fine sandy loam. Alfalfa is not considered adapted to the Orangeburg soil. The average yield of cotton, when the land is fertilized with 600 pounds of a 6–8–4 fertilizer (which has proved the most profitable fertilizer used), was 1,060 pounds an acre. The average yield of corn, when grown in rotation with cotton that received a large application of mixed fertilizer the preceding year and when fertilized with 225 pounds of nitrate of soda an acre as a side dressing, was 31 bushels an acre. Other crops suited to the Red Bay soil are adapted to this soil, and yields under similar farm-management practices do not differ greatly on the two soils.

Ruston fine sandy loam.—Ruston fine sandy loam is very closely associated and related to the Orangeburg and Red Bay soils. It is most similar to the Orangeburg but differs from that soil in that it has a lighter colored upper subsoil layer and a much lighter colored lower subsoil layer. The surface features and soil characteristics are practically the same as those of the Orangeburg soil.

A profile of Ruston fine sandy loam shows the following layers:

0 to 6 inches, gray or brownish-gray loamy fine sand.
6 to 10 inches, yellowish-gray or grayish-yellow fine sandy loam.
10 to 18 inches, reddish-yellow friable fine sandy clay.

18 to 40 inches, yellowish-red or reddish-brown friable fine sandy clay which is slightly more compact than the material in the layer above.
40 inches +, brownish-red fine sandy clay material mottled and splotched with yellow and some gray.

The underlying material is much lighter in texture than the subsoil. This is not an extensive soil. The areas are scattered, and few of them include more than a few hundred acres each. The largest body is associated with Orangeburg fine sandy loam, north of Sawyerville. The relief is undulating or gently sloping, and the land everywhere is well drained.

Practically all of this soil is cleared, and most of it is tilled. It, like Orangeburg fine sandy loam, with which it is closely associated, is well suited to a diversified system of farming and produces large yields of crops under good management. Its responsiveness to good management, its productivity, its crop adaptations, and its fertilizer requirements, according to the results of experiments, are the same as for Orangeburg fine sandy loam. Any cropping systems suited to the locality may be used on this soil with excellent results, as it is well adapted to all the crops commonly grown, with the exception of the lime-loving crops. Cotton and corn are the main crops, and cotton is by far the dominant crop. Winter legumes have proved very beneficial in building up and maintaining the fertility of this soil. The different crops suited to this and related soils are discussed under the section on Agricultural Methods and Management.

Ruston fine sandy loam, hilly phase.—Ruston fine sandy loam, hilly phase, includes all rolling and decidedly sloping but not rough lands having profiles resembling those of the Ruston, Orangeburg, or Red Bay soils. The slope of this land ranges from 8 to 15 percent. Owing to its sloping position and erosibility, the profile of this soil varies considerably. The surface soil generally is gray or grayish-brown loamy fine sand, although in many small areas this material has been washed away entirely. The subsoil is reddish-yellow fine sandy clay which becomes heavier and redder with depth and is similar to that common to Ruston fine sandy loam.

This soil occurs either as bands along the edges of the smoother soils or as extensive rolling tracts throughout the northern part of the county, especially north of Melton. Because of the steep slope, drainage is excessive and erosion is a great hazard to cultivated land.

Probably 35 percent of this soil is tilled. The rest supports second-growth loblolly and rosemary pines and some hardwoods. The soil is well suited to forest, and, under present economic conditions, the steeper and more rolling parts are best utilized for this purpose. With careful terracing the soil on the gentler slopes can be held and made to produce fair to good crops. The same crops are grown as on Ruston fine sandy loam, but less of the land is devoted to cotton. This is because more farms on this soil are of the subsistence type. Common subsistence crops are corn, peanuts, peas, beans, and sweetpotatoes. Yields average less than those obtained on similar soils having smoother relief, but the well-terraced and fertilized land returns fair yields.

The same fertilizer practices are recommended for this soil as for Ruston fine sandy loam, but they are not so consistently followed. Owing to the rolling character of this soil and its susceptibility to erosion, great care should be taken to maintain terraces and to keep a crop on the cultivated land, in order to protect it from washing. Austrian Winter peas, vetch, and winter oats are particularly valuable for protection throughout the rainy season of winter and early spring. A cover of Bermuda grass, Dallis grass, and lespedeza, provided the soil is in a fairly productive state, not only protects the soil from erosion, but also affords good grazing. Kudzu is well suited to this soil and will produce a large quantity of grazing. Controlled grazing is very necessary on a kudzu pasture.

Luverne fine sandy loam.—Luverne fine sandy loam resembles Orangeburg fine sandy loam, but it differs in that the surface soil is shallower, the brownish-yellow subsurface layer that characterizes the Orangeburg soil is not present, and the subsoil, which is near the surface and is exposed in many places, is red or reddish-brown compact heavy fine sandy clay. This soil does not absorb or give up moisture to growing plants so readily as does Orangeburg fine sandy loam. It differs also from the Orangeburg soil in having micaceous loamy fine sand or light fine sandy loam underlying material at a depth of 3 or more feet.

A profile of this soil shows the following characteristics:

0 to 5 inches, gray loamy fine sand. In many places erosion has removed a large part of this layer.
6 to 36 inches, brick-red stiff compact clay containing some fine sand. This layer may extend to a depth of as much as 8 feet.
36 inches +, finely laminated gray clay and yellowish-red or reddish-yellow micaceous fine sandy material.

Probably 60 percent of the land is tilled, and the rest either is forested or is used for permanent pasture. Trees grow well, but the grazing value of the land is low unless desirable pasture grasses are established, fertilized, and properly cared for. Cotton occupies a greater acreage than any other crop. Because this soil occurs in sections where tillable land is scarce and farms are small, a greater proportion is devoted to subsistence crops, such as corn, peas, peanuts, and beans, than is used for this purpose on Akron fine sandy loam.

Since this soil has a heavy and compact subsoil beneath a shallow surface soil, it absorbs moisture slowly and also gives it up slowly to growing crops. It, therefore, is not so responsive to good management as are Orangeburg fine sandy loam and related soils. Yields of cotton normally range from one-fourth to one-half bale an acre, and yields of four-fifths of a bale on small areas have been reported, where cover crops are turned under or where the land is heavily fertilized. Recommendations for crops and fertilizers for Orangeburg fine sandy loam should be applicable to this soil. It is possible, however, that a lower rate of application but the same ratio of fertilizer ingredients should be used on this soil. In this soil, moisture becomes a more limiting factor in crop production than in Orangeburg fine sandy loam. The land possibly is just as responsive to oats and other winter and spring crops as is Orangeburg fine sandy loam, but yields of cotton and particularly corn are far less.

Luverne fine sandy loam, hilly phase.—Luverne fine sandy loam, hilly phase, includes areas having a relief that resembles that of

Ruston fine sandy loam, hilly phase, and profile characteristics of Luverne fine sandy loam. The relief is slightly greater than that of Ruston fine sandy loam, hilly phase. The slopes range from 8 to 20 percent. The surface soil, to a depth of approximately 5 inches, is brownish-gray loamy fine sand or fine sandy loam, which is underlain by a bright-red compact heavy subsoil. The sloping to hilly relief, combined with the slowly pervious subsoil, causes this soil to be subject to severe sheet and gully erosion. Erosion is constantly active even in forested areas, particularly in those that are frequently burned over.

Most of this soil lies north and northeast of Greensboro. It is less extensive than the hilly phase of Ruston fine sandy loam. The crops grown, fertilization, and the cultural methods practiced are almost identical for these two hilly phases, but yields average slightly less on this soil. The proportion of the land under cultivation also is less. The more rolling and hilly areas should be devoted to forestry or woodland pastures. Some lespedeza grows in the more sparsely timbered areas.

Norfolk fine sandy loam.—Norfolk fine sandy loam is recognized as the upland sandy soil having a gray surface soil and a yellow subsoil. It is closely associated with Ruston fine sandy loam and Orangeburg fine sandy loam and has very similar textural and structural characteristics.

Following is the description of a profile of typical Norfolk fine sandy loam:

0 to 6 inches, gray loamy fine sand.
6 to 14 inches, pale-yellow loam or fine sandy loam.
14 to 30 inches, yellow friable fine sandy clay.
30 inches +, yellow fine sandy clay, mottled and streaked with gray and yellowish gray. The material becomes lighter textured with depth.

Mapped with this soil north of Sawyerville are a few poorly drained areas, in which the soil is dark-gray fine sandy loam to a depth of 6 or 7 inches. Below this is finely variegated or mottled gray and yellow loam which grades, at a depth of about 16 inches, into faintly mottled bright-yellow and gray clay loam containing a few dark-yellow somewhat indurated aggregates. The moisture content below the surface layer is at most times noticeably higher than that of typical Norfolk fine sandy loam. These included areas are best suited to the production of sorgo, soybeans, and corn, or, where sufficiently extensive, they may be fenced off and used as pasture land producing carpet grass and lespedeza, if the surface water is removed.

Norfolk fine sandy loam is not extensive, and few areas exceed 40 acres. The bodies are scattered throughout the northern part of the county on ridges, on the lower edges of slopes, and bordering the valley floors of the larger streams. A few areas border the terraces between Moundville and Havana, and two are near Liberty Church east of Havana. The relief is gently sloping or undulating to gently rolling. The crops grown, cultural methods, and fertilization are practically the same as for the Orangeburg and Ruston fine sandy loams, according to results obtained at the experiment station. This is a good soil for the production of all the crops commonly grown, except those requiring lime. *Crops, fertilizers,* and yields, which are given for Orangeburg fine sandy loam on page 17, are applicable also to this soil.

Amite fine sandy loam.—Amite fine sandy loam is very similar to Red Bay fine sandy loam. The principal difference between the two soils is in their topographic positions. The Amite soil occurs on a benchlike or terrace position, ranging from a few feet to as much as 80 feet above overflow of the stream, whereas the Red Bay soil occupies a position ranging from 50 to 150 feet above the Amite soil. The Red Bay soil occurs on ridges and plateaulike positions surrounded by steeply escarped slopes which in many places contain numerous deep gullies that are constantly and progressively extending up into the fields.

Amite fine sandy loam has the following profile characteristics:

0 to 6 inches, brown friable fine sandy loam or loamy fine sand.
6 to 12 inches, reddish-brown friable fine sandy clay loam.
12 to 32 inches, red fairly friable fine sandy clay.
32 to 70 inches, same material as in the layer above, except that it is slightly lighter colored and contains some small gray mottles in places.
70 inches +, reddish-yellow loamy fine sand containing, in many places, rounded water-worn gravel.

The relief is nearly level or gently undulating, and terraces are seldom needed except along some slight escarpments. The sandy lower layers allow sufficient internal drainage for the satisfactory growth of crops. Surface drainage is slower than that of the red upland soils but is ample for all crops.

This soil is not extensive. Practically all of it lies on the second bottoms or terraces along Black Warrior River. The largest areas are southeast and west of Evansville and Akron. About 95 percent of the land is tilled. The crops grown on this soil and its fertilizer requirements are similar to those features of the Red Bay and Akron fine sandy loams, but yields possibly are slightly higher. Recommendations relative to crops, fertilization, and management of Red Bay fine sandy loam are applicable to this soil (p. 16). It is one of the most productive soils of this group.

Cahaba silt loam.—Cahaba silt loam occupies a low terrace position between areas of Cahaba fine sandy loam and areas of Ochlockonee-Bibb silt loam. In most places it is above normal overflow, but all the land is subject to overflow during periods of exceptionally high water.

A profile of this soil shows the following characteristics:

0 to 4 inches, brown friable loam or silt loam.
4 to 36 inches, reddish-brown or reddish-yellow firm silt loam or silty clay loam.
36 inches +, brownish-yellow stiff clay mottled with light gray and some rust brown. Finely divided mica is present in many places throughout the soil profile.

Included with Cahaba silt loam are a few areas, west and southwest of Powers, with a noticeably compact subsoil, although the surface layer is similar to that of the typical soil. Below the surface layer the material is decidedly stiff compact silty clay. The color gradually fades with depth. At a depth of about 38 inches, the material is dark-yellow or brownish-yellow, faintly mottled with yellowish gray, compact stiff silty clay. In other counties of the State, such areas are mapped as Wickham silt loam. Sandier material underlies some areas at a depth of more than 40 inches.

Cahaba silt loam is not extensive. Most of the soil is on low ridges or swells, closely associated with the river lowlands. The most

extensive areas are southwest of Moundville. The relief is nearly level or very gently billowy. Drainage ranges from fair to good.

Since practically all of this soil is subject to overflow during extremely high waters and probably is overflowed every 6 or 8 years, the surface soil is at least partly replenished by organic matter. The water recedes from the land slowly, consequently it is left in a fairly fertile condition and is somewhat benefited by the overflows. Practically all of this soil has been cleared and put into cultivation and is being used for general farm crops. About equal proportions of the land are planted to cotton and corn, and a part of the soil is devoted to sorgo and hay crops. This soil is well suited to all the crops commonly grown, and it produces large yields. Inherently it is one of the most fertile soils in the county. Only a small quantity of fertilizer is used, and most of it is used under cotton, in order to hasten maturity of the cotton bolls. It is possible that more phosphate and potash are needed than are applied in this manner. Fertilization should be similar to that for Ochlockonee-Bibb silt loam, and crop yields are about the same as on the cultivated areas of that soil. In some places corn is side dressed with from 50 to 100 pounds of nitrate of soda an acre.

Cahaba fine sandy loam.—Cahaba fine sandy loam is similar to Amite fine sandy loam except that the colors of the surface and subsurface layers are lighter. Normally this soil occupies a slightly lower position than the Amite soil which occurs on the highest parts of the terraces.

Following is a description of a characteristic profile of this soil:

0 to 5 inches, grayish-brown loamy fine sand.
5 to 12 inches, yellowish-red or yellowish-brown friable fine sandy loam.
12 to 40 inches, yellowish-red fairly friable fine sandy clay. The color gradually becomes more yellow and the texture more sandy with depth.

Between depths of about 10 and 25 inches the color in some areas is nearly as red as that of Amite fine sandy loam. In a few places mottled gray, yellow, and red stiff sandy clay is reached below a depth of about 24 inches.

Cahaba fine sandy loam occurs on the terraces, particularly of Black Warrior River, and on low swells of the first bottoms. Practically all of it lies from 10 to 40 feet above high-water overflows. A few small areas near the river are overflowed about every 7 to 10 years. The largest body is immediately west and south of Powers. The total area is greater than that of Amite fine sandy loam, and the soil is more widely distributed.

The relief ranges from nearly level to gently undulating, thereby affording utilization of some broad level continuous fields. Drainage is satisfactory for the production of all crops. The land is used for the same purposes as is Amite fine sandy loam. Natural fertility and crop yields are possibly slightly less than those reported for the Amite soil, but there is very little difference in yields under similar management.

Cahaba loamy fine sand.—Included under the designation, Cahaba loamy fine sand, are all the loamy fine sand and sand soils on the terraces and on the swells of the first bottoms. About 80 percent of this soil is reddish-brown loamy fine sand to a depth of about 20 inches. This material grades into brownish-yellow fine sand which, in turn, rests on loose pale-yellow fine sand below a depth of about 30 inches. The rest of the soil mapped is more yellow, the 3- to 5-inch surface layer being grayish-yellow or brownish-yellow loamy fine sand underlain by pale-yellow fine sand and, below a depth of about 30 inches, by pale-yellow or grayish-yellow loose fine sand. Many of the areas which border the river form natural levees consisting of brown or yellow sand or fine sand. The color gradually changes to grayish yellow below a depth of 12 or 14 inches.

The relief is more gently undulating or billowy than that of the finer textured Cahaba and Kalmia soils. Surface drainage is not so well developed as in those soils, but the subsurface material is so porous that drainage of this soil is excessive for good plant growth.

Practically all of this soil is widely distributed on the terraces of Black Warrior River and on low ridges or swells throughout the first bottoms. The largest area of typical soil is along the river northwest of Millwood. Most of the yellow variation is north of Akron.

Probably 50 percent of this land is tilled. Cotton, corn, peas, peanuts, melons, and sweetpotatoes are the most common crops grown. Yields are low because of the naturally small supply of plant nutrients and the excessively porous nature of the soil. The soil responds quickly to fertilization, but its fertility is maintained with difficulty because plant nutrients are readily leached from it. At lock 8 and in other locations along the river, enough clay is deposited during times of overflow to aid this soil in the conservation of moisture and plant nutrients. These areas, therefore, are fairly productive. Probably the best utilization for the sandier areas is forestry.

Cahaba-Kalmia fine sandy loam.—Narrow elongated low ridges or swells of Cahaba, Amite, and Kalmia soils and intervening parallel wet narrow shallow troughs or depressions of such soils as Augusta, Leaf, or Ochlockonee are designated on the map as Cahaba-Kalmia fine sandy loam. Because of the inclusion of the poorly drained soils and the difficulty of tilling the narrow strips of the better soils, this land is considerably lower in productivity than the typical Kalmia and Cahaba soils. Only a small proportion is cleared and tilled. The greater part supports a forest or is devoted to pasture. Yields of all crops grown on the better areas are somewhat lower than those obtained on Cahaba fine sandy loam. This soil is of very small extent, and most of it is associated with the first-bottom lands of Black Warrior River, especially northwest of Wedgeworth. The best uses for this mixed soil are forestry and pasture.

Kalmia fine sandy loam.—Kalmia fine sandy loam occupies a terrace position and is comparable in most respects to Norfolk fine sandy loam of the uplands. It is similar in structure and texture to Cahaba fine sandy loam, with which it is generally associated, even though the areas do not everywhere join. The Kalmia has a yellow subsoil, whereas the subsoil of the Cahaba is reddish yellow.

Following is a description of a typical profile of this soil:

0 to 6 inches, light-gray loamy fine sand and, in some places, loamy very fine sand.
6 to 15 inches, light-yellow fine sandy loam.
15 to 28 inches, bright-yellow friable fine sandy clay.

28 to 36 inches, yellow friable fine sandy clay containing some grayish-yellow and light-gray mottlings.
36 inches +, pale-yellow slightly compacted fine sandy loam, intensely mottled with gray. Some brown and red mottlings may be present.

Kalmia fine sandy loam occurs in the second bottoms along Black Warrior River. The greater part of this soil lies from 10 to 25 feet above overflow. Several small areas west of Akron and Moundville, however, are subject to overflow during extremely high waters, which occur at intervals ranging from about 5 to 8 years. A few small bodies are along the larger interior streams. This soil is probably more widely distributed and its aggregate area is greater than that of any other soil on the river terraces. The largest bodies are south of Moundville and in the vicinity of Powers. The relief in general is flat or gently undulating, but in a few places it is nearly level, and small poorly drained depressions are included. Surface drainage and drainage of the upper 2½ feet of this soil are good, but below that depth drainage is only fair.

Probably 80 percent of this soil is tilled, and the rest either is occupied by forest or is cleared and used for pasture. Carpet, Dallis, and Bermuda grasses are commonly used for permanent pasture. This soil is well adapted to practically all the crops commonly grown on Akron fine sandy loam and Cahaba fine sandy loam. Cotton ordinarily occupies 80 percent of the tilled acreage and corn probably 10 percent. The rest is devoted to peas, peanuts, and forage crops, such as sorgo and mixed sorgo and peas. A very small acreage is in small grains, such as oats and wheat. All these crops produce well under good soil-management practices. The natural state of fertility is slightly less than that of Ruston fine sandy loam and Cahaba fine sandy loam.

Cotton, under the current system of management, with ordinary care yields from one-fourth to three-fifths of a bale an acre and corn from 10 to 30 bushels. These yields are obtained when from 200 to 400 pounds of a 4–8–4 or other low-grade fertilizer and a 75- to 100-pound side dressing of nitrate of soda are used. Corn generally is side dressed with from 100 to 150 pounds of nitrate of soda when the crop is about 18 inches high. Many farmers are building up the fertility of this soil by turning under winter vetch or Austrian Winter peas at intervals of 2 or 3 years. On most farms this practice is supplemented by the use of a fertilizer with a comparatively high content of phosphate for the cotton crop. Corn generally, but occasionally cotton, follows the cover crop. In general, small grains are fertilized with from 100 to 200 pounds of nitrate of soda early in the spring.

In a test on Kalmia fine sandy loam in the Aliceville field the Alabama Agricultural Experiment Station found that the most economical fertilizer for the production of cotton under normal conditions is 600 pounds of 6–8–4. Under this treatment the production averaged 1,027 pounds of seed cotton an acre. It was also found that the most economical fertilizer for the production of corn on this soil, when rotated with a crop that had previously been highly fertilized with mixed fertilizers, is 225 pounds of nitrate of soda or its equivalent. Average yields under these conditions were 30.5 bushels an acre. The use of winter cover crops also proved very profitable. The use of these crops and other crops for soil improvement, cultural management of this and related soils, and varieties of crops are discussed in the section, Agricultural Methods and Management.

SOILS OF THE CLAY UPLANDS AND PRAIRIES

The clay uplands and prairies occur only in the southern part of the county and cover about one-third of the total area. These soils differ markedly in color, texture, and structure from the soils of the sandy uplands and river terraces. The relief ranges from almost flat to gently rolling broad ridge tops and gentle slopes.

Many of these soils have heavy clay surface soils, and practically all of them have extremely heavy clay subsoils. They are very plastic when wet and are hard, intractable, and have a tendency to shrink and crack badly when dry. When plowed and cultivated under favorable moisture conditions, the surface soils, especially those of members of the Houston, Sumter, and Bell series, crumble to coarse particles resembling buckshot. Most of these soils have fair or good surface drainage, but, owing to the impervious character of both surface soils and subsoils, internal drainage is extremely slow.

The clay uplands and prairies include both soils developed under grasses and those partly prairie and partly timbered. The Houston, Sumter, and Bell soils originally were covered largely with grasses, whereas the Oktibbeha, Vaiden, and Eutaw soils of the clay uplands are partly prairie and partly timbered. The Houston, Sumter, and Bell soils are calcareous, and the Oktibbeha, Vaiden, and Eutaw are acid.

The native cover of the Houston, Sumter, and Bell soils, is practically a grass and cane vegetation, as there are very few trees. A few cedar trees grow on the Sumter soil. The grass vegetation accounts for the high content of organic matter and the black color of the Houston and Bell soils. The light color and shallowness of the subsoil of Sumter clay is largely due to relief. Run-off was greater on this soil. Therefore, less water entered the soil for the growth of plants, and erosion has been more pronounced.

These soils are formed from the underlying white soft Selma chalk. This material is high in calcium carbonate and has influenced the soils to considerable extent. Outcrops of this limy material are common, especially throughout the Sumter soils. The soils, therefore, are neutral or alkaline in reaction. Considerable differences are apparent in the color and, to less extent, in the structure and lime content. The Houston soils are known as "black prairie" and the Sumter as "gray prairie." In some places no sharp line of demarcation can be drawn between the Houston and the Bell soils, as both are black and gradually merge, one into the other.

Practically all of these soils either are cultivated or are used for the production of hay and pasture, but the agriculture is markedly different from that on the sandy uplands. The soils of the clay uplands and prairies are considered the best for the production of grass, not only in the prairie section but also in the State, and a large proportion of the Houston, Sumter, and Bell soils are devoted to hay or grazing. Among the heavy clay soils, the Bell and Houston are the best hay lands and produce the best corn. Johnson grass is the principal grass grown for hay. Since the advent of the boll weevil,

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livestock raising has in a large measure replaced the production of cotton even though large areas are still planted to this crop.

The noncalcareous, or post oak, soils include the Oktibbeha (red post oak land), the Vaiden (yellow post oak land), the Eutaw (gray post oak land), and Catalpa clay. These soils originally were timbered, and some of the land still supports a growth of post oak, white oak, rosemary pine, loblolly pine, and hickory.

The surface layers of the soils of this group range from red to gray, and the subsoils range from mottled red, yellow, and gray to mottled gray and rusty-brown heavy impervious plastic clay. They are very acid in reaction and are adapted only to those crops which thrive under acid conditions. These soils are intricately intermixed with the prairie soils, but apparently they are developed from beds of heavy clay overlying the limestone. The nearness of the limestone to the surface has influenced the drainage, aeration, and oxidation of this material. The Oktibbeha soils are the best oxidized and the reddest soils in the prairies, and the limestone, in most places, lies at a depth ranging from about 2 to 3 feet below the surface, in some places 5 feet or more. The Eutaw soils have the flattest relief, are the most poorly drained, and are the most gray throughout both the surface layers and subsoils; and no lime concretions or limy material occurs nearer the surface than 5 feet. The Vaiden soils are intermediate in color, position, and relief between the Oktibbeha and the Eutaw soils, and the subsoils are calcareous at a depth ranging from 3 to 6 feet. The post oak, or noncalcareous, soils are used for the production of cotton, a small quantity of corn, and pasture grasses.

Houston clay.—Houston clay, commonly known as "black prairie land," is a dark-colored clay upland soil developed from the underlying soft limestone, or Selma chalk. In general the characteristics of a profile of this soil are as follows:

0 to 20 inches, dark olive-gray sticky clay having a black appearance. This layer is sticky when wet, extremely hard when dry, and in cultivated fields crumbles into granules the size of buckshot. Lime concretions may be present on the surface and in the surface soil, due to the activities of crawfish in bringing them up from the underlying chalk.

20 to 40 inches, yellow sticky and plastic clay containing an abundance of lime concretions. The yellow clay of this layer is slightly acid in reaction, but the abundance of lime concretions when crushed with the mass gives the material a neutral or slightly alkaline reaction.

40 to 60 inches, yellow sticky plastic clay containing a large quantity of lime concretions. Although the clay in itself is slightly acid, the mass is alkaline due to the presence of the lime concretions.

60 inches +, yellow sticky clay which grades rather abruptly into bluish-gray rotten limestone, or Selma chalk, that is strongly alkaline in reaction.

During very dry seasons cracks in both the surface soil and subsoil are common, except in freshly cultivated fields.

Houston clay occupies broad undulating ridges. Surface drainage is good, but internal drainage is very slow. In most places the yellow plastic clay is permanently wet below a depth of 30 inches. It is this condition that is favorable for crawfish and detrimental to the root growth of some crops, particularly alfalfa.

This soil, like all other lime soils, occurs only in the southern part of the county. It is most extensively developed in the vicinity

of Prairieville where separate areas comprising more than 1 square mile are not uncommon. Practically all of this land is either tilled or is used as permanent hay land or pasture. Probably 60 percent is in hay. Johnson grass, the most important cash crop grown, occupies most of the hay land and is grown continuously in the same fields. It is a common practice to plow this ground once every 3 or 4 years in the fall and sow oats which are harvested either for hay or grain. This occasional tillage improves the stand of Johnson grass and destroys the accumulated growth of weeds. Cowpeas, velvetbeans, sorgo, and millet are grown for hay and forage. Corn and cotton each occupy probably about 10 percent of the total acreage. Between 10 and 15 percent of the land is in pasture composed of mixtures of Bermuda grass, Dallis grass, hop clover, and white clover. Black medic grows in some pastures where lime concretions are abundant on the surface as the result of the activities of crawfish.

According to results (based on a 5- or 6-year period) obtained on Houston clay at the Black Belt Substation at Marion Junction (*9*), this soil is well suited to the production of Dallis grass, white clover, peanuts, sorgo, sagrain (a grain sorghum), soybeans, cowpeas, and corn; and in some locations, where shells and lime concretions are more abundant, alfalfa may be grown. For best results, all these crops should be fertilized with 375 pounds an acre of superphosphate. Dallis grass should be fertilized with 225 pounds an acre of sodium nitrate, and sorgo and sagrain each should be fertilized with 50 pounds an acre of muriate of potash in addition to the phosphate. Alfalfa, if grown, also should have an application of 50 pounds an acre of muriate of potash in addition to the superphosphate. The use of fertilizers for corn proved unprofitable. In addition to the crops mentioned, it has been observed that Johnson grass, partridge-peas, and sensitiveplants do well on this soil. Lespedeza grows in a few locations, but it tends to develop chlorosis. Oats produce large yields when not drowned out by winter rains which have proved to be the greatest hazard to this crop on this soil. Under the system of management suggested, peanuts produced an average yield of 2,012 pounds an acre, sagrain 25.7 bushels, corn 26.1 bushels, sorgo 33,597 pounds (green weight), vetch 4,926 pounds (green weight), soybeans 3,823 pounds, and cowpeas 1,335 pounds. The pasture grasses made excellent growth and supplied an exceptionally large quantity of grazing. More detailed information may be obtained by writing the substation.

Houston clay, shallow phase.—Areas of Houston clay in which the depth to the underlying yellow clay is markedly less than average are separated on the soil map as a shallow phase. The surface of plowed fields shows a distinct variation in color, the knobs and slopes are lighter colored than Houston clay, whereas soil in the draws and parts less susceptible to erosion are dark olive gray. Lime concretions are abundant on the surface and throughout the soil. The depth to yellow plastic clay ranges from 3 to almost 15 inches, and the depth to the underlying disintegrated chalk ranges from 10 to 20 inches. This soil is alkaline throughout.

The relief of this soil is undulating or gently rolling, and the land is somewhat more sloping, on the whole, than Houston clay. Drain-

age is slightly better than that of the typical soil, but it is not sufficiently good to discourage the activities of crawfish on most of the acreage not continuously cultivated.

This shallow soil is associated with and is more extensive than the typical soil, and the bodies are somewhat more scattered. All the land is either under cultivation or is used for pasture or general farm crops. It is devoted to the same crops and is handled in about the same manner as is Houston clay, but a larger percentage of it is used for general farm crops. Both cotton and corn, in addition to hay crops, are grown rather extensively and produce good yields. Since this soil has a gently sloping or sloping relief, allowing good surface drainage, and the chalk is near the surface, it is possibly suited to the production of alfalfa. Yields of the various crops differ widely within the separate areas, depending on the thickness of the dark-colored fertile surface layer. Because of its somewhat better drainage, this soil probably is a little more easily handled than Houston clay. It is subject to sheet erosion, and care must be exercised in handling it. Crop and fertilizer recommendations and yields given for Houston clay (p. 27) should be applicable to this soil.

Sumter clay.—Sumter clay, locally known as "gray lime land," is markedly different from the other black-belt soils with which it is associated. In a few areas the surface soil, to a certain extent, resembles that of Houston clay or Bell clay, but, in general, it is much lighter colored, owing to the higher content of lime in the surface soil as well as in the subsoil. This soil consists largely of highly weathered chalk containing considerable organic matter in the surface soil. It is strongly alkaline in reaction throughout. In most places it is characterized by the presence of numerous exposures of the underlying chalk.

Following are the characteristics of the profile in most areas of this soil:

0 to 5 inches, gray or light-gray calcareous and friable clay which is sticky when wet. This layer ranges in thickness from 1 inch to 8 inches, and in many places it has been completely removed by erosion.
5 to 14 inches, grayish-yellow or yellowish-gray crumbly calcareous friable clay that contains a high percentage of calcium carbonate.
14 to 25 inches, yellowish-gray or creamy-gray friable calcareous clay containing numerous lime flecks or splotches. This layer also has a high content of calcium carbonate.
25 to 60 inches, creamy-white chalk which is very soft and partly weathered.
60 inches +, blue chalk that has weathered to only a slight degree.

Each of these soil layers is somewhat sticky or plastic when wet, but the mass is easily crumbled when dry. This is the only soil of the black belt that will scour off a plow when moist. A few areas of Oktibbeha and Vaiden soils, too small to separate on the map, are included.

The relief is undulating or gently rolling. In some places surface drainage is excessive and causes serious erosion. The friability and looseness of the surface soil and the more impervious character of the lower clay layers subject this soil to erosion even on very gentle slopes. Practically all tilled areas should be protected by terraces.

Sumter clay is the most extensive of the limy soils, and it is widely distributed throughout the southern part of the county. The largest area lies between Prairie and Little Prairie Creeks. All this land, at some time, has been used for cultivated crops, but at present only about 15 percent is cultivated. Of the tilled acreage, about 15 percent is used for cotton and most of the remainder for corn and oats.

The farmers in this county consider this soil better suited to the production of oats and corn than to cotton. According to results obtained on Sumter clay at the Black Belt Substation at Marion Junction, this soil is best suited to the production of oats, Dallis grass, black medic, alfalfa, corn, sorgo, soybeans, sagrain, cowpeas, and, possibly, Kentucky bluegrass. These crops do not make satisfactory growth unless liberally fertilized. Alfalfa, according to these results, should be fertilized with 375 pounds of superphosphate and 50 pounds of muriate of potash an acre, or an equivalent, annually. The fertilizers should be applied at the time of planting and thereafter each year, in the fall. According to the experiment station results (*9*), each of the other crops should be fertilized with 375 pounds of superphosphate and 50 pounds of muriate of potash except oats and Dallis grass, which should be fertilized with the same quantity of superphosphate and 225 pounds of nitrate of soda. No lime is needed on this soil. The soil is not considered suited to the production of cotton, but if cotton is grown, an application of 375 pounds of superphosphate and 50 pounds of muriate of potash is recommended. The same fertilization is recommended for vetch, should that crop be grown.

At the experiment station, under the above-mentioned fertilizations, the acre yields were as follows: Oats 33.1 bushels, alfalfa 5,774 pounds, corn 24.7 bushels, sorgo 24,040 pounds (green weight), soybeans 3,057 pounds, and cowpeas 2,688 pounds. The earliest grazing in the spring is from this soil, with black medic and hop clover supplying the greater part of it. Dallis grass supplies summer and fall grazing, but, as this soil is droughty, it does not maintain such a good growth of grass during the summer as do the Houston and Bell soils. Kentucky bluegrass at present seems promising, but results of the experiments are not conclusive.

Sumter-Oktibbeha clay.—Sumter-Oktibbeha clay is locally known as "mixed prairie." It includes areas of Sumter clay, Oktibbeha clay, and smaller patches of Vaiden clay loam and Houston clay so intricately associated in such inextensive bodies that their separation is impractical on a small-scale map. The Sumter clay areas consist of typical Sumter soil. The Oktibbeha soil covering the limy material is, in most places, shallow, ranging in thickness from a few inches to 2 feet. The soil in most areas of Houston clay is shallow, but the Vaiden clay loam material in places is 3 feet thick over the limy material.

The most extensive body of this mixed soil is northeast of Millwood. The relief is undulating, gently sloping, or rolling and generally is more uneven than that of the typical Houston and Oktibbeha soils. Possibly 50 percent of this mixed soil is tilled, and the rest is used for pasture, together with small patches of forest comprised principally of scrubby cedar, hackberry, Osage-orange, and dogwood, and some pine on the areas of Oktibbeha and Vaiden soils. Cotton and corn are the most common crops. They yield about as well as they do on the typical soils included in this complex. Johnson grass and corn are generally grown on the Sumter and Houston areas, and peas, beans, cotton, peanuts, and other crops on the Oktibbeha soil.

The methods of farming and fertilization practiced are similar to those prevailing on the typical soils included in this land, which are described and discussed in other parts of this report.

Sumter clay, eroded phase.—Sumter clay, eroded phase, includes those areas of Sumter material which are so hilly or so badly gullied and eroded as to preclude their use for tillage. The profile shows characteristics similar to those of Sumter clay, but the surface soil is not so thick and a higher percentage of chalk is exposed. This soil occupies slopes ranging from 4 to 15 percent, and erosion is very active. Some of the hilly areas retain a grass cover, but a large part of the recently eroded areas are barren and white.

The most extensive areas are south of Dry Creek, east and west of Laneville. Although this soil is not so extensive as typical Sumter clay, its area is constantly increasing because of the destruction by erosion of the smoother Sumter clay. Where feasible this soil should be protected from erosion by terracing and the growing of crops that hold the surface soil.

This soil is used principally for pasturage and the growing of cedar trees. The same crops are adapted to this soil as to Sumter clay. The land is very droughty, and the grazing period is short, including (principally) a few months in early spring. The early spring grazing includes black medic, hop clover, and sweetclover. Some grazing on Dallis grass is available during the wetter parts of the summer. If this soil is terraced and the terraces maintained, it is possible to build it up and use it for the same crops as those grown on Sumter clay. In many places the cost of constructing and maintaining terraces exceeds the value of the land.

Bell clay.—Bell clay is a dark-colored soil occupying heads of drainageways, the very gentle slopes along drainageways, the second bottoms or terraces of the prairies, and the swales and depressions of the uplands. It is derived from and formed by local colluvial and alluvial wash from the surrounding Houston and Sumter soils. In characteristics of the profile, crop adaptations, and fertilizer requirements, it resembles the Houston soils.

The following description of a profile of this soil is characteristic:

0 to 12 inches, dark olive-gray or nearly black clay which is plastic when wet, but when dry crumbles easily to a coarse-granular structure. Lime concretions may be present on the surface and in the surface soil, particularly in the areas surrounded by Sumter clay.
12 to 40 inches, dark bluish-gray or olive-gray plastic clay. The color of the soil to this depth is darker than that of Houston clay.
40 to 60 inches, gray plastic clay mottled with yellow and containing some lime concretions.
60 inches +, calcareous and limy material grading into the underlying chalk.

The depths of the different horizons indicated above vary greatly, owing to the different degrees of erosion that have taken place on the surrounding soils from which this soil is derived. The upper two layers are neutral or slightly alkaline in reaction and the underlying material is alkaline.

The relief of Bell clay is very gently sloping. Surface drainage is fairly good, and internal drainage is comparatively slow. Strips or tongues of this soil, ranging from 200 feet to two-thirds of a mile in width, embrace the upland drainageways associated with the Houston and Sumter soils throughout the prairie belt. A few areas are wider,

This soil is not subject to flooding by the streams, but a considerable proportion of it is subject to sheet flooding during heavy rains, by water from the bordering uplands.

Crop and fertilizer recommendations are the same as those given for Houston clay, but yields are higher than on that soil. This is an excellent soil for the production of pasture grasses.

Oktibbeha clay.—Oktibbeha clay, locally known as "red post oak land", occurs in close association with the true prairie or timberless soils, but at one time trees grew on it, and a few areas now support a stand of trees, principally old-field pine and post oaks. In general a profile of this soil shows the following characteristics:

0 to 3 inches, reddish-brown clay loam or clay, which is friable when moist but sticky and plastic when wet.
3 to 15 inches, yellowish-red or brownish-red plastic clay containing a few faint mottlings of yellow.
15 to 30 inches, mottled and marbled gray, yellow, and red heavy sticky plastic clay.
30 inches +, white chalky material which is very calcareous.

The upper four layers range from slightly acid to strongly acid, whereas the underlying material is very calcareous. The depth to the underlying chalk ranges from 18 to 40 inches.

A few bodies, in which the material between depths of about 4 and 18 inches is deep yellow or yellow, only slightly tinged with red, are included. The included soil is Vaiden clay loam that could not be separated on the map, on account of its very small extent.

The clay in both the surface and subsurface layers of Oktibbeha clay is plastic when wet and hard when dry. During dry seasons, checks and cracks which extend well into the soils and range from one-fourth to 1 inch in diameter, appear in hayfields or in untilled areas.

The relief is undulating or gently sloping. Drainage, especially internal, although comparatively slow, is better than that of either the Vaiden or Eutaw soils, owing to the slighter depth to limy material. This is a fairly widely distributed soil throughout the prairie belt. The greatest aggregate area is north and northeast of Cedarville.

Probably 35 percent of the land is tilled, the greater part of which is used for the production of cotton. The rest is used for pasture and woodland pasture. The pasture grasses are principally carpet grass, lespedeza, and Dallis grass. Crop yields are normally low on this soil. Since experiments have been conducted at the Black Belt substation on Vaiden clay, which is very similar to and related to Oktibbeha clay and Vaiden clay loam, the results obtained should be applicable to Oktibbeha clay. This soil is considered slightly more droughty than Vaiden clay loam, and crop yields probably would be a little less. The same recommendations as those made for crops and fertilizers for Vaiden clay loam are suggested for this soil.

Oktibbeha fine sandy loam.—Oktibbeha fine sandy loam differs from Oktibbeha clay principally in having a fine sandy loam surface layer. This layer is yellowish brown and ranges from 3 to 8 inches in thickness. The subsoil is yellowish-red plastic clay similar to the corresponding layer of Oktibbeha clay, but, in general, the yellow mottlings are less conspicuous. The underlying layers of these

two soils are identical. The underlying chalk normally lies at a greater depth than under the clay soil. Oktibbeha fine sandy loam is not so extensive as Oktibbeha clay, and few areas exceed 100 acres. The largest bodies are east of lock No. 6.

The relief is similar to that of Oktibbeha clay, but internal drainage is better. In addition to its better drainage, the sandy surface layer has better tilth, absorbs and retains moisture better for growing crops, warms earlier in the spring, and is better adapted to several of the crops commonly grown. Most of the land is tilled. Yields normally are higher than on Oktibbeha clay. Experimental results are not available for this soil. Since this is true, it is recommended that the results of experiments on Vaiden clay loam, a closely related soil, be used prior to the release of information on the Oktibbeha soil. That part not tilled is devoted to pasture. A mixed forest of hardwood and pine occupies a small acreage, with the pines dominating.

Vaiden fine sandy loam.—Vaiden fine sandy loam is closely related to Vaiden clay loam, but it differs from that soil principally in that it has a fine sandy loam surface covering and has a little more sand in the subsoil, making it slightly more friable than the clay loam. A description of a profile of this soil is as follows:

0 to 7 inches, yellowish-gray fine sandy loam.
7 to 16 inches, brownish-yellow fairly friable clay which is sticky and plastic when wet.
16 to 40 inches, brownish-yellow plastic clay finely mottled with light red, brown, and gray.
40 to 60 inches, gray sticky clay mottled with red, yellow, and some brown.
60 inches +, chalky and limy material. The depth to the underlying chalk ranges from 40 to as much as 60 or more inches.

Even though the chalk may be present at a depth of 20 inches, it has no apparent influence on the crop adaptation and the responsiveness of this soil to good management. The surface soil is slightly acid, whereas the subsoil layers are very acid and the underlying material is very calcareous or alkaline.

Vaiden fine sandy loam is widely distributed throughout the prairie section of the county. The most extensive development is northwest of Newbern. The soil occupies broad undulating ridges. Surface drainage is good, and internal drainage is fairly good. The native vegetation consists of loblolly and rosemary pines and hardwoods, especially post oaks. Abandoned or idle areas develop a good sod of Bermuda, carpet, and Dallis grasses, intermixed with an abundance of lespedeza and some hop clover.

Probably 40 percent of this land is cultivated, and the rest is used for pasture. Cotton occupies about 70 percent of the cultivated acreage, and corn is the second most important crop. Much of the corn is planted across the cottonfields at intervals of about 20 feet. Other crops commonly grown are peas, peanuts, velvetbeans, and sorgo. A small quantity of Johnson grass is cut for hay, but yields are very small. The principal pasture vegetation includes lespedeza, carpet grass, Bermuda grass, Dallis grass, and hop clover.

Since this soil has a sandy surface soil and a more friable subsoil than Vaiden clay loam, it absorbs rainfall more readily and gives it up more freely to growing crops. It is therefore more easily tilled and more responsive to management than Vaiden clay loam, otherwise crop and fertilizer recommendations applicable to Vaiden clay loam should be applicable to this soil. The yields are normally higher on this soil than on Vaiden clay loam. Recommendations and yields obtained at the Black Belt Substation on Vaiden clay, which closely resembles Vaiden clay loam, are given on page 34. Farmers seldom apply the grades and quantities of fertilizers recommended, therefore, they obtain proportionally lower yields.

Vaiden fine sandy loam, buckshot phase.—Vaiden fine sandy loam, buckshot phase, is intermediate in development between Vaiden fine sandy loam and Akron fine sandy loam. It is much better developed than the other Vaiden soils but has not developed to the point of becoming Akron fine sandy loam. Following is a description of a characteristic profile of the buckshot phase of Vaiden fine sandy loam:

0 to 6 inches, brownish-yellow friable fine sandy loam containing some hard iron concretions.
6 to 18 inches, brownish-yellow heavy but friable clay containing an abundance of brown or nearly black small rounded concretions.
18 to 40 inches, mottled gray, yellow, and brown heavy and slightly sticky clay splotched with some brown and red. Many soft iron concretions are present. The gray increases with depth.
40 to 60 inches, gray plastic clay intensely mottled with yellow and some red and rust brown.
60 inches +, bluish-gray plastic clay mottled with yellow. A noticeable quantity of specks of green sand are present throughout this material, and the concretions disappear. In most places the material grades into the finely laminated clays of the Eutaw formation at a depth ranging from 7 to 8 feet.

Most of this soil occurs along the northern edge of the prairie belt. It occupies undulating ridge tops and gently rounded ridges flanked on either side by steeper slopes. The largest areas are west of Greensboro and southwest of Sawyerville. Surface drainage is good and internal drainage fairly good. This soil, in general, is better drained than typical Vaiden fine sandy loam. The native vegetation is loblolly and rosemary pine.

This soil is considered more desirable for farming than the typical soil. Probably 75 percent of it is cultivated, most of which is devoted to cotton. Under the same cultural treatment, average yields of corn, oats, peas, peanuts, velvetbeans, and sorgo exceed those obtained on Vaiden fine sandy loam. In fact, crop adaptations, land use, fertilization, and productivity of this soil more nearly resemble those features of Akron fine sandy loam. Records are available of at least one area of this soil, which has been in continuous productive cultivation for more than a century. In the management of this soil it is recommended that the practices suggested for Akron fine sandy loam be used.

Vaiden clay loam.—Vaiden clay loam is locally known as "yellow prairie." It is the yellow member of the group of acid, or noncalcareous, soils of the prairie section, the Oktibbeha soils are the red members, and the Eutaw soil is the gray member. A description of a characteristic profile of this soil follows:

0 to 4 inches, brownish-yellow or grayish-brown clay loam or loam.
4 to 24 inches, brownish-yellow or yellow plastic clay finely mottled in the lower part with red, brown, and some light gray.
24 to 40 inches, marbled and mottled brownish-yellow and gray sticky plastic clay.

White lime concretions are present at a depth of 40 or 50 inches, and Selma chalk underlies the soil at a depth ranging from 5 to 6 feet.

The relief is undulating or very gently sloping, as most of this soil is developed on the broad stream divides. Surface drainage is good, but internal drainage is hindered by the impervious clay subsoil. This soil dries and warms more slowly than Vaiden fine sandy loam and is not so easily handled as that soil.

Vaiden clay loam is associated with Vaiden fine sandy loam. The largest areas are in the vicinity of Laneville. About 60 percent of the land is tilled. The clay loam surface soil tends to become hard and to crack during prolonged dry periods, thus hindering the growth of plants. Like all heavy plastic clay soils, it is difficult to till, especially in the spring. If plowed when too wet it runs together or puddles, and if plowed when too dry it breaks into large clods that interfere with cultivation and are difficult to work into a desirable seedbed. Liming and the incorporation of organic matter through the growth of cover crops, are very beneficial in developing good tilth in this soil. It is generally possible to dig lime from nearby exposures and to apply it with no cost other than for the labor.

According to results obtained on Vaiden clay (which closely resembles Vaiden clay loam) at the Black Belt Substation, this soil is best suited to the production of oats, peanuts, sorgo, sagrain, orchard grass, lespedeza, Dallis grass, cowpeas, soybeans, Austrian Winter peas, hairy vetch, cotton, velvetbeans, and, possibly, corn. Cotton should be fertilized with from 400 to 600 pounds of a 6–10–4 fertilizer and 2 tons of lime an acre. The lime is sufficient to last several years. Each of the other crops mentioned should receive in addition 225 pounds of sodium nitrate an acre as a side dressing. In addition to the phosphate, cowpeas, hairy vetch, soybeans, Austrian Winter peas, lespedeza, and peanuts should receive 2 tons of lime an acre, the effects of which will last many years. Sorgo should receive, in addition to the phosphate, 50 pounds of muriate of potash, 225 pounds of sodium nitrate, and 2 tons of lime. The requirements for Dallis grass apparently are the same as those for sorgo, except that the potash is not required. If corn is grown on this soil, 375 pounds of superphosphate, 225 pounds of sodium nitrate, and 2 tons of lime should be used. Velvetbeans and orchard grass, according to current experimental results, make maximum economical growth when superphosphate alone is used.

The acre yields of the different crops suited to this soil, according to these experiments, were as follows: Oats 29.4 bushels, peanuts about 1,960 pounds, sorgo about 23,000 pounds (green weight), sagrain 25.8 bushels, cowpea hay about 3,500 pounds, soybean hay about 4,000 pounds, cotton 733 pounds of seed cotton, and corn about 28.5 bushels. It was necessary to interpolate a part of the above-mentioned results, as the limed plots received heavier phosphate fertilization than was included in the recommendations. The heavier applications of phosphate did not prove profitable.

Eutaw clay.—Eutaw clay is commonly known as "gray post oak land" and is the gray member of the group of acid or noncalcareous soils. It frequently is referred to as "hog-wallow land." It has the following profile characteristics:

0 to 4 inches, dark-gray clay having a brownish cast. In cultivated areas the surface soil has a distinctly brown or rusty-brown color. The material is sticky and plastic when wet, checks and cracks when dry, but maintains tilth when farmed under favorable moisture conditions.
4 to 7 inches, grayish-yellow sticky clay which is slightly more friable than the underlying material. This layer may not be present in all areas of this soil.
7 to 30 inches, gray sticky plastic clay mottled with brownish yellow, light yellow, and rusty brown.
30 to 60 inches, gray sticky plastic clay highly mottled with red, yellow, and some brown.
60 inches +, bluish-gray plastic clay mottled with red, yellow, and some brown to a depth ranging from 65 to 80 inches, where the chalk is reached.

This soil ranges from moderately to strongly acid to a depth of about 5½ feet, or to the depth where the clay becomes distinctly grayish yellow and more friable. The material overlying the chalk is alkaline.

The relief of Eutaw clay is noticeably smoother than that of the Vaiden and Oktibbeha soils. The land is very gently undulating or sloping, and many areas appear nearly flat. The elevation generally is somewhat lower than that of the other soils of this group. Because of the heavy clay texture of this soil and the absence of marked slope, drainage is slow, and water remains on the level areas or in slight depressions after heavy rains. Crawfish are present in the more poorly drained areas, and crawfish chimneys are common.

Eutaw clay is not extensive. More than 60 percent of it is included in one large area about 3 miles south of Newbern, and several smaller bodies are scattered throughout the extreme southeastern part of the county. The land is farmed largely by colored tenants.

Eutaw clay has a rather wide crop adaptation, but its desirability is handicapped by the fact that it warms slowly in the spring, winter cover crops and oats are subject to injury caused by drowning out and freezing, and the heavy plastic clay texture makes this soil rather difficult to prepare in the spring. According to results obtained at the substation at Marion Junction and according to observed practices of some of the farmers owning this soil, it seems best suited to the production of oats, sorgo, peanuts, Dallis grass, lespedeza, sagrain, soybeans, cowpeas, cotton, velvetbeans, Austrian Winter peas, hairy vetch, and corn.

Cotton on this soil probably should be fertilized with from 400 to 600 pounds of a 6–10–4 fertilizer and 2 tons of lime to the acre. The lime is sufficient for several years. On virgin areas, it is apparent that 375 pounds of superphosphate is sufficient and produces the most economical returns. Each of the other crops should be fertilized with 375 pounds of superphosphate. Corn should receive in addition 225 pounds an acre of sodium nitrate as a side dressing. It is possible that both oats and sagrain should receive 225 pounds an acre of sodium nitrate, but the use of this fertilizer has not proved profitable on virgin areas. In addition to the phosphate, cowpeas, soybeans, hairy vetch, Austrian Winter peas, lespedeza, and peanuts should receive 2 tons of lime which is sufficient for many years. Sorgo should receive, in addition to the phosphate, 50 pounds of muriate of potash. Velvetbeans, according to current experimental results, make maximum economical growth when superphosphate is used alone. Velvetbeans reduce the yield of corn more than

any other summer crop, therefore their use is not encouraged except for those farmers who mean to graze or harvest the beans as winter feed. *Crotalaria*, as a summer legume, is adapted to this soil. It is used only for soil improvement.

In addition to the crops mentioned, this soil should be well suited to the production of vegetables, particularly beets, sweetpotatoes, and okra, in addition to several other vegetables with tuberous roots. Beans, beggarweed, partridge-peas, sensitiveplant, and *Sesbania*, as feed for birds, may be grown satisfactorily on this soil.

Average acre yields of the different crops grown on this soil, according to the results of experiments at the substation, are as follows: Cotton 1,038 pounds, corn 30.7 bushels, oats 20.6 bushels, sagrain 24.8 bushels, sorgo about 35,000 pounds (green weight), cowpea hay about 4,000 pounds, soybean hay about 4,500 pounds, hairy vetch about 5,000 pounds (green weight), Austrian Winter peas about 1,300 pounds (green weight), lespedeza (Kobe and Common) about 10,000 pounds (green weight), and peanuts 2,000 pounds. The additional phosphate had little effect on yield. Velvetbeans made an average yield of 1,469 pounds of seed an acre over a 2-year period. Most of the yields given, based on a 3- or 4-year average, are subject to slight changes as the experiments are conducted over a long period. It is advised, for more complete and up-to-date information, that the Alabama Agricultural Experiment Station at Auburn or the substation at Marion Junction be contacted.

Probably 35 percent of this soil is under cultivation. About 85 percent of the tilled acreage is planted to cotton, and the rest is used largely for the production of corn and subsistence crops. Under current farm management, yields are normally much lower than those given above, as very little or no fertilizer is used by a large number of farmers. A few farmers use fertilizers similar to or identical with those recommended. Probably from 50 to 75 percent of the noncultivated land is open land and is used for pasture which, under native conditions, supports a growth of carpet grass, lespedeza, Dallis grass, and broomsedge. The latter is a pest in the pastures. Probably the best use for this land is pasture. The principal trees in the forested areas are post oak, blackjack oak, old-field pine, and hickory. In many forests the oaks predominate, and in others pines are the more numerous trees.

Leaf fine sandy loam.—Leaf fine sandy loam is recognized by its gray sandy surface soil, its mottled gray, yellow, and rusty-brown stiff fine sandy clay subsoil, and its position on the terraces along the larger streams. A profile of this soil shows the following characteristics:

0 to 5 inches, light-gray or brownish-gray fine sandy loam.
5 to 20 inches, yellowish-gray, mottled with yellow, fine sandy clay which is slightly plastic when wet and crumbly when dry.
20 inches +, stiff plastic gray clay mottled with yellow, brown, and red.

The material throughout the entire profile ranges from moderately to very strongly acid.

The relief is nearly level, and both surface and internal drainage are slow. Most of the soil lies on comparatively low terraces along the large streams, especially Prairie Creek. A few areas are scattered throughout the county, but most of them are within the prairie belt.

A few bodies, especially the one lying west of German Creek, are on comparatively high terraces. The native vegetation consists of sweetgum, loblolly pine, and rosemary pine. Although about 70 percent of the land is cleared, only about 10 percent is cultivated. A small acreage is devoted to cotton and corn, but yields are low. The land is well suited to pasture, to which purpose a large proportion of it is devoted.

Since this soil is derived from the surrounding upland acid or noncalcareous soils, principally the Vaiden, Oktibbeha, and Eutaw, it has, to a certain extent, characteristics of the parent soils. Drainage of the Leaf soil is very similar to that of the Eutaw. Prior to the release of information by the experiment station on this soil, it is advised that the recommended crop and fertilizer practices on Eutaw clay be followed, except in such places as the winter crops are likely to be drowned out. Yields are expected to be slightly lower than those obtained on Eutaw clay. The best use for the Leaf soil is pasture, as it is naturally adapted to carpet grass, lespedeza, and, to a certain extent, Dallis grass.

Leaf fine sandy loam, high-terrace phase.—Leaf fine sandy loam, high-terrace phase, is intermediate in soil development and position between Leaf fine sandy loam in the true terrace positions and Vaiden fine sandy loam of the uplands. In profile development it probably more closely resembles Vaiden fine sandy loam. A description of a profile of this soil follows:

0 to 6 inches, gray or yellowish-gray fine sandy loam.
6 to 15 inches, yellow fairly friable fine sandy clay loam having similar physical characteristics to the corresponding layer of Vaiden fine sandy loam.
15 to 35 inches, mottled red and yellow heavy plastic fine sandy clay containing some gray mottlings below a depth of 20 inches.
35 inches +, gray plastic fine sandy clay intensely mottled with red and yellow.

The material throughout the entire profile ranges from moderately to strongly acid.

The relief of this soil is gently undulating and is sufficient to cause surface drainage to be noticeably better than in the typical soil. Internal drainage is slow. Practically all this soil is within the prairie belt. Most of it lies in the vicinity of Newbern and to the southwest of that town, where the elevation approximates that of the surrounding prairie soils. Several areas are northwest of Cedarville.

This is a fairly productive soil, and probably 70 percent of it is cultivated. Cotton is the most important crop grown, and yields under average fertilization range from one-fourth to two-thirds of a bale an acre. Yields of corn, peas, beans, sweetpotatoes, and sorgo are similar to those obtained on Vaiden fine sandy loam. Because of its smooth or nearly level relief, terracing, although not so necessary as on more sloping soils, is beneficial in most places. Most of the uncultivated areas are devoted to pasture, mainly of Bermuda grass, carpet grass, Dallis grass, lespedeza, and hop clover. The uncleared areas are occupied principally by loblolly and rosemary pines.

The crop adaptations, land use, crop yields, fertilizer recommendations, and management on this soil should be essentially the same as those for Vaiden fine sandy loam.

Leaf clay loam.—Leaf clay loam differs from Leaf fine sandy loam in that it has only a thin loamy surface layer. This soil also occupies terrace positions, in association with the acid clay upland soils, principally the Eutaw and Vaiden. Following is a description of a profile of Leaf clay loam:

0 to 3 inches, brownish-gray loam.
3 to 15 inches, highly mottled gray, yellow, and red heavy plastic clay containing a small quantity of fine sand.
15 inches +, gray plastic clay mottled with rusty brown and yellow and becoming more intensely gray at a depth of about 35 inches.

This is not an extensive soil. Like Leaf fine sandy loam, most of it lies along the larger streams flowing through the prairie belt. The most extensive area lies near Greers Creek south of Laneville. This soil is nearly level, and its position and drainage, in most places, are comparable to those features of Leaf fine sandy loam. Probably not more than 20 percent of its acreage is tilled, and the rest is used for pasture and woodland pasture. The principal grasses are carpet grass and lespedeza. Sweetgum, post oak, and black gum constitute the principal timber growth. The land is difficult to cultivate, and it drains and warms slowly in the spring. Corn and cotton are the most commonly grown crops.

The crop adaptations, fertilizer requirements, and land use for Leaf clay loam are similar to those for Eutaw clay loam of the uplands, but yields on the Leaf soil probably are slightly lower than those obtained on the Eutaw. Most of this soil is best suited to permanent pasture, but it should be liberally fertilized with phosphate and lime for best results, particularly if Dallis grass or lespedeza are to be grown.

Catalpa clay.—Catalpa clay includes material washed from the higher lying limy soils or from soils in which lime is present at a depth of a few feet below the surface. In many places this material is mixed to a small extent with materials washed from the acid or noncalcareous soils. This soil has been deposited by flood waters along the streams. It differs from Bell clay primarily in that it is lighter colored, more subject to overflow, more mixed, and less well drained. The surface soil is dark olive-gray or dark-brown clay mottled, in most places, with rusty brown. Below a depth of about 12 inches, the soil material, in most places, is gray or brownish-gray heavy plastic clay somewhat mottled with yellow and brown. Thin layers of fine sand, especially near the streams, are common. Both surface soil and subsoil are plastic when wet and are hard, brittle, and subject to cracking when dry. Most of this soil is neutral or slightly acid throughout.

The relief of Catalpa clay is very nearly level. Most of the land lies from 5 to 12 feet above the streams. It occupies the first bottoms of all the larger streams throughout the prairie belt and is subject to inundation.

About 50 percent of the land is cleared, about one-half of which is tilled. Corn, sorgo, soybeans, and Johnson grass are the most common crops. This is a fertile soil, and its content of organic matter, although lower than that of Bell clay, is high compared with that of the average soils of the county. Frequent flooding and deposition of fresh alluvium tend to maintain the fertility, even under continuous cropping. The chief difficulties experienced in farming this land are its slowness in warming and drying enough to till until late in the spring and its susceptibility to overflows. If plowed when wet it clods badly, and this condition tends to persist throughout the growing season. If the seedbed is prepared under favorable moisture conditions, however, a desirable granular tilth is developed and is easily maintained.

Crop yields are good under favorable conditions. Corn yields from 20 to 40 bushels an acre, sorgo for silage 6 to 12 tons, and hay crops do proportionally well. Very little fertilization is practiced on this soil. It is well suited to pasture grasses. A well-established mixture of Bermuda grass, Dallis grass, and, in some places, hop clover and black medic, kept free from weeds, is capable of supporting at least one animal unit an acre through the spring and summer. Dallis grass is the principal pasture grass. Should the demand for agricultural products increase, this soil could be made very productive for tilled crops if it were protected from flood water by levees and drained by ditching.

MISCELLANEOUS SOILS AND LAND TYPES

This group includes Guin soils, undifferentiated, Susquehanna fine sandy loam, Susquehanna fine sandy loam, hilly phase, Myatt fine sandy loam, Ochlockonee fine sandy loam, Ochlockonee-Bibb silt loam, Augusta silt loam, alluvial soils, undifferentiated, and swamp. The characteristics and uses of these soils are variable and do not correspond to those of the soils of either major group. Most of these soils are either badly eroded or are poorly drained and subject to overflow from the streams. All are capable of producing a good forest growth, and some are useful for pasture. Very small areas, particularly the better drained parts of the alluvial soils, undifferentiated, are suitable for cultivation. Corn, ribbon cane, and sorgo are the dominant crops grown. The native forest vegetation of the upland soils is mixed pines and hardwoods. Hardwoods predominate on the steepest slopes, and the lowland soils for the most part are covered by hardwoods.

Guin soils, undifferentiated.—The Guin soils, undifferentiated, include areas so rough as to preclude tillage on practically all of the areas. The relief for the most part is very hilly and includes narrow winding ridge tops flanked by rough broken slopes, deep V-shaped gullies, and extensive steeply rolling areas. The soil profile is not definite. Most of the soil material is merely parent material with a thin irregular sandy surface covering. Small areas of Ruston, Luverne, Orangeburg, Akron, and especially Susquehanna soils, are included. Drainage is excessive, and erosion is active in most areas in spite of the forest cover. Extensive areas, ranging from less than 1 square mile to 3 square miles, are common throughout much of the remaining upland of the northern two-thirds of the county.

This soil is not suitable for tillage and supplies only a limited amount of pasture. It is most useful for forest, to which a large part of it is now devoted. Adequate measures to prevent fire are practically the only requisite necessary for the reestablishment of a good loblolly, rosemary, and longleaf pine forest cover in those areas

where enough trees remain to afford mast for reseeding. This land also is suitable for game preserves, as enough underbrush and cane grow along the streams to support deer; and, in addition, there are enough nuts, beggarweeds, mast, native vetch, native lespedeza seeds, French mulberry seeds, dogwood seeds, and other seeds for the feeding of quails and turkeys.

Susquehanna fine sandy loam.—Susquehanna fine sandy loam is recognized by its gray surface soil and heavy red sticky subsoil which is exposed in many places as the result of both sheet and gully erosion. A profile of this soil shows the following characteristics:

0 to 5 inches, gray or yellowish-gray loamy fine sand. This layer varies in thickness from practically nothing to as much as 7 or 8 inches.
5 to 15 inches, red or brownish-red heavy plastic clay mottled with some yellow and gray. This material is exposed on the surface in many places.
15 to 25 inches, red heavy plastic clay intensely mottled with yellow, gray, and some brown.
30 inches +, gray heavy sticky plastic clay intensely mottled with red and grayish yellow.

Because of the gently rolling or undulating relief and the presence of a heavy plastic clay subsoil which allows very little downward movement of moisture during heavy rainfalls, surface drainage tends to be excessive. These features account for the extreme susceptibility of this soil to erosion—both the sheet and gully types. Drainage, however, is sufficient for the growth of plants.

Susquehanna fine sandy loam is a sandy upland soil which ranges from moderately to strongly acid throughout. The land is more sloping than Ruston fine sandy loam. In places it has an 8-percent slope.

This is not an extensive soil in this county, but it is rather extensive in the State. The largest areas in this county are northwest and northeast of Greensboro and in the vicinity of China Grove Church. Probably 50 percent of the land is tilled. Cotton ordinarily occupies more than 65 percent of the tilled acreage, and the rest is devoted to corn, oats, peas, and other subsistence crops.

Since this soil and its related clay type, together with their hilly phases, are very extensive in the State, the experiment station is starting some experiments on them, in order to determine their suitability for crops and their fertilizer requirements. As at least 4 or 5 years will elapse before experimental results will be available to farmers, crop adaptations and fertilizer requirements, based on observations, and the results of experiments, based on related soils, are as follows: The soil is best suited to the production of oats, peanuts, winter legumes, sorgo, cowpeas, soybeans, velvetbeans, and cotton. For the most part it is better adapted to spring-grown crops than to summer-grown crops. This soil tends to be droughty because the heavy clay subsoil holds moisture too tenaciously for a large part of the summer-grown crops, especially corn. For pasture purposes, the land is adapted to the production of lespedeza, carpet grass, and Bermuda grass. Prior to the release of results by the experiment station on this soil, it is suggested that the fertilizer recommendations for Vaiden clay loam be followed.

Susquehanna fine sandy loam, hilly phase.—The hilly phase of Susquehanna fine sandy loam differs from the typical soil primarily

in relief. The difference in relief renders the hilly soil more subject to erosion and also affects the land use. The slope ranges from 8 to as much as 25 percent, but most of the land has a slope between 8 and 15 percent. Because of this feature and the slowly pervious subsoil, the gray surface layer is not uniform. Much of this layer has been removed by sheet and gully erosion, especially in the small cultivated areas. Very little of this land is in cultivation, but practically all of it has been or is now covered by a forest of loblolly, rosemary, and, in some places, yellow pines. In many of the sparsely timbered areas, particularly along the lower slopes and drainage channels, carpet grass supplies a large amount of grazing, and this grass is supplemented in some locations by lespedeza. This soil produces about the best-quality timber grown in the parts of the county where it occurs and should be devoted mainly to forestry.

Myatt fine sandy loam.—Myatt fine sandy loam includes the gray poorly drained land on the low second bottoms of Black Warrior River and its larger tributaries, especially near Akron and Stewart and along Big Creek. The greater part is subject to overflow during extremely high water. This soil is commonly associated with the Kalmia and Augusta soils. In this county it is derived from heavier materials than most of the Myatt soils mapped elsewhere in the State. A profile of this soil shows the following characteristics:

0 to 5 inches, light-gray or dark-gray fine sandy loam or loamy fine sand streaked with dark brown along old root channels.
5 to 15 inches, gray fine sandy loam mottled with yellow and somewhat streaked with dark rusty brown.
15 to 30 inches, gray heavy fine sandy clay mottled with yellow and some brown.

In places the lower part of the subsoil is mushy or waterlogged sandy material. To the west of Moundville and Akron, areas of gray silt loam are present that resemble Roanoke silt loam as mapped in other counties of the State. These areas have a 3-inch light brownish-gray silt loam or silty clay loam surface soil underlain by light-gray firm smooth clay mottled with some rusty brown and yellow. Such areas are best used for pasture as they produce excellent carpet grass. They are closely associated with areas of Augusta silt loam.

Most areas of Myatt fine sandy loam are nearly level or slightly depressed. A few bodies occur on very gentle slopes between the upland and the adjoining first or second bottoms. Drainage is very slow. The water table is at or very near the surface during most of the winter and spring. Following rainy periods, water remains in many places for some time.

Probably 20 percent of this soil is cleared. Very little is cropped and that with only fair success. The cleared areas are used almost wholly for pasture. Carpet grass is the dominant and probably the most satisfactory grass for grazing. It probably would be profitable to establish lespedeza with carpet grass for pasture on this soil. A liberal application of basic slag or superphosphate should be applied at the time lespedeza is sown. Owing to the almost perpetually moist condition of the land, grazing crops do better in the dry summer season than they do on the associated better drained soils. Because of the low position of this soil, its nearly level relief, its clay subsoil, and its natural low state of fertility, artificial drainage sufficient for tillage is seldom warranted. The uncleared areas are occupied

by a hardwood forest, including sweetgum, water oak, post oak, and black gum, in which considerable pine is intermixed. *Sesbania*, a bird feed, makes an excellent growth on the better-drained areas, and it is possible that benne, also a bird feed, will thrive on this soil.

Ochlockonee fine sandy loam.—Ochlockonee fine sandy loam is recognized as a brown soil along the stream channels, which is subject to overflow during periods of high water. It is derived from sandy coastal plain upland soils. A profile of this soil shows the following characteristics:

0 to 12 inches, light-brown fine sandy loam or loam.
12 to 30 inches, brownish-yellow friable fine sandy loam or fine sandy clay, mottled with gray in the lower part.
30 inches +, light-gray fine sandy clay intensely mottled with yellow and brown.

Included with mapped areas of Ochlockonee fine sandy loam are numerous long narrow swales in which are developed Bibb fine sandy loam and Bibb silt loam. The surface soil in such areas is gray, and the subsoil is light gray mottled with yellow or rusty brown. All these included bodies are naturally poorly drained.

All this soil is subject to overflow. Drainage is somewhat better than that of Ochlockonee-Bibb silt loam, because of the more sandy character and higher position of the fine sandy loam areas, many of which occupy slight rises above the surrounding first-bottom soils or the natural levees along streams. This soil occurs on the first bottoms of Black Warrior River and of the larger streams of the sandy uplands.

This soil is associated with Ochlockonee-Bibb silt loam but is much less extensive. From 5 to 10 percent of the land is tilled, and the rest is pastured or is covered with a hardwood forest. Corn, sorgo, sugarcane, and, to less extent, beans, peas, sweetpotatoes, peanuts, and a little cotton are grown. Yields average about the same as on the Ochlockonee-Bibb soil, but, because of its more sandy character and better drainage, the fine sandy loam is more easily tilled and is adapted to a greater variety of crops. Very little fertilizer is used.

Ochlockonee-Bibb silt loam.—Ochlockonee-Bibb silt loam is a complex of areas of Ochlockonee silt loam and Bibb silt loam so intricately associated and so small in extent that the two types cannot be separated on a map of the scale used. This soil condition exists as sloughs, ponds, and slight ridges lying in strips more or less parallel to the river. The areas of Ochlockonee silt loam have an 8- or 10-inch brown silt loam surface soil underlain by light-brown silt loam or silty clay loam, which, at a depth ranging from about 20 to 24 inches, is mottled with brownish yellow, gray, and rusty brown. Small dark-brown concretions are numerous in the lower part of the subsoil. The poorly drained areas are Bibb silt loam which has a gray, mottled with yellow or brown, silt loam or silty clay loam 12- to 15-inch surface soil underlain by light-gray silty clay loam or clay, mottled with yellow and rusty brown. A few small brown iron concretions are present.

The relief of areas of Ochlockonee silt loam ranges from nearly level to gently undulating. The more undulating land is nearer the river. Drainage of the browner areas ranges from fair to good. The

areas of Bibb silt loam, on the other hand, are too poorly drained for tillage, as the water table is seldom more than 3 feet below the surface. All areas of Ochlockonee-Bibb silt loam are subject to overflow with a 20- to 25-foot rise in the river, therefore crops at all times are subject to this hazard. The brown areas, in general, occupy the first bottoms of Black Warrior River, and some of the gray areas lie along the larger streams of the interior. None of this soil occurs within the belt of prairie soils.

Possibly less than 1 percent of this soil complex is tilled. The cultivated areas are adjacent to the river where drainage is best established. The rest of the land is covered by a hardwood forest including principally sweetgum, together with more or less elm, beech, water oak, ash, hickory, white oak, post oak, magnolia, willow, bay, and maple in places. Corn is the dominant crop and yields from 20 to 50 bushels an acre with little or no fertilization. Small patches of sorgo cane are grown, and the yields produced are large. There are several 5- to 30-acre fields planted to cotton which yields from one-third to one-half bale an acre. Only a small quantity—from 75 to 150 pounds—of fertilizer is used under the cotton, and this is generally a low-grade mixed fertilizer. Since this soil has a high organic-matter content, a result of frequent overflows, principally during the winter, and as it cannot be planted so early in the spring as is desirable, its greatest need for the profitable production of cotton is a fertilizer that will promote and hasten maturity of the bolls. The land, therefore, should be fertilized with from 200 to 300 pounds of superphosphate and 25 pounds of muriate of potash an acre. A few areas are cleared for pasture, to which this soil is well adapted. Carpet grass, Bermuda grass, and lespedeza do well, especially on the better drained areas. Owing to the frequency of overflow from the river and the choppy and irregular occurrence of sloughs and poorly drained strips, present economic conditions do not warrant further opening of large areas of this land. A few small areas, however, may be opened for cultivation.

Augusta silt loam.—Areas of Augusta silt loam occur in a low terrace position, and all are subject to overflow during extremely high water in Black Warrior River. This soil is closely associated with Cahaba silt loam. Its surface features are distinctive. It contains numerous small iron accretions in most places. This soil is more poorly drained in this county than in other counties of the State, and a much smaller proportion of the land is in cultivation.

In general, a profile of this soil has the following characteristics:

0 to 6 inches, dark-gray smooth, mellow, and friable silt loam or loam.
6 to 8 inches, grayish-yellow loam.
8 to 25 inches, grayish-yellow silty clay loam or clay loam containing gray mottlings.
25 inches +, compact smooth mottled gray and yellow silty clay having a soapy feel when crushed. In most places the material in this layer seems to be drier than the overlying material.

The reaction of the material in the surface layer in most areas is slightly acid, and that of the material in the lower layers ranges from moderately to strongly acid. In most places iron accretions are present on the surface and throughout the soil profile. The accretions have developed as the result of insufficient internal drainage. A few

small areas of Augusta fine sandy loam are included with this soil in mapping.

Augusta silt loam suffers from extremes of wetness and dryness. The soil is very wet during the winter and early spring and, therefore, cannot be planted until late. The compact subsoil, in addition to interfering with drainage during that period, also hinders the movement of soil moisture upward to the plant roots during the drier summer season.

This soil occurs in low-lying areas of the second bottoms along Black Warrior River. The largest body is southwest of Akron, and some areas are scattered over the river terrace in the northwestern part of the county. Some bodies consist of slight depressions associated with areas of such soils as Kalmia fine sandy loam and Cahaba silt loam, whereas others are very slightly elevated above wet areas.

About 5 percent of the land is tilled. The greater part is covered by a forest, principally of sweetgum, with some post oaks, water oaks, hickory, and loblolly pine in places. The cleared areas afford fair grazing where carpet, Dallis, and Bermuda grasses are established. The tilled acreage is devoted mostly to cotton and corn, and low yields are obtained. Other subsistence crops are grown to less extent. Cotton is practically the only crop fertilized, and this crop generally is fertilized with a small quantity of a low-grade fertilizer.

To render this soil productive, large quantities of lime, phosphate, and potash are required, in addition to the nitrates. Therefore, under present economic conditions, the land is best suited to pasture and forest, even though a large part of the timber is sweetgum, and carpet grass constitutes the principal grazing.

Alluvial soils, undifferentiated.—Included under the classification, alluvial soils, undifferentiated, is the mixed alluvial material of the first bottoms along the smaller streams in that part of the county occupied by soil derived from sandy coastal plains material. It is comprised of material washed from the surrounding sand and sandy clay uplands, and consequently it varies widely in character. In general, the texture is fine sandy loam or loamy fine sand, and the color is gray, dark gray, or grayish brown. In many places, especially along the small streams and drainageways, the surface layer, which ranges from 4 to 25 inches in thickness, consists of brown or light reddish-brown fine sandy loam that has been deposited since tillage of the surrounding upland soils was started. In its natural state, this soil is poorly drained and is subject to frequent overflow.

Probably 10 percent of this soil is cleared, drained, and tilled. Most of the cultivated areas occupy the upper ends of the stream valleys and the shallow depressions in the upland soils that are less subject to, and able to recover more quickly from, overflow. Most of the tilled areas are drained by ditches, and where these are well maintained, the land is very productive. It is used for the production of corn, sorgo, sugarcane, fall garden crops, and permanent pasture. Yields of all these crops ordinarily are good, in spite of occasional inundation of the land. Corn yields from 20 to 40 bushels an acre, and sugarcane is reported to have yielded as much as 200 gallons of sirup an acre when growing conditions were favorable and the land was abundantly fertilized with barnyard manure. Commercial fertilizers are seldom used, but the use of superphosphate or mixed fertilizers possibly would be profitable. Decaying organic matter possibly supplies sufficient nitrogen for a normal crop. Most of the cleared areas having fair drainage afford good pasture. Carpet grass and lespedeza are the best pasture grasses produced. Land which cannot be drained advantageously is best utilized for either pasture or forest. The greater part of this soil supports a forest growth consisting of sweetgum, willow, bay, water oak, and other moisture-loving vegetation.

Swamp.—Swamp includes permanently wet land. In most places the surface layer is a waterlogged mucky mass of partly disintegrated organic matter and mineral material, in which tree and vine roots are massed. Gray mineral soil material is present at a depth ranging from a few inches to several feet.

Swamp occupies old river channels of Black Warrior River, first bottoms, and areas along the larger creeks where either artificial or natural barriers keep the water table permanently near or at the surface of the ground.

The largest areas are west of Cypress and south of Liberty Church along Fivemile Creek. None of the land is cleared, but it is occupied by a growth, principally of bay, tupelo gum, and cypress. The gum and cypress trees are merchantable, and this land probably is best adapted to their production. Corn, sorgo, and hay probably could be grown successfully on land provided with artificial drainage, but the expense is practically prohibitive from a purely economic point of view. Drainage, however, may be undertaken for the purpose of removing a hazard to health. The drained areas immediately establish themselves to carpet grass which makes excellent pasture, provided sweetgums and briers are kept down. Wild ducks hide and feed in the swamp areas during the day in the duck-hunting season and go to the open ponds and streams during the late afternoons and nights.

AGRICULTURAL METHODS AND MANAGEMENT

Agriculture in Hale County, north of the prairie belt, is based on the production of cotton and corn, and small acreages are in other subsistence crops. Cotton, Johnson-grass hay, corn, forage crops, and subsistence crops for livestock and human consumption are the crops commonly grown throughout the prairie belt. In the northern part of the county cotton is the main source of cash income, whereas in the prairie belt cotton, hay, dairy products, and beef cattle are the main sources of income.

Cotton, the universal cash crop, is by far the most important crop, and it is grown with various degrees of success on practically every tillable soil in the county. The best yields are obtained on the red soils, and the largest areas in cultivation are of these soils. Most of the cotton grown is some strain of the Cook, Cleveland, or D. P. L. varieties. Cook 1010, Cook 307–6, and Half-and-Half are the most common.

The ground to be planted in cotton ordinarily is prepared during February, March, and April, but some of the bottom-land soils are too wet for preparation until the first of May. Much of the crop is planted on ridges, although a part of the acreage of the better

drained soils is planted on a flat or smooth seedbed. The crop is planted between March 25 and May 10. The earlier planting is favored, in order to avoid, so far as possible, devastation during the late summer by the boll weevil. Only a small acreage is planted following a cover crop, because of the delay incident to the development and turning under of the cover crop. From 200 to 400 pounds of mixed fertilizer, analyzing from 3 to 4 percent of nitrogen, 8 to 12 percent of phosphoric acid, and 4 to 5 percent of potash, is applied just previous to planting. This treatment frequently is followed by a side dressing of from 75 to 100 pounds of nitrate of soda about the time the crop is thinned out, or chopped. From 300 to 600 pounds of a 6–8–4 fertilizer, which needs no side dressing, is recommended and used by a large number of farmers. When large applications of the high-grade fertilizer are used, it is advisable to put down a large part of the fertilizer and bed on it. Heavy applications of fertilizers with the seed may injure the stand. No nitrate of soda is used when the crop follows a leguminous cover crop.

The Alabama Agricultural Experiment Station at Auburn, through field tests, has ascertained that the best fertilizer for cotton on Akron fine sandy loam, Red Bay fine sandy loam, Orangeburg fine sandy loam, Ruston fine sandy loam, Luverne fine sandy loam, and Norfolk fine sandy loam of the uplands and Cahaba fine sandy loam, Amite fine sandy loam, and Kalmia fine sandy loam of the second bottoms and terraces in this general region is 600 pounds of 6–8–4 an acre. The plant nutrients may be supplied by 600 pounds of a 4–8–4 fertilizer and a side application of 75 pounds of nitrate of soda or its equivalent; or, they may be supplied by 225 pounds of nitrate of soda or its equivalent, 200 pounds of superphosphate, and 48 pounds muriate of potash an acre. In the experiments, all the superphosphate, all the potash, and one-fourth of the nitrogen were applied in the bed immediately before planting, and the remaining three-fourths of the nitrogen was applied just prior to the first cultivation, after the cotton was chopped. Cultivation by hand and machinery begins as soon as the crop is well out of the ground and continues until about the middle of July. Most of the crop is picked between August 25 and September 30.

Johnson grass, although grown both as a cash and as a subsistence crop, is the second most important cash crop. It can be produced economically for hay only on the lime or prairie soils. In general, it will make a sufficient volunteer growth to establish itself for a hay crop on the fallow areas of these soils. A common practice is to plow Johnson grass meadow in the early fall once every 3 or 4 years and sow a crop of oats. The tillage tends to keep down weeds and increase the stand of hay. No fertilizer is used. The grass is cut for hay three or four times each season and is baled within a short time after cutting. The part to be sold is marketed during the following fall and winter.

A small part of the other crops, such as peanuts and peas, are sold, but their principal use is for consumption on the farm.

The most important subsistence crop is corn. Like cotton, it is grown universally and is produced on practically every soil. It is most successfully grown on the fertile lowland soils and is least adapted to the dry sandier soils. The most commonly grown and recommended varieties are, in order of their importance, Hastings

Prolific, Whatley Prolific, and Tennessee Red Cob. Corn commonly follows the cover crops. It is planted from about March 26 to June 1. Late-planted corn generally is affected severely by the dry, hot summer. Most of the crop is planted in furrows, and the ground is worked to rows during subsequent cultivation. On some lowland areas, corn is planted on ridges, as is cotton. A small part of the crop receives a complete fertilizer treatment at the time of planting, and most of it is side dressed with a nitrate fertilizer when it reaches a height ranging from 1 to 2 feet. The corn crop is laid by about July 1. Occasionally field peas are sown at this time to furnish fall forage, and, in some fields, velvetbeans, peanuts, or soybeans are planted in alternate rows for the same purpose. Most of the corn is gathered and is stored with the husks on. Some of the fodder is pulled or the tops are cut for winter forage. This, however, is not a universal practice and is not advised. Cattle and hogs are turned on the rest of the crop, including that in which peas, peanuts, soybeans, or velvetbeans have been planted. Some farmers plant *Crotalaria*, which is grown as a summer legume for soil improvement, in the corn. This crop reseeds itself year after year.

Only a small acreage is devoted to hay crops, other than Johnson grass for livestock feed. Probably the most common hay crops grown on the nonlimy soils are sorgo, mixed sorgo and field peas, mixed oats and Austrian Winter peas, mixed oats and vetch, lespedeza, soybeans, and Sudan grass. In addition, peanut vines and some field-pea vines are preserved for winter forage. All except the mixed oats and Austrian Winter peas and mixed oats and vetch are sown in the spring. The fall-sown crops are cut early enough to allow the planting of soybeans, field peas, peanuts, or sweetpotatoes immediately after their removal. According to the county agricultural agent, hay crops recommended for the nonlimy or sandy upland soils are lespedeza, soybeans, and mixed oats and Austrian Winter peas. Lespedeza is best adapted to moist bottom-land soils. This crop on Ochlockonee silt loam near Moundville yielded from 1½ to 2 tons annually from three cuttings. The crop is sown in the spring and is cut during the following summer or early fall. It will reseed itself for subsequent seasons. About 300 pounds an acre of superphosphate or 600 pounds of basic slag should be applied at the time the crop is sown, and subsequent lighter applications should be made annually (*3*). The recommended varieties of lespedeza for hay are Kobe and Tennessee 76.

Soybeans for hay may be sown either in the spring or on ground from which an oat crop has been harvested. This crop is well adapted both to the sandy upland soils and the prairie soils. It should be fertilized with at least 250 pounds of superphosphate or an equivalent of basic slag, in order to obtain profitable results. Otootan, Laredo, Chiquita, and Biloxi for hay, and Laredo and Chiquita for seed, are commonly recommended varieties.

Of the soils of the sandy uplands and terraces, only the more fertile and better drained soils—Akron loam, Akron fine sandy loam, Red Bay fine sandy loam, and Amite fine sandy loam—are suited to the production of alfalfa. The ground should be prepared for this crop by turning under a leguminous cover crop and by the application of 2½ to 3 tons of crushed limestone an acre, about 300 pounds

of superphosphate, or 600 pounds of basic slag, and about 50 pounds of muriate of potash. Similar applications of phosphate and potash should be made annually, and the applications of limestone should be repeated every 5 or 6 years. Yields ranging from 2½ to 3½ tons an acre from four cuttings have been obtained where the land is properly fertilized. One farmer near Greensboro reported a yield of 5 tons an acre obtained under favorable conditions when the following fertilizer was used: 2 tons of crushed limestone, 1,000 pounds of basic slag, and 100 pounds of muriate of potash an acre every 6 years, and, in addition, 800 pounds of basic slag applied annually.

This crop is sown either in the fall between September 1 and October 15 or in the spring as soon after March 1 as the condition of the ground allows. After it is well established, it is cut three or four times each season. If properly cared for, a good stand ordinarily can be maintained for several years. Alfalfa cannot be grazed successfully. The most satisfactory seed is the Kansas- and Utah-grown Common variety. A very small acreage of the limy prairie soils, principally Sumter clay, is devoted to alfalfa, but results obtained by the farmers have not been encouraging.

Alfalfa has given a very satisfactory return when phosphate was applied, and it has been found that the use of a small amount of potash per acre will prolong the life of the stand of alfalfa. As a general rule, work at this station up to date (May 1935) indicates that Sumter soils are the best for alfalfa and all winter legumes. It has shown that both potash and phosphate are necessary to grow alfalfa successfully. These fertilizers have been applied in the early fall.[5]

It appears probable that alfalfa can be grown more successfully on the more fertile areas of Sumter clay than on the average Houston clay, although encouraging results have been obtained on Houston clay at the agricultural experiment substation at West Point, Miss. (*2*). Unfertilized land at this station yielded 1.63 tons of alfalfa an acre annually over a 5-year period, and land fertilized with 250 pounds of superphosphate, annually, yielded an average of 2.22 tons. Nitrogen and potash fertilizers had no noticeable affect on the growth.

Sorgo is practically the only crop grown for silage throughout the prairie belt. It ordinarily yields from 6 to 8 tons of silage an acre. Some dairymen who fertilize their land produce higher yields. One farmer near Greensboro reported an average yield of 15 tons an acre in 1934. He planted Texas-seeded cane after turning under a crop of Austrian Winter peas. Much of the sorgo grown for silage is produced on Catalpa clay and Bell clay.

According to results obtained at the Black Belt Substation, all the prairie and associated post oak lands are well suited to the production of sorgo. The lime soils, such as the Sumter, Houston, Bell, and Catalpa, should be fertilized with 375 pounds of superphosphate and 50 pounds of muriate of potash an acre, and the post oak soils, Oktibbeha, Vaiden, Eutaw, and Lufkin, should be fertilized with 2 tons of lime and 225 pounds of nitrate of soda an acre, in addition to the same quantities of phosphate and potash as are applied to the lime lands (*9*).

Other forage crops available as feed for livestock throughout the black belt are oat straw and corn fodder.

[5] Statement of K. G. Baker, superintendent, Black Belt Substation, Marion Junction.

The most important small-grain crop is oats. Most of the oats are used as feed for livestock, but occasionally a carload is sold. All oats are fall sown, and the only variety recommended and successfully grown is Red Rustproof (Texas Red). From 150 to 225 pounds of sodium nitrate and 375 pounds of superphosphate are recommended and are in general use. The nitrate fertilizer is applied in March. According to the county agricultural agent, this crop is highly recommended for the better drained prairie soils. He reports yields ranging from 45 to 55 bushels an acre on Houston clay and the better areas of Sumter clay, where fertilized as recommended above. According to K. G. Baker, of the Black Belt Substation, the average yield of oats over a 3-year period on Sumter clay has been more than doubled by the application of 375 pounds of 16-percent superphosphate an acre at planting time and 225 pounds of nitrate of soda as a top dressing in the spring. According to this same authority, oats seem to be one of the promising crops for this soil.

The acreage of wheat is small, but where the land is fertilized according to the recommendations given for oats, from fair to good yields are obtained. The variety recommended for this section is Alabama Bluestem. This crop is more susceptible to rust than are oats, and, consequently, yields are much more variable. Wheat is grown principally for household use and to less extent as feed for livestock, especially poultry. It has limited possibilities as a fall-sown crop to replace row-cultivated crops.

The total acreage of field peas is small, but some are grown on practically every farm. The Crowder and Whippoorwill varieties of cowpeas are grown, especially for food. They are also commonly sown in the cornfields at about the time the corn crop is laid by. On many farms the peas are picked in the fall and fed to livestock during the winter as a concentrate to supplement other grain feed and forage. Ordinarily this crop is not fertilized.

Peanuts are grown both for household use and as feed for livestock, but on few farms are more than 2 or 3 acres planted to this crop. For profitable results, the crop should be fertilized with from 200 to 375 pounds of superphosphate an acre, or its equivalent of basic slag, unless it follows cotton or some other crop that has been heavily fertilized. On the acid prairie soils, lime is beneficial, unless basic slag is used as the phosphatic fertilizer. Spanish varieties of peanuts are the principal ones recommended and grown. The crop is pulled and stacked for curing, and it is stored later, in order to protect it from the weather. Occasionally the crop is hogged off.

Sorgo and ribbon cane are grown universally for sirup, mainly for use in the home, and a small quantity is sold locally. Ribbon cane generally is planted on low fertile sandy land (alluvial soils, undifferentiated). It is grown from canes from the previous crop preserved in pits. It generally receives a heavy application of barnyard manure at the time of planting. Sorgo is grown on similar land, also on higher, better drained land. The best quality of sorgo sirup is produced on well-drained sandy soils with yellow subsoils. This crop also is commonly fertilized with barnyard manure.

Sweetpotatoes or yams are grown principally for household use, and a small proportion of the crop is sold on the local markets. They

are also commonly used for hog feed. The crop is "bedded out" in February and transplanted about the middle of April. Practically every farmer devotes from one-half acre to 2 acres to this crop.

Pasture crops are of importance wherever livestock is raised. As careful consideration should be given to the establishment and maintenance of good pasture crops as is given to the growing of other crops. They furnish an easy and economical means of feeding livestock, especially in a section where grazing is possible for a large part of the year. A volunteer stand of legumes or grasses develops readily on all the prairie soils.

Because of the different natural adaptations of the prairie soils, it is very desirable to have the lime land and the post oak land included in the same pasture. The lime land, including the Sumter, Houston, Bell, and Catalpa soils, affords very early grazing in the spring from black medic, white clover, sweetclover, and hop clover, as well as large amounts of grazing during the summer from Dallis grass and white clover. Johnson grass, sensitiveplants, and partridge-peas also supply some grazing. The post oak land, including the Oktibbeha, Vaiden, and Eutaw soils, supplies a large amount of grazing in the summer from lespedeza, Dallis grass, and carpet grass, in addition to some early grazing from hop clover. Orchard grass also may be grown on the Vaiden and Oktibbeha soils, but, probably, a liberal application of phosphate is necessary before a successful stand can be obtained.

A very extensive pasture experiment being carried on at the Black Belt Substation indicates that all pasture plants, especially legumes, respond to the use of a phosphate fertilizer. An application of 375 pounds of superphosphate proved profitable on both calcareous and noncalcareous soils. The use of 2 tons of lime in addition was beneficial on the noncalcareous land, and 225 pounds of nitrate of soda increased the stands of grasses on the noncalcareous land.

The most satisfactory pasture soils, outside of the prairie belt, are the alluvial soils, undifferentiated, and the Ochlockonee, Myatt, and Augusta soils. The grass mixture recommended by the county agricultural agent for these soils is comprised of Bermuda grass, carpet grass, Dallis grass, common lespedeza, and hop clover. For the best results, a phosphate fertilizer applied at a rate ranging from 200 to 375 pounds of superphosphate an acre should be applied annually. According to one farmer's experience, 30 acres of alluvial soils, undifferentiated, seeded to this mixture and fertilized annually with 300 pounds of basic slag, supports 50 head of cattle through a grazing period of 8 or 9 months. Other crops of value for summer grazing are Sudan grass, field peas, soybeans, and kudzu.

Oats or rye are of considerable value for winter grazing, provided sufficient growth is developed by the middle of December to support grazing throughout the following 3 months. If these crops are sown late or if their growth is suppressed by dry weather during the fall, they will not afford much winter grazing. If they are not too heavily grazed and the livestock are removed about March 15, they will mature a normal grain crop the following spring. For early spring grazing, fall-sown leguminous cover crops can be pastured for a short time without seriously lessening their value for green manure. Further information on pasture crops may be obtained from publications issued by the Alabama Agricultural Experiment Station (*3*, *4*, *6*).

Fall-sown leguminous cover crops are rapidly becoming the most important means of building up both the nitrogen and organic-matter content of the tillable soils in this county. According to the county agricultural agent, a crop of hairy vetch, crimson clover, or Austrian Winter peas, the principal crops grown for this purpose, will very nearly double the yield of the crop following it. The cover crops are sown in September or October and turned under about the middle of April. An application ranging from 300 to 400 pounds of superphosphate, or the equivalent of basic slag, at the time of planting this crop is recommended (*7*). These crops may be grown on practically all the soils, except those subject to overflow, and they should prove of economic value on all except the highly fertile bottom lands and the black soils of the black belt.

The improvement and maintenance of the fertility of the tilled soils are gradually receiving more attention by the farmers. As previously pointed out, the acreage of leguminous cover crops has increased noticeably during the last few years, and much attention is being devoted to the terracing of all tilled soils that are susceptible to erosion. Improved varieties of seeds are becoming increasingly more common, and the knowledge of the most profitable use of commercial fertilizers is becoming more widespread.

Meanwhile, a more self-sufficing type of agriculture is being developed. Throughout the sandy uplands and terraces, the reduced acreage in cotton has resulted in an increased acreage in subsistence crops, especially corn. A simple rotation of alternate crops of cotton and corn, with a leguminous cover crop following cotton, is probably the most satisfactory major cropping plan to be followed on these soils.

The tendency of livestock farming to increase throughout the prairie belt is a move toward a natural adaptation of the soils. Practically all the soils of the prairie belt are capable of producing good pasture crops, and many of them are capable of producing profitable forage and grain crops. Because of the great susceptibility of most of these soils to sheet erosion, the great difficulty experienced in cultivating them, and the continuous struggle necessary to keep down the growth of weeds, the county agricultural agent recommends a system of farming that avoids, as much as possible, the growing of row crops. This means a reduction in the acreage, especially of cotton and corn. A practice now recommended and practiced to some extent is that of growing oats for grain and a hay crop for forage, the hay crop being volunteer Johnson grass that develops after the removal of the oat crop. If a legume-hay crop is to be grown, soybeans can follow the oat crop. Alfalfa should prove a profitable crop on the more fertile areas of Sumter clay and possibly on the red sandy soils of the uplands, principally Akron fine sandy loam and possibly the Red Bay and Amite fine sandy loams.

A rotation being tried under the direction of J. T. Williamson, associate agronomist, Alabama Polytechnic Institute, on a post oak clay soil near Gastonburg, Ala., similar to Eutaw clay and Vaiden clay, is as follows: First year, cotton followed by fall-sown oats;

second year, cowpeas for hay followed by vetch for a cover crop; third year, corn; fourth year, soybeans for hay. During this 4-year period, 300 pounds of nitrate of soda, 1,200 pounds of superphosphate, and 75 pounds of potash are applied. One hundred pounds of the nitrate are applied to the cotton and 200 pounds to the oats. Two thirds of the phosphate and potash are applied to the vetch, and the other third is applied to the cotton. Such a rotation gives one cash crop, two grain crops, two hay crops, and one soil-building crop. The greatest difficulty experienced so far is in avoiding the winter-killing of the oat crop.

Dairying is practiced almost universally throughout the prairie belt. There are a few large dairies, but most of the milk is produced from herds of less than a dozen cows. Most of the cows freshen in the early spring, thus producing most of the milk while the pasture crops are most succulent. Very little special feeding is done to increase the production of milk. Most of the dairy cattle are wintered on roughage and a small quantity of grain. The Jersey breed of cattle predominates in the dairy herds.

Most of the beef cattle and dairy cattle are raised within the prairie belt. Calves are dropped during the early spring, and the less desirable beef animals are marketed between the ages of 4 and 6 months. The rest are marketed directly off grass in early summer between the ages of 1½ and 2½ years. The animals are wintered on a maintenance ration comprised mainly of roughage and a small quantity of cottonseed meal. The Hereford breed predominates among the beef cattle.

A few sheep are raised, but their numbers are somewhat limited by their susceptibility to disease when raised in large flocks. Lambs are dropped about January 1 and are marketed about May 15, at a weight of approximately 60 pounds. Disposing of lambs at this date has the distinct advantage of being well in advance of the marketing of lambs produced in most other sections of the United States. Southdown and Hampshire breeds of sheep predominate.

MORPHOLOGY AND GENESIS OF SOILS

Hale County is situated on the Gulf Coastal Plain in the west-central part of Alabama. It is in the Red and Yellow soils region of the United States where light-colored Red and Yellow soils predominate, but areas of dark-colored Rendzina soils are included. The average elevation of the prairie belt is noticeably less than that of the sandy uplands to the north. The average annual rainfall is over 50 inches, and the mean annual temperature is about 64° F.

With the exception of the Rendzina soils of the Houston, Sumter, and Bell series, these soils supported originally a forest growth of deciduous trees and pines. All the soils are light colored and, with the exception of the Houston and Bell soils, contain only a very small quantity of organic matter. The virgin forested areas contain a noticeable quantity of vegetable matter in the topmost inch or two of soil.

Within the memory of man, the calcareous soils in the prairie section have not supported a forest growth worthy of mention, but grasses and cane have grown for a long time, and this feature accounts for the dark color and high content of organic matter in the Houston and Bell soils. In the Sumter soils, the most calcareous soils of the prairies, erosion has kept close pace with soil development, so that the surface soils are light colored, and the solum is thin.

Leaching or the washing out of the carbonates and alkaline earths has been extensive and is still going on. This accounts for the fact that the surface soils contain a smaller quantity of plant nutrients than the subsoils. In this area of heavy rainfall and warm temperature, leaching is continuous throughout the year.

Sheet erosion and gullying are extremely serious throughout the northern one-half of the county. They are much more noticeable in the extensive areas of Guin, Ruston, Luverne, and Orangeburg soils than in the prairie section. Sheet erosion is severe throughout the areas of Houston, Sumter, Vaiden, and Oktibbeha soils. Over the greater part of Sumter clay, sheet erosion is and has been destructive, in that the clay surface soil in many places has been removed and the underlying Selma chalk formation exposed. Erosion not only has changed the surface features of the fields since the land was cleared, but it has also changed the texture of the soil and destroyed once normal soil profiles. In many places the sandy surface material has been entirely removed, laying bare the unweathered formation of the underlying heavier material. Particularly is this true in the northern part of the county.

All the soils, with the exception of those of the Sumter, Houston, Bell, and Catalpa series, are definitely acid. Table 5 gives the pH determinations of soil profiles of the principal soils of the county.

TABLE 5.—*pH determinations on several soil profiles from Hale County, Ala.*[1]

Soil type and sample No.	Depth	pH	Soil type and sample No.	Depth	pH
Amite fine sandy loam:	*Inches*		Eutaw clay:	*Inches*	
417901	0–6	6.1	417929	0–2	5.4
417902	6–12	6.2	417930	2–5	4.5
417903	12–36	5.0	417931	5–54	4.5
417904	36–62	5.0	417932	54–72	7.7
417905	62–80	5.0	417933	72+	8.2
Sumter clay:			Bell clay:		
417911	0–5	8.2	417938	0–12	7.9
417912	5–14	8.2	417939	12–72	7.8
417913	14–17	8.2	417940	72–90	8.1
417914	17+	8.2	Ruston fine sandy loam:		
Vaiden fine sandy loam:			417946	0–7	5.7
417915	0–7	5.2	417947	7–22	5.8
417916	7–16	4.6	417948	22–36	5.5
417917	16–22	4.5	417949	36–44	4.7
417918	22–60	4.6	417950	44+	4.9
417919	60–72+	4.8	Akron fine sandy loam:		
Oktibbeha clay:			417959	0–6	4.6
417920	0–4	5.5	417960	6–18	5.1
417921	4–18	4.8	417961	18–36	4.7
417922	18–26	5.0	417962	36–50+	4.7
417923	26–32	7.0			
417924	32–44+	8.3			
Houston clay:					
417925	0–8	7.8			
417926	8–24	8.0			
417927	24–78	8.1			
417928	78–100	8.0			

[1] Determinations made by the hydrogen-electrode method in the laboratories of the Bureau of Chemistry and Soils.

The Sumter soils are highly calcareous, and they grade, at a very slight depth, into the soft decomposed calcareous chalk. Calcareous

material is also present at a depth of 6 or more feet under the Vaiden and Eutaw soils and at a depth ranging from 2 to 4 feet under the Oktibbeha soils.

Three geological formations occur in this county: The Selma chalk, the Eutaw, and the Tuscaloosa (*1*). The Selma chalk formation, or decomposed limestone, is white or very light gray chalk limestone exhibiting, in some places, clearly defined bedded planes. The chalk, or limestone, was deposited on the sea floor at the end of the Cretaceous period and was doubtless formed as calcareous more or less muddy ooze which gradually accumulated on the bottom of a clear and moderately deep sea. The Selma chalk formation underlies practically all the soils of the prairie section. The soil-forming processes have acted upon the weathered material of this soft limestone and produced the Sumter, Houston, and Bell soils, and the same material underlies the C horizon of the Oktibbeha soils. Beds of heavy clays, superimposed on the Selma chalk, have given rise to the Oktibbeha, Eutaw, and most of the Vaiden soils. These soils are underlain by Selma chalk at a depth ranging from 5 to 8 feet.

Lying north of the prairie section and underlying the Selma chalk formation is the Eutaw formation which crosses the central part of the county. It consists of thinly bedded and laminated light-gray or bluish-gray clays and yellow fine micaceous sands and glauconitic material. This formation, in many places, contains a noticeable quantity of finely divided mica scales. The Akron and Luverne soils have developed from this material.

The Tuscaloosa formation, consisting of light-colored irregular or cross-bedded bodies of sands and clays and some gravel, underlies the northern part of the county. It gives rise principally to the Orangeburg, Ruston, and Red Bay soils.

Two main groups of soils are developed in Hale County—one including soils which have normal soil profiles and the other including soils which have not developed normal soil profiles owing to erosion, gullying, poor drainage, poor aeration, and poor oxidation. The first group includes soils of the Orangeburg, Luverne, Akron, Ruston, Red Bay, Norfolk, Amite, Cahaba, and Kalmia series. The most striking features of the profiles of these well-developed soils are a comparatively coarse-textured A horizon, a finer textured B horizon, and a third, still deeper, horizon which varies considerably in texture but which, in most places, is finer than the A horizon and coarser than the B horizon. The B horizon is the uniformly colored and most thoroughly oxidized layer in the profile. These soils show the influences of eluviation in the A horizon and illuviation in the B horizon. They are the most thoroughly aerated and best-drained soils in the county, and, in addition, oxidation of the iron salts is more complete in them than it is in any other soil. This accounts for the intensely red color of the B horizon of many of these soils to a depth of several feet. The C horizon consists of the unconsolidated geological material which is extremely variable in structure and color.

Orangeburg fine sandy loam may be considered the most normally developed soil of the county and the soil which expresses most thoroughly the climatic influences of the general region. A description of a profile of this soil, as observed 3 miles north of Sawyerville, is as follows:

1. 0 to 8 inches, light-gray loamy fine sand. Before this soil was disturbed from its virgin condition, the 1½-inch surface layer was dark-gray loamy fine sand containing a noticeable quantity of partly disintegrated leaves, small stems, and rootlets. Below this, the color changed rapidly to lighter gray. The material in this layer is slightly acid.
2. 8 to 12 inches, mottled gray and pale-red friable fine sandy loam. This is a transitional zone. The upper part is light-gray loamy fine sand containing a few pale-red pebblelike aggregates of sandy clay loam. The proportion of gray sandy material decreases with depth, and, at a depth of about 10 inches, the red fine sandy clay loam predominates. The reaction of this layer and that of the underlying layers is acid.
3. 12 to 24 inches, uniformly red friable but somewhat sticky fine sandy clay. This is the darkest red layer of the soil profile and the zone of maximum accumulation of fine material. There is no definite structure or lines of cleavage. The brittle mass breaks under pressure into irregular angular fragments that are reduced easily to a crumbly mass.
4. 24 to 40 inches, uniformly red friable fine sandy clay loam. The changes to a slightly lighter color and a coarser texture than those of the above layer are very gradual. The same massive condition prevails throughout this layer as in the layer above, but the brittleness of the material decreases gradually with depth.
5. 40 to 54 inches, light-red or yellowish-red, streaked and splotched with yellowish gray, crumbly fine sandy loam that readily crushes to a friable mass. It grades with depth into a more yellow sandy material.

The Ruston soils differ essentially from the Orangeburg soils in that their B and C horizons are lighter colored throughout, ranging from yellowish red to reddish yellow. The Luverne soils differ essentially from the Orangeburg soils in the character of the B horizon and to some extent in the material of the C horizon. The upper part of the B horizon is dull-red heavy tough compact clay, as contrasted to the friable sandy clay of the corresponding layer of the Orangeburg soils, and the lower part is light-red heavy but friable fine sandy clay containing, in most places, small mica scales.

The 4- to 6-inch surface layer of the Akron soils is brown or reddish-brown fine sandy loam, and the B horizon is dark-red heavy compact extremely stiff clay. The Red Bay soils bear the same relation to the Akron soils as the Orangeburg soils do to the Luverne soils. The surface layer is brown or reddish-brown fine sandy loam and is underlain by a dark-red friable sandy clay B layer. The Susquehanna soils are characterized by light-colored sandy surface soils and mottled red, yellow, and gray heavy plastic clay B horizons, the upper part being predominantly red. The Norfolk soils have light-gray surface layers, yellow B horizons, and mottled yellow and gray comparatively friable underlying material. The Amite soils represent the development of the Red Bay characteristics on second bottoms or terraces, the Cahaba soils represent the development of Orangeburg and Ruston characteristics on terraces, and the Kalmia soils represent the development of Norfolk characteristics on terraces.

Houston clay, as regards the development of its profile, is a Rendzina. Rendzina is a term applied to black soils whose grass vegetation, dark color, and other characteristics are due to the influence of the parent material rather than to the action of external forces and conditions. The Houston soil owes it black color to the preservation of organic matter through the agency of lime inherited from the

parent material rather than to the climatic forces of the region. In this climate, the tendency would be for Houston clay to lose its organic matter and free calcium carbonate and finally develop a red B horizon.

A description of a profile of Houston clay taken about 2 miles north of Prairieville follows:

1. 0 to 8 inches, dark olive-drab sticky plastic clay. The reaction is neutral. This layer is slightly lighter in color than the layer below. The lighter color is undoubtedly the result of activity of the crawfish which very commonly inhabit this soil. They bring up the limy material from the layer below.
2. 8 to 24 inches, dark-gray or dark grayish-black sticky heavy clay. The mass breaks easily into fine angular fragments when moist, but the material is plastic when wet. A few yellow lime nodules, about one-fourth inch in diameter, are distributed throughout this layer. The reaction of the material in this layer is nearly neutral. Although the content of calcium carbonate is sufficient to preserve, at least partly, the organic matter from rapid leaching, it is not sufficient to flocculate the soil colloids enough to give a friable or granular structure to the material.
3. 24 to 100 inches, yellow plastic clay containing an abundance of lime nodules. Almost white soft limy flecks are present below a depth of about 50 inches. This material is not plastic but is brittle and crumbly. The reaction is alkaline. Selma chalk is reached at a depth ranging from 3 to 10 feet.

The Sumter soils, in many places, may be considered eroded Houston soils. They have light-gray or yellowish-gray A horizons, pale-yellow, grayish-yellow, or creamy-white B horizons, and, in most places, the soil material grades, at a depth ranging from 20 to 40 inches, into white blocky soft limestone or Selma chalk.

The Oktibbeha, Vaiden, and Eutaw soils are post-oak soils, that is, in their virgin condition they supported a forest principally of post oak and some pine. The main differences between the soils in this subgroup are probably due to the thickness of the heavy clay material overlying the Selma chalk. Where the clay material is thin, a soil profile has developed, which, in its color characteristics, expresses to a considerable degree, the climatic influence of the region. This is Oktibbeha clay. The calcareous material is reached in most places at a depth ranging from 20 to 50 inches below the surface, and this has resulted in better drainage and has allowed aeration and oxidation of the overlying clays. This is by far the best oxidized soil on the prairie. The Vaiden soils are intermediate in degree of oxidation and aeration between the Oktibbeha soils and the poorly drained Eutaw soils.

All the black-belt soils are immature for this climate. The Houston and Sumter clays are abnormal soils for this climate, because they contain large quantities of calcium carbonate. If erosion were not continually exposing fresh chalk and removing the residue from the weathering of the chalk, it is probable that these soils would develop normal profiles, become acid in the course of time, and finally, as maturity is attained, take on the characteristics typical of mature soils for this climate.

The order of the magnitude of the buffer and base-exchange capacity varies inversely with the degree of weathering, or these could be expressed as varying inversely in order of magnitude with the silica-sesquioxide ratio. Eutaw clay, with a ratio of 2.31, is highly

mottled gray and yellow clay, and Oktibbeha clay, with a ratio of 1.90, is uniformly red (*8*).

Investigations by L. D. Baver indicate that Eutaw clay is more plastic than Oktibbeha clay, and that the plasticity of these soils ranges in order of magnitude with the silica-sesquioxide ratio: Houston clay and Sumter clay are the least plastic, a result which would be expected because of their high calcium content.

Table 6 gives the chemical composition of four soils from the black-belt section of Alabama, together with their silica-sesquioxide ratios.

TABLE 6.—*Chemical composition of the colloids from the soil profiles of typical black-belt soil types and their silica-sesquioxide ratios*[1]

Soil type and No.	Depth	SiO_2	Al_2O_3	Fe_2O_3	P_2O_5	TiO	$\frac{SiO_2}{R_2O_3}$	$\frac{SiO_2}{Al_2O_3}$
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*		
Oktibbeha clay, 710	0–2	37.639	28.662	9.550	0.1011	1.370	1.84	2.23
	2–6	39.623	29.884	10.860	.0775	1.526	1.83	2.25
	6–12	42.755	21.227	9.710	.0378	1.206	1.90	3.42
	12–18	44.012	33.138	9.070	.0364	1.154	1.92	2.25
Eutaw clay, 722	0–4	43.855	27.850	9.7704	.1116	.886	2.18	2.67
	4–14	45.655	27.848	8.9632	.0659	.832	2.31	2.78
Sumter clay, 732	0–4	44.440	26.062	8.9032	.6760	.0784	2.38	2.89
Houston clay, 739	0–6	37.010	27.274	8.9831	.6500	.0928	1.90	2.30

[1] From Scarseth (*8*).

The chemical analyses of Orangeburg fine sandy loam, from Lauderdale County, Miss. (table 7), will apply fairly well to Orangeburg fine sandy loam from Hale County, Ala., as also will the mechanical analyses of Orangeburg fine sandy loam from Dallas County, Ala. (table 8).

TABLE 7.—*Chemical composition of Orangeburg fine sandy loam, Lauderdale County, Miss.*[1 2 3]

Horizon	Depth	SiO_2	TiO_2	Fe_2O_3	Al_2O_3	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	SO_3	Ignition loss	Total	N
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
A	0–10	a93.65	0.50	0.93	2.57	0.04	0.16	0.06	0.45	0.15	0.03	0.09	1.53	100.77	0.050
		b95.11	.50	.94	2.60	.04	.16	.06	.45	.15	.03	.09		100.73	
B	10–36	a87.61	.52	2.41	6.30	.260	.26	.14	.37	.35	.08	.03	2.48	100.82	.050
		b89.84	.53	2.47	6.45	.272	.27	.14	.38	.35	.08	.03		100.81	
		c40.35	.44	10.08	33.27	.595	.45	.67	.81	.29	.17	.09	13.60	100.95	.250
		d46.70	.51	11.66	38.50	.680	.52	.72	.94	.33	.20	.10		100.80	

[1] Collected by H. H. Bennett.
[2] Analyzed by W. O. Robinson and R. S. Holmes.
[3] Table from Atlas of American Agriculture.

TABLE 8.—*Mechanical analyses of Orangeburg fine sandy loam, 4⅓ miles north of Selma, Dallas County, Ala.*

Sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
30289	0–4	2.1	2.4	6.7	56.9	7.2	17.6	7.1
30290–30291	5–12	.1	1.9	6.4	54.1	8.0	16.3	13.9
30292	19–40	.2	1.6	5.1	54.0	4.6	12.4	32.9
30293–30294	41–132	.1	1.5	7.4	61.4	3.1	24.9	1.7

Bell clay is developed around the heads of drainageways and on very gentle slopes adjacent to streams in the prairies, from both colluvial and alluvial material washed down from the surrounding Houston, Sumter, and Oktibbeha soils. It has a dark-gray or black surface soil and a dark-gray subsoil. The materials in both horizons are heavy and plastic. Catalpa clay differs from Bell clay in that it is lighter colored and is alluvial material deposited in the first bottoms by streams rising in and flowing through prairie soils. The Leaf soils are developed on terraces, principally within the prairie belt, but are formed evidently from noncalcareous clays similar to those underlying the Oktibbeha, Vaiden, Eutaw, and other acid soils. They have a well-defined eluviated layer and gray heavy stiff fine sandy clay subsoils mottled with yellow and some red.

The Myatt soils are characterized by dark-gray or dingy-gray surface soils and yellowish-gray or gray, mottled with rusty brown, friable subsoils. They represent poorly drained terraces. The Augusta soil also is a poorly drained soil of the terraces, but it is somewhat better drained than the Myatt soils. The upper part of the subsoil is yellow, whereas that of the Myatt soils is gray. Another striking difference is the compact stiff character of the material, at a depth of about 24 inches, of the Augusta soil. This material is so extremely compact that water moves very slowly through it. The Ochlockonee soils occur on the first bottoms of Black Warrior River and the larger streams throughout the sandy upland part of the county. The material from which they are formed is developed principally from the Tuscaloosa and Eutaw formations. Alluvial soils, undifferentiated, are so variable in color, texture, and structure that no soil type distinction could be made.

Guin soils, undifferentiated, represent a soil condition developed through erosion of different soil types throughout the sandy uplands. Its areas include badly gullied areas of the Ruston, Susquehanna, Orangeburg, and Luverne soils so intricately mixed that no separation into soil types could be made.

Mechanical analyses of samples of two soil profiles are given in table 9.

TABLE 9.—*Mechanical analyses of two soil profiles from Hale County, Ala.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Akron fine sandy loam:								
417951	0–6	0	0.7	8.5	62.3	8.5	14.4	5.6
417960	6–18	0	.4	5.4	33.4	4.5	22.0	34.4
417961	18–36	.1	.4	5.2	35.7	4.0	13.4	41.2
417962	38–50+	.1	.3	5.1	33.1	4.0	16.1	41.3
Oktibbeha clay:								
417920	0–4	.3	1.6	2.6	7.4	3.5	26.6	58.1
417921	4–18	.1	.6	1.1	2.7	1.6	31.5	62.4
417922	18–26	.2	.4	.6	2.1	1.4	26.9	68.4
417923	26–32	.2	.3	.4	1.3	1.2	11.1	85.6

SUMMARY

Hale County is in the west-central part of Alabama. The southern one-third is underlain by the Selma chalk geologic formation, the central part by the Eutaw formation, and the northern one-third by the Tuscaloosa formation. That part overlying the Selma chalk formation is known as the prairie belt, and the remaining two-thirds is known as the sandy uplands. Black Warrior River forms the entire western boundary, and the extreme western part of the county comprises first bottoms and river terraces. The prairie section has a relief ranging from almost level to gently rolling. The sandy uplands include broad flat interstream areas, narrow winding ridges, steep hillsides, and broken gullied areas. Probably 40 percent of the land is so badly gullied and eroded as to preclude its use for general farming. Practically all the soils, except some of the bottom lands, have good surface drainage.

An abundant supply of good drinking water, from dug wells, springs, and artesian wells, is obtained throughout the county.

Railroad facilities are ample. Some good roads have been built across the county, and Montgomery, Tuscaloosa, and Birmingham, the markets for dairy products, are readily accessible.

The climate is mild, and, in conjunction with the wide variety of soils, favors a diversified agriculture. Hardy vegetables can be grown during the winter, and the grazing season for cattle ranges from 9 to 10 months.

From the point of view of agricultural use, there are two definite soil sections, namely, the prairies and the sandy uplands. The prairie section includes the dark-colored soils developed under a grass vegetation and the associated heavy clay soils, or semiprairie soils. The Houston, Sumter, and Bell soils are highly calcareous and are formed from the underlying soft white Selma chalk. The Oktibbeha, Vaiden, and Eutaw soils, originally forested for the most part with post oak and pine, range from moderately to strongly acid and apparently are developed from beds of heavy noncalcareous clay, several feet thick. Prior to the advent of the boll weevil in 1914, the prairie soils and associated clay lands were used extensively for the production of cotton. On these soils, because of their heavy texture and structure, cotton matures late, and much of the crop is destroyed by the boll weevil. This condition has forced the farmers to make a wider use of these lands, and, as a result, the raising of livestock, the production of hay, particularly Johnson grass, and dairying have supplanted cotton growing to a large extent. The crops needed for dairying seem to fit the soils and climatic conditions better than any other crop at present. The Houston and Bell soils are potentially productive soils and, owing to their high content of organic matter and possibly to their better moisture conditions, are the best soils for corn and grass on the prairies.

In the sandy uplands and on the river terraces, a more diversified and self-sufficing type of agriculture is practiced. Although cotton is the principal crop and is grown to greater or less extent by practically every farmer, it is supplemented by corn, oats, garden vegetables, sweetpotatoes, sorgo or ribbon cane, fruits, and leguminous crops. The dominance of cotton is a natural response to the character of the soils of this part of the county.

The dominant agricultural soils in the sandy uplands and on the river terraces, as mapped and described in the report, are the well-known fine sandy loam types of the Akron, Red Bay, Orangeburg, Ruston, Luverne, Norfolk, Amite, Cahaba, and Kalmia series.

the coastal plain of Alabama these are considered among the best cotton soils. They lend themselves admirably to the production of a wide variety of crops. Although they are naturally low in the soluble plant nutrients, they respond readily to fertilization and produce some of the most profitable crops grown. These soils are naturally well drained, warm readily in the spring, and mature from one-third to two-thirds bale of cotton before the boll weevil arrives in the summer.

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