

SOIL SURVEY OF LAVACA COUNTY, TEXAS.

By CHARLES N. MOONEY, FRANK BENNETT, A. T. STRAHORN,
and H. L. BELDEN.

LOCATION AND BOUNDARIES OF THE AREA.

Lavaca County is situated in the southern part of east Texas, in the third tier of counties from the Gulf of Mexico, its southern boundary being about 60 miles distant from the coast. The county is intersected by the ninety-seventh meridian west from Greenwich, while it is situated between the parallels of 29° and 30° north, the

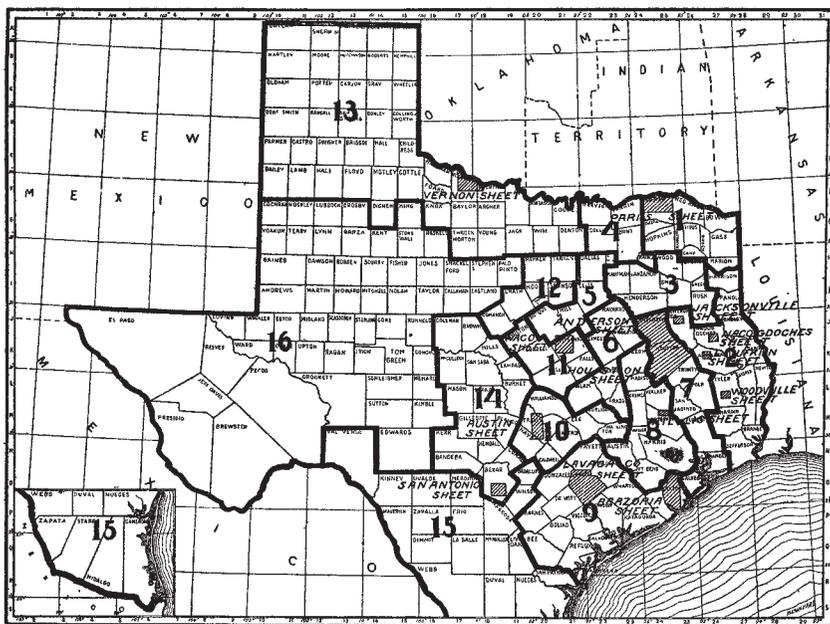


Fig. 25.—Sketch map showing location of the Lavaca County area, Texas.

extreme southern portion extending nearly to the twenty-ninth parallel.

Seven counties border on Lavaca County, beginning with Fayette, which touches it on the north, and then, passing to the east, south, and west, they are Colorado, Wharton, Jackson, Victoria, De Witt, and Gonzales, respectively.

The area of Lavaca County is 636,800 acres, or approximately 995 square miles. Hallettsville, with a population of nearly 2,000,

centrally located in the county, is the county seat and a thriving business place. It is practically in the same latitude with Houston and San Antonio, and in an air line is about equidistant from the two places. Other towns in the county and on the railroad are Shiner, Moulton, Sweet Home, and Sublime. Yoakum, with 3,500 inhabitants, situated on the county line, but principally in De Witt County, is the largest near-by town, being a railroad junction point and shipping center.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

In 1832 a few families from Missouri settled in what is now Lavaca County. They were soon followed by more families from the same State, also from other parts of Texas, and later from the older Gulf States. Settlement was encouraged in this section at that time by the Mexican Government, inducements being offered by giving large grants of land to settlers, which was continued until Texas gained her independence, in 1836.

These early settlers located along the streams and on the border of the treeless prairie and timber belt. The former afforded them cleared land for cultivation and pasturage for stock, while from the latter lumber was obtained for building purposes, fuel, and fencing. Pasturage was also afforded in the thinly timbered regions.

The settlers brought with them live stock, which, on account of the mild climate and abundance of pasturage throughout the year, greatly increased in numbers, so that in a few years cattle grazing became an important industry.

In 1846 territory was cut off from Gonzales County and Lavaca County was organized. During the following decade German and Bohemian settlers, some from Fayette County, to the north of Lavaca, and others direct from Europe, began to locate in the county. Later this class of immigration greatly increased, and two-thirds of the county's present population has its origin in these nationalities. These people located upon the prairie and gave their attention to cultivating crops instead of stock raising.

The open range and the low-priced lands at an early day attracted the attention of cattlemen, who were being crowded out in the more thickly settled sections of the State, and this region, therefore, became prominent as a grazing section. Attention was given entirely to the native cattle, but it is said that by 1850 the more enterprising ranchmen began improving the grade of their herds with Shorthorn and Hereford blood. The cattle were at first marketed by driving them to Galveston, New Orleans, or some smaller local market. Some time after the civil war the cattle were for a few years driven to Abilene, Kans., a point on the Union Pacific Railroad, and also to St. Louis, but after the building of railroads the larger stock markets

were reached through shipment at nearer points. In 1887 the San Antonio and Aransas Pass Railroad, from Houston to San Antonio, was built through the county and afforded better shipping points and railroad connections.

Corn was the first and principal crop grown by the early settlers. Some sorghum for molasses, sweet potatoes, and other vegetables, pork, milk, and butter were also produced for home consumption. Cotton was grown to some extent from the first, and soon became a staple crop. By 1860, 5,000 bales were being produced in the county. Horse gins were used, but just prior to the civil war a few steam-power gins were introduced. Port Lavaca, the nearest shipping point on the Gulf, was the cotton market until the railroad was built. Transportation was by wagons drawn by oxen, and the traffic was sufficient to engage many men in this work.

Until barbed wire came into use in the county about 1870 for fencing purposes, it was considered unprofitable to put much land under cultivation because of the great expense, even in the timbered portion of the county, of erecting and maintaining wooden fences to protect the crops from the herds that had free range of the whole country. With the use of barbed wire, fencing could be done easily and economically. Some prairie lands, occupied by the German and Bohemian settlers, were fenced and put under cultivation mainly to cotton. The production of cotton, however, declined from 1860 to 1870, and there was increased attention given to stock raising, due no doubt to the changed local conditions prevailing during and immediately after the civil war. But in the next decade cotton again became a favorite crop, and by 1880 the production was double what it had been before the war, its acreage being nearly as large as that devoted to corn. On the other hand, the number of cattle in the county had decreased one-fourth since 1870. At this time sheep raising had become an industry of some importance, and there were more than half as many sheep as cattle of all kinds. Sheep raising, however, in a few years declined, and continued to do so, until now only a very few are raised in the county. During the next twenty years, from 1880 to 1900, the cattle industry grew in importance along with the increased production of cotton, the census figures showing that there were more cattle in the county in the year 1890 and also in 1900 than there had been at any time except in 1870. In this connection it is interesting to note that the increase was more largely on the small farms than on the ranches, and was not accompanied by a decline in cotton growing. In 1890 the value of the cotton crop was equal to one-half of the estimated value of all the farm products of the county for that year. But in the last few years the production of cotton has been greatly decreased by the ravages of the boll weevil, and there seems to be at present a manifest tendency toward a diversification of crops.

CLIMATE.

The appended tables, taken from the records of the Weather Bureau stations at Hallettsville, Cuero, and Rock Island, give the normal monthly and mean annual temperature and precipitation, and the occurrence of the last killing frost in spring and the earliest in fall. The figures represent fairly well the climatic conditions of the area. As will be seen from the table the average annual mean temperature is about 69° F. for all the stations. The average temperature for the winter months is about 17° lower than the average annual mean temperature, while for the summer months it is about 15° higher. The extreme annual range in temperature is about 80° F. The maximum is very close to 100° F., while the minimum may go as low as 20° or 15°. Some sudden changes occur during the winter, when cold waves from the north reach down into this section. Starting with a cold north wind, there may be a change in temperature in an hour or two of 30° or more. These cold winds, known as "northers," are of short duration, lasting rarely more than three days. There is seldom any snowfall, but occasionally during the prevalence of a "norther" there may be a few snow flurries.

Situated near the Gulf, with prevailing southerly winds throughout the year, Lavaca County has a moderate and rather equable climate. In the warmest weather the cool Gulf breezes moderate the heat so that it is not oppressive, and the nights are cool and pleasant. By reference to the table showing occurrences of killing frosts it will be seen that the growing season for crops liable to damage by frosts is nearly nine months, but for those that can withstand somewhat lower temperatures it extends throughout the year.

In east Texas the annual rainfall exceeds 40 inches, but it decreases westward in the State to less than 10 inches. The rainfall in Lavaca County is a mean between the heavier precipitation to the east and the semiarid condition to the west, it being between 30 and 40 inches. How rapid these changes are will be noted in the difference in rainfall at Rock Island and Hallettsville, the difference being about 9 inches, although Rock Island is only about 25 miles east of Hallettsville.

The average rainfall of the county is ample for farm crops, and is well distributed throughout the year.

Normal monthly and annual temperature and precipitation.

Month.	Hallettsville.		Cuero.		Rock Island.	
	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January	52.3	2.35	52.7	2.37	52.0	3.08
February	53.7	1.85	53.6	2.10	50.5	1.79
March	63.5	1.79	63.3	2.09	63.2	2.40
April	70.3	3.08	70.3	2.82	66.0	4.20
May	76.8	3.82	77.3	3.14	76.0	3.52
June	82.0	3.92	82.7	5.49	81.6	4.82
July	84.0	2.09	85.0	2.14	82.7	3.87
August	83.7	2.39	84.8	1.66	83.4	2.64
September	79.4	3.36	79.1	4.52	78.7	4.06
October	70.7	2.74	71.1	3.03	71.6	2.76
November	61.3	2.58	61.7	2.61	62.5	5.07
December	53.8	2.43	54.2	2.05	53.5	3.13
Year	69.3	32.40	69.7	34.02	68.5	41.34

Dates of first and last killing frosts.

Year.	Hallettsville.		Cuero.		Rock Island.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
	1896	Feb. 15	Nov. 28	Feb. 15	Nov. 8	-----
1897	Mar. 24	Dec. 4	Feb. 1	Dec. 4	-----	-----
1898	Mar. 5	Nov. 22	Mar. 5	Oct. 27	-----	-----
1899	Mar. 29	Nov. 3	Mar. 6	Nov. 4	Feb. 12	Nov. 3
1900	Mar. 1	Nov. 12	Feb. 19	Nov. 12	Feb. 19	Nov. 12
1901	Mar. 6	Dec. 10	Mar. 5	Dec. 10	Apr. 6	Dec. 9
1902	do	Dec. 5	Mar. 6	None.	Feb. 21	None.
1903	Feb. 18	Nov. 18	Feb. 19	Nov. 18	Feb. 17	Nov. 18
Average	Mar. 6	Nov. 24	Feb. 24	Nov. 16	Feb. 27	Nov. 18

PHYSIOGRAPHY AND GEOLOGY.

The surface of Lavaca County changes gradually from flat to rolling as one goes from south to north and as the elevation increases. The elevation of the coastal prairie above sea level probably does not exceed 100 feet. The highest elevation within the county is on the high rolling prairie in the vicinity of Moulton on Burkett Mound, which is 500 feet above sea level. Hallettsville, with an intermediate location, has an elevation of 235 feet.

The extreme southern part of the county is occupied by a flat treeless prairie, which is an extension of the Gulf Coastal Plain. It has a gradual rise from the Gulf, probably not over a foot or two to the mile. In wet times it is covered by water, which does not pass off because of lack of surface drainage. Next to this prairie is a timber belt, which extends northward to a little above the central portion of the county, crossing the county in a southwesterly direction and occu-

pying a large part of its area. The topography of this section is flat to rolling. The southern portion adjacent to the treeless prairie is flat like the prairie and is also wet and lacks surface drainage. It, too, gradually increases in elevation, and the section to the north becomes more rolling and connects with the higher prairie. Its elevation is sufficient for stream erosion and the surface is somewhat dissected. The slopes to streams are long and gentle and rarely steep. The interstream portions are broad and flat or gently rolling. The characteristic growth is post oak, from which the soil has become popularly known as "post oak land."

The northern part of the country is much higher and more rolling and is a part of what is known as the Fayette Prairie, and here popularly called "black prairie." The dividing line between the black prairie and the timber or post oak land is followed approximately by the railroad across the county. The black prairie consists of a succession of broad, rolling ridges having an easterly to southeasterly trend. The slopes of these are, as a rule, long and gentle, except in the western and northwestern part, where they are somewhat steeper and the tops of the ridges not so broad. The ridges rise about 100 feet or more above the intervening troughs or valleys. The black prairie is treeless, with the exception of a fringe of liveoaks along some of the streams and an occasional clump of small trees on some of the sandy knolls which occur in the formation. Areas of post oak land extend to the eastward into this section and are covered by the characteristic growth. The succession of ridges with green pastures and cultivated fields interspersed makes a most pleasing landscape.

The drainage of Lavaca County is effected by the Lavaca and Navidad rivers and their numerous tributaries. Navidad River drains the eastern part of the county, having its source in Fayette County to the north. Lavaca River flows through the central part and drains the western two-thirds of the county. The drainage is toward the south or southeast. Most of the streams head in the black prairie, and the surface configuration is such that surface drainage is effected easily. During heavy rains the water flows off so rapidly that even little branches become raging torrents, but as soon as the rain ceases the streams fall almost as rapidly as they rose. The smaller streams carry water only during wet times, and even the larger ones become dry or nearly so in prolonged periods of drought. The streams are rather rapid flowing, having a good fall through the county. They are still cutting their channels and no flood plains are being formed. During high water they carry large quantities of soil materials.

Geologically, Lavaca County is included in the Gulf Coastal Plain. In Cenozoic time this portion of Texas was covered by an extension of the sea, whose waters then extended much farther northward.

From the lands to the north, gravel, sand, silt, and clay were carried down by the streams and deposited in this sea. At a later time the earth's surface was elevated above sea level, and these vast deposits, subject to the agencies of weathering and erosion, have since been modified to form the present soils. Since these deposits were laid down, sufficient time has not elapsed for their consolidation, but there is to be seen, however, along some of the stream courses in the higher and older parts of the county occasional outcrops of loosely consolidated sandstone, locally called "rotten rock," or "rotten sandstone." In the black prairie section limy material is found in the subsoil, occurring in the form of concretions averaging an inch or two in diameter, and occasional small knobs are made up of these concretions. Limy material is also present to a less extent in the mottled clay subsoil of the lower parts of the county. All the clays are more or less calcareous. The origin of the lime is found in the remains of marine life accumulated with the deposits of rock material.

The soils are the more or less weathered product of the different sediments or deposits. The larger part of the surface of the county is covered by sand of medium to fine texture and of varying depths, underlain by drab and yellow mottled sandy clay, occasionally reddish, quite impervious, and extending to an unknown depth. The soil of the black prairies is a black waxy clay, which at a foot or more beneath the surface changes to drab because of the lower organic matter content and the presence of limy material.

SOILS.

Only three types of soil are found in Lavaca County, and as two of these—the Lufkin sandy loam and Lufkin sand—are separated on the difference of the depth of the sand covering the sandy clay subsoil, the entire surface of the county is occupied by soils belonging strictly to two classes—sand and clay. There is thus little variety in soil types, although there is the greatest difference in the character and agricultural value of the types found.

The following table gives the names and extent of the different types, all of which have been found in other parts of Texas already surveyed.

Areas of different soils.

Soil.	Acres.	Per cent.
Lufkin sandy loam	357,632	56.2
Houston black clay	215,232	33.8
Lufkin sand	63,936	10.0
Total	636,800	

LUFKIN SANDY LOAM.

The soil of the Lufkin sandy loam consists of medium or fine sand, varying in texture from an incoherent sand through loamy sand to sandy loam, and in color from gray to dark brown, depending largely upon the amount of organic matter present. In some places where this soil borders the black prairie it is much more loamy and darker in color. Here it represents a zone of gradation between the Lufkin sandy loam and the Houston black clay rather than a distinct type, the change from one to the other being very gradual and covering a considerable area. In the flatter areas the soil becomes quite compact, but in texture does not depart from the main type, the difference in structure being due to a difference of condition rather than to a difference of mineral particles. The depth of the soil varies greatly over the county and within narrow limits. It ranges from 8 to 20 inches, and this variation may be found within any given field. The average for the county, however, is about 14 inches.

The subsoil consists of a drab and yellow mottled sandy clay, sometimes one and sometimes the other color predominating, often streaked with iron stains. In places it is an even yellow or red, but the occurrences are in small areas. The sand particles in the clay are of the same sizes as in the soil—that is, medium to fine, with a much larger percentage of the fine sand. It is a stiff, tenacious, impervious clay. Ponds or tanks dug in it retain water, and water falling on the surface is held and is lost through evaporation rather than percolation. Its water-holding capacity is high and the clay is always found in a moist condition. It erodes badly where the slope is sufficient, and deep gullies are quite common. The depth of the clay is unknown, extending beyond the ordinary means of observation as shown by exposures in road and stream cuts. It is more or less calcareous, and occasionally some lime concretions are seen. Iron concretions, but in no great quantity, occur in both soil and subsoil, and occasional thin beds of gravel.

The Lufkin sandy loam occupies more than one-half of the total area of the county. It occurs in the southern part of the county in practically one continuous area, and in the northern part in several smaller irregularly shaped areas interspersed through the Houston black clay. The topography is flat to rolling. In the southeastern corner of the county and the extreme southern corner the type occupies the flat treeless prairies, one known locally as the "Golden Rod Prairie," and the other as the "Victoria Prairie," or in general as "Sandy Prairie." North of these prairies this type of soil is still largely forested. The wooded areas next the prairies are generally flat, but to the north the topography becomes more rolling, and the larger part of the type has the latter character of surface. In the

northern part of the county it occupies the tops of the ridges in the high rolling prairie and slopes to the stream courses. The slopes to the streams are usually gentle, but occasionally they are steep. The interstream areas are flat to gently rolling.

Wherever the surface is rolling the drainage is good, there being plenty of stream courses to carry off the water, but the flat interstream areas and the low-lying portions of the southern part of the county lack drainage, and the subsoil being impervious the water stands on the surface for some time after rains. These flat areas are, therefore, in their present condition, unfit for cultivation, but do fairly well for pasturage. All the larger streams of the county flow through this soil type, and many have their sources in the northern parts, although the greater number of streams head farther north in the Houston black clay.

The Lufkin sandy loam is derived from the weathering of Gulf Coastal Plain deposits, consisting of unconsolidated sands and clays.

This type supports a forest growth, consisting largely of post oak with some black-jack oak, and, along the streams, liveoak. The post-oak growth is not heavy, nor is it large, attaining a height of not more than 40 or 50 feet. Rarely more than one cut can be taken for posts, as above that the trunk and limbs are twisted and gnarly and of no use except for fuel. From the limbs hang long masses of gray Spanish moss, and when completely covered with it the tree in time is killed. The Spanish moss serves a good purpose in that stock will eat it when other food is not available. In winter when food is scarce the trees are cut down to enable the stock to get the moss.

The principal crops grown on the Lufkin sandy loam are cotton and corn, the staple products of this section of the State. Cotton, however, is the crop to which the most attention is paid. It succeeds well on this soil, the yields being from one-half to three-fourths bale per acre in favorable seasons, and even as high as 1 bale or more in exceptional cases. These yields are secured without the use of any fertilizer whatever. The land is easy to till and responsive, and produces a good grade of fiber. Corn does not do so well as cotton, except on the lower slopes near streams, where the soil is deeper and more loamy. The corn grown is mostly a white dent variety, and the average yield is from 15 to 18 bushels per acre, although higher yields are secured on the best lands. Sorghum is grown and does well on this soil, and ribbon cane also in the more loamy and richer places along the streams. Quite a large quantity of the former is grown for forage and some for sirup.

Last season the growing of tobacco and truck crops was begun on this soil. The tobacco grown was a Cuban filler leaf, yielding about 600 pounds to the acre. There was also produced some Sumatra wrapper leaf. The adaptability of this soil to the growing of the

Cuban filler leaf of the desired quality can not be positively stated as yet.

The Lufkin sandy loam is unquestionably well adapted to truck crops. The past season early Irish potatoes succeeded very well and proved quite profitable. The average yield was between 75 and 100 bushels, but larger yields should be obtained when the growers become more familiar with the methods of growing this crop. The Tennessee Triumph, a red variety, succeeds best, and to get an early crop northern seed, from Maine and Minnesota, is used. Onions were also grown, and the acreage is increasing. This season a large acreage will be planted to cucumbers for pickling purposes. Tomatoes and beans also do well on this soil, and some will be produced for shipment.

The size of the farms of this type of soil ranges from a few acres to ranches of several thousand acres, the latter being stock ranches. The average value of the land is about \$10 an acre. Land near the towns and the railroad brings \$25 or more, while in the lower part of the county it is as low as \$2 an acre. The value of the large ranch tracts depends upon whether there is flowing water upon them.

All of the Lufkin sandy loam not under cultivation is fenced for pasture. The soil supports a growth of sage and mesquite grass, and about 8 or 10 acres is required for each animal pastured.

The results of mechanical analyses of samples of the soil and subsoil of this type are given in the following table. The figures are the average results for two samples each of soil and subsoil.

Mechanical analyses of Lufkin sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>				
12092, 12441	Soil.....	0.2	4.5	11.0	49.8	16.1	12.3	5.7
12442, 12093	Subsoil.....	.2	3.3	8.1	31.9	9.3	12.1	34.7

LUFKIN SAND.

The Lufkin sand consists of a loose, incoherent, gray, medium to fine sand, with the surface foot having organic matter enough to give it sometimes a brownish color, the lower portion being gray to yellowish in color. The depth of the soil usually exceeds 36 inches. Beneath the sand is found the same drab and yellow mottled sandy clay that forms the subsoil of the Lufkin sandy loam. In fact, the only distinction between the two types is the difference in depth of sand overlying the clay and the consequent difference in agricultural value. In some places, however, the clay comes to within 24 inches of the surface.

The Lufkin sand has the least extent of the three soil types found in the county. The largest area is in the eastern part of the county, extending from Sublime down the Navidad River to Vienna and eastward to the county line. Another considerable area occurs between the Navidad and Lavaca rivers to the west of Vienna. Other smaller areas are scattered over the county as spots in the Lufkin sandy loam.

The type occupies the sandy ridges in the post-oak section of the county, and also occurs as narrow areas along some of the streams. In the vicinity of Sublime and south and eastward the surface is quite flat and the depth to the clay is not so great. The soil readily absorbs water, and its location on ridges insures thorough surface drainage.

The Lufkin sand is of sedimentary origin, and is derived from a Coastal Plain formation consisting of loose, incoherent sands. Like the Lufkin sandy loam it supports a forest growth of post and black-jack oak and some liveoak in moist locations, but there is more black-jack than on the Lufkin sandy loam and it is sometimes called "black-jack land." It is a poor soil and but little of it is cleared and under cultivation. Crops grown upon it usually suffer from lack of moisture, but in favorable years when rainfall is plentiful fair crops of cotton are obtained. This soil seems best suited to sweet potatoes, which are of excellent quality, and with a good market they would no doubt prove a profitable crop. Early trucking crops might also do well.

The average results of mechanical analyses of typical samples of the Lufkin sand are given in the following table:

Mechanical analyses of Lufkin sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>				
12990, 12986	Soil	0.4	9.6	19.3	54.9	8.3	4.5	2.8
12991, 12987	Subsoil.....	.5	8.7	20.1	54.6	8.4	4.3	3.3

HOUSTON BLACK CLAY.

The soil of the Houston black clay varies from a heavy loam or clay loam to a stiff waxy clay, but consists largely of the latter phase, to which the names of "hog wallow" and "black waxy" land, or the more general term "black prairie," have been locally applied. The first name refers to the numerous shallow holes or depressions in the surface, resembling wallowing places made by hogs, but due entirely to natural causes not understood. The latter names re-

fer to the black colored and waxy character of the clay. The soil ranges in depth from 8 to 20 inches, with an average of about 12 inches, and in color is generally black, although small areas or spots occur where the color is drab or grayish black. These spots are usually found in the cultivated fields. The soil carries a high percentage of organic matter, which no doubt accounts largely for its color.

In places on the rolling prairie and on lower slopes toward some of the streams, particularly along borders of the sandy types of soils, there are varying amounts of sand on the surface, from a trace to as much as 3 or 4 inches in depth, which when incorporated with the black clay by plowing gives the loamy phase of the type, making it lighter and more friable. This is spoken of as "heavy black sandy loam" or "heavy loam." These areas, however, are small and the condition may be considered a gradation between the black clay and sandy loam soils. Areas with the sandy character sufficiently pronounced and large enough to map were placed with the Lufkin sandy loam, differing but little from that type of soil, especially in its more loamy phases.

The subsoil of the Houston black clay is a stiff, very tenacious waxy clay, generally some lighter in color than the soil, because of lower organic matter content, and gradually becoming still lighter in color with depth, varying from yellowish to drab. Sometimes, however, the color in narrow streaks or pockets becomes reddish, and often there is a succession of the different colors, black, yellow, red, and drab, as seen exposed in road cuts. In the subsoil and occasionally in the soil occur lime concretions, the quantity generally greater in the lower depths, making the subsoil so much lighter in color that the name of "chalky clay" is often given to it. Occasionally also some iron concretions are seen in the subsoil and on the surface.

The extent of the Houston black clay is next to that of the Lufkin sandy loam, or fully one-third of the area of the county. Its principal development is in the northern part of the county above the line of the railroad, where it occurs practically in one large area with but few interruptions. Small isolated areas are scattered over the southern part of the county.

The topography of the Houston black clay consists of flat to high rolling prairies. In the southern part of the county the areas are flat, while the northern area consists of a series of broad rolling ridges having a southeasterly trend, with an average elevation of nearly 400 feet. The slopes as a rule are long and gentle, but are a little steeper in the northwestern part, which forms a divide between drainage basins to the east and west.

The lower and more level areas lack surface drainage, and having

an impervious clay subsoil are wet the greater part of the year. In the higher areas the rolling character of the surface insures rapid surface drainage. Many streams head in the high prairie, but only a few carry water the whole year. For watering the stock wells are dug and water lifted by windmills. Water is found in a sandy stratum beneath a stratum of joint clay.

The Houston black clay is derived from the weathering of a Coastal Plain deposit consisting of a calcareous clay, the lime occurring in the form of concretions. The only rock found in the county occurs in this formation and is a loosely consolidated sandstone, outcrops of which are seen in road and stream cuts.

The Houston black clay is the most valuable soil in the county for the staple crops, and farms of this soil are the highest in price. It is treeless, with the exception of a fringe of live oaks along the stream courses and occasional clumps of small trees growing on the sandy knolls. It is all settled and divided into farms, which are being further subdivided into smaller farms. The farms are owned almost exclusively by German and Bohemian farmers, who are industrious and thrifty. The crops grown are cotton and corn. Cotton yields from one-half to 1 bale to the acre. It has always been the principal crop, and before the appearance of the boll weevil it was possible for a farmer to purchase a farm with borrowed money and be able to clear himself of debt in a few years. Corn does fairly well on this soil, producing from 25 to 50 bushels per acre. For corn the lower locations are best, where the soil is more loamy and better moisture conditions prevail. Some onions are grown on this soil and good yields are obtained. Irish potatoes are grown on some of the lighter phases, but they do better on the sandy soils. Sorghum and millet are grown for forage and give large yields. Alfalfa has succeeded on a similar soil in other parts of the State, and if grown here would prove a most profitable forage crop and a soil improver as well. The cowpea is another legume which should be extensively grown, as it no doubt will thrive here. The growing of these legumes, aside from being profitable as forage crops, would afford a desirable step in crop rotation, thus eliminating the necessity of keeping so much land in permanent pasture. Under present methods a large part of each farm is left in the native prairie pasture, consisting of sage and mesquite grasses, which make a strong growth on this soil. Some is cut for hay, but the larger part is pastured. About 4 acres is allowed for each animal, which is about one-half that allowed on the sandy soils.

The value of the farms located on the Houston black clay ranges from \$25 to \$50 an acre. At the present time, however, these farms are not on the market even at the higher price.

The average results of mechanical analyses of samples of the soil and subsoil of the Houston black clay are shown in the following table:

Mechanical analyses of Houston black clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>				
12984, 12982	Soil	0.0	0.7	2.0	12.3	5.1	24.4	55.3
12985, 12983	Subsoil	.1	.6	1.7	9.0	4.2	26.4	57.5

The following samples contain more than one-half of 1 per cent of calcium carbonate (CaCO₃): No. 12982, 2.93 per cent; No. 12983, 6.45 per cent.

AGRICULTURAL METHODS.

Lavaca County, unlike most of the cotton-growing sections of the South, has a diversity of interests on nearly every farm, in that stock raising is practiced in connection with the cultivation of staple crops, each interest being conducted independently of the other, thus differing from those sections in which the raising of stock is included in the general farming operations only as a factor in the rotation of crops and the improvement of the soils. In Lavaca County the farmer raises stock because his lands naturally afford good pasturage, and from the sale of cattle or other live stock he has an income independent of his farming operations. On every farm, large or small, may be found cattle and hogs. This necessitates the leaving of a large part of the farm in pasture, and in the southern part of the county ranches of several thousands of acres are devoted entirely to the grazing of cattle. On the smaller farms stock cattle are generally kept, while the ranches are used mostly for range cattle. Yearlings and 2-year-olds are bought up and put on the ranges and pastured for a year or two and then sold and shipped to the northern part of Texas and to Oklahoma, where they are pastured before marketing for beef. Some cattle are fattened here on cotton-seed meal and hulls, but the greater number are shipped farther north each spring for pasturing and preparation for the fall market. Throughout the year cattle are made to depend almost entirely on the range for sustenance and are without shelter of any sort; consequently during a severe "norther" many are lost. When feed is scarce on the range it is common practice to cut down trees covered with Spanish moss, which the cattle will eat when there is nothing better. At times it is found necessary, in order to bring them through the winter, to feed them cotton-seed meal or hulls.

The cattle are largely the native Texas breed of Spanish origin, but somewhat modified by the introduction of some Shorthorn and Hereford blood. They are kept because of their hardiness and adaptability to the range. Grading up the stock still more with good beef breeds will improve it in both size and quality. The increasing

prices of land and the more exacting demands of the markets make this improvement not only desirable but necessary, and a little more attention to sheltering stock in the most inclement weather and supplying fodder during a few of the coldest weeks of the winter will result in raising a better class of beef animals and securing more profitable returns than were realized under the methods that succeeded in the days of the open range and low-priced lands. The hogs raised are well graded up with improved breeds, and the corn grown not used for feeding the working stock is turned largely into pork.

Although a large part of the land is left in native prairie grass for pasturage, only a small area is cut for hay. This supply of forage is supplemented by the growing of sorghum and millet and curing them for winter feeding. No cultivated grasses or legumes are grown, the former not succeeding here as yet, while the latter have not been tried, although cowpeas and alfalfa would both do well, the cowpeas especially.

In the production of cotton and corn the methods followed are those generally practiced in the South. These crops are grown on ridges and without any previous preparation of the soil for the planting of a crop, except that involved in throwing several furrows together to make the row or ridge. The method is to throw two furrows together with a turning plow late in the fall or in the winter, and then in the spring before planting to complete the ridge by breaking out the middles between the ridges by a plow with wings, commonly called a "lister." The following year this ridge is turned and what was the furrow the preceding year is now the ridge, and this is continued year after year, alternately moving the furrow and ridge. The corn or cotton is planted in a furrow on top of the ridge.

The corn planting season is from February 15 to March 15. The furrow in which it is planted is made deep in the ridge and the result of the first cultivation is to make the ground level, but in the cultivation after that larger shovels are used and the earth is thrown to the corn, so that the corn finally stands above the general level of the field. The cultivation in ridges causes a great loss in moisture by exposing a larger surface to the drying action of the sun and wind, and it would be much better, therefore, to cultivate as level as possible to prevent this loss, although it may be desirable and necessary to ridge the soil at first so as to get it in the right condition for planting. As corn is considered a crop of secondary importance it is not so well tilled as cotton, the farmers rarely giving more than two cultivations and one hoeing in which the corn is thinned. As a consequence the fields become weedy and in a few years it becomes necessary to grow cotton, which is given clean cultivation, to kill off the weeds. The corn is harvested by breaking off the ear from the stalk and storing in cribs without shucking. The

shucks protect the corn from dirt and the attack of weevil. Some difficulty is experienced in saving corn or any grain from the weevil, but with corn this loss is lessened or prevented by growing the corn as early as possible and storing as soon as matured.

The planting of cotton is done about one month later than corn. Unlike corn, it receives careful attention and clean cultivation. The number of times it is cultivated depends upon the season, but it receives at least three cultivations and two hoeings. The boll weevil in this section has become a very serious pest, and farmers are fortunate to get even small yields, for often the weevil ruins whole fields and there is not much cotton to pick. To combat the ravages of the boll weevil both the National and State authorities have recommended early planting, the use of earlier maturing varieties, the forcing of maturity by proper cultivation and fertilization, and, finally, the destruction of the stalks immediately after the crop is harvested. This last suggestion is not generally complied with in this county. The effect of the pest has been to turn the attention of the cotton growers toward a diversification of crops.

Although corn occupies about two-thirds as great an acreage as cotton, no systematic rotation is followed. Each is grown continuously on the same fields, and, as before stated, the only change made is to grow cotton after several crops of corn so as to destroy the weeds. No fertilizers of any sort have been used with either of these crops on any of the soils, as it is said they have shown as yet no appreciable decline in productiveness. That the soils have not decreased in productiveness is due mainly to the comparatively short time they have been tilled. However, if the present crop yields are to be increased or even indefinitely maintained, fertilization, preferably by means of barnyard manure or the use of green manuring crops, and systematic rotation with the best methods of cultivation must be practiced. A greater diversification of crops is also recommended.

AGRICULTURAL CONDITIONS.

The interests of Lavaca County are entirely agricultural, and in agricultural wealth it holds a prominent place among the counties of this section of the State. This is due to two factors—the productiveness of its soils and the generally industrious and thrifty character of its people. The farmers, however, like those in some other sections in which cotton is the main crop, have been passing through a period of depression, due chiefly to the boll weevil, whose ravages have been most serious in this part of Texas. The small farmers and tenants, depending entirely on cotton as a means of livelihood, have felt the loss most keenly. The whole community, in fact, has suffered, the merchant as well as the farmer. Prior to the advent of the boll weevil it was not an unusual thing for a farmer to buy and

pay for a farm in a few years with cotton alone, even though the prices had not been the best. It can be said, too, that stock raising does not pay as well as it did formerly. With the low-priced lands and the free range of early days the raising of cattle was very profitable, but with the increased value of land, the low price of beef on the hoof, and the more exacting demands of the markets, together with the scarcity and increased cost of labor, this industry does not give the profits it once did.

Although the present conditions seem unfavorable they will no doubt prove beneficial in the end by bringing the attention of the people to the necessity of diversifying their crops and improving their cultural methods. A case in point is the introduction within the past two years of two new industries into this section—the growing of tobacco and trucking. The latter now promises to become of great importance, certain truck crops having already brought about a change for the better in parts of the county.

The cultivation of field crops is confined mostly to territory along the railroad on the sandy soils, and to the black prairie occupying the northern part of the county.

The Houston black clay of the prairies is the strongest and most productive soil of the county for general farming, and consequently the farms on the prairie are the most desirable and have the highest value. The farms are fenced and in a fair state of cultivation. The dwellings are small, but comfortable; and the outbuildings, as a rule, are also small. On account of the mild climate no shelter is provided for the stock, excepting the work animals. On a large number of farms windmills are used to pump the water for the stock, and many have storage tanks at an elevation to supply water to the houses. The owners are almost exclusively Germans and Bohemians, who, with the aid of their families, work the land without recourse to hired labor, and whose success is largely due to industry and strict economy. On all the farms cattle are kept, and this necessitates the leaving of permanent pastures. The farms on the Houston black clay are the smallest in size in the county, averaging about 100 acres. Before the introduction of barbed wire much of this land could be bought as low as 25 cents an acre; but the use of barbed-wire fencing made it possible to fence it cheaply and to cultivate to crops, and since that time its value has been increasing, prices now ranging from \$25 to \$50 an acre.

The sandy soils of the county do not have as high a value as the black prairie, but if the growing of tobacco and truck crops or either of these interests develop to large proportions these lands will be in great demand, with corresponding increase in values. When the county was settled and until the barbed-wire fence came into use these lands were held at a much higher price than the black prairie, because the timber afforded material for building purposes, fencing, and fuel.

The soil was easy to cultivate and made fair yields of the staple crops, cotton and corn, particularly the former. The larger proportion of the sandy lands is now in large ranches devoted to grazing. With the successful introduction of the new industries mentioned there is promise of more remunerative returns from the sandy types of soil.

According to the census of 1900 there were 3,876 farms in Lavaca County, with an average size of 134.1 acres, but the land holdings vary greatly in size, ranging from places of only a few acres to ranches of several thousand acres, the larger holdings being generally in the more remote parts of the county. According to the same authority, of the total acreage in farms only about one-third is improved, and of the total number of farms 44.7 per cent are operated by the owners. Foreigners, particularly the Bohemians, and some negroes, form the tenant classes, as they lack the capital necessary to purchase land, and as they prefer to work the black prairie lands, which are high priced and not for sale, but can be rented. The tenants as a rule devote themselves to the staple crops, making enough corn if possible for their needs and cultivating as large an acreage of cotton as possible, depending upon it as their money crop. With small yields, on account of the damages of the boll weevil, even with the prevailing prices, cotton growing has certainly not been as remunerative as formerly, and in some cases the tenants have suffered greatly, and the landowners also, though to a less extent. Renting is done on both the share and cash basis. The general rule is to pay cash for corn land, the usual rental being about \$4 an acre. Cotton before the weevil became a factor was also grown on a money-rent basis, but now the share system is used exclusively, so that the owner as well as the tenant may share in the uncertainty of the crop. The rule is to give the landowner one-third of the cotton where the tenant furnishes everything except the land, but when the owner furnishes the working stock and tools and half the seed he gets half of the crop. The tenant is allowed a house with ground for garden and also a limited amount of stock in the pastures. Ranch lands are leased for a nominal money rental for a number of years. The value of the ranch lands is low, varying from \$2 to \$10 an acre. As a rule the ranch owner does not live on the ranch. A foreman superintends the work, having under him a number of men to help care for the stock, who receive some wages in cash and are allowed to cultivate small patches of ground to aid in their support. There is but little hired labor employed except on the ranches.

In 1899, according to the last census, the acreage in cotton in the county was about 80,000 acres, with an average yield of something over one-half bale to the acre. Since that time the production has fallen off greatly owing to the ravages of the boll weevil, as has been heretofore explained.

The acreage in corn in 1899, according to the census, was about five-eighths that in cotton, with a yield of a little over 1,000,000 bushels. The yields could be greatly increased if better cultural methods were practiced and a suitable crop rotation followed. The small grains do not succeed in this climate, although small patches of wheat, oats, and rye are often seen. No rice is produced in the county, although the black prairie land in the southern part of the county, with irrigation, is well suited to this crop. Cowpeas would thrive on the soils of this county and, besides being an excellent forage crop, would prove beneficial to the soil if given a place in the crop rotation. Alfalfa would also probably do well, and prove a most valuable forage crop. The millets and Hungarian grasses are grown with success. Sorghum forms the most important forage crop, and is valued also for the sirup produced. Sugar cane is grown on the bottoms and some sirup is made. A forage crop that might prove of value is teosinte, small experiment patches of which were seen. Sweet potatoes are grown on the sandy soils in sufficient quantities for home consumption. If an outside market could be found, this crop would be a profitable one. The Lufkin sand is particularly adapted to the growing of sweet potatoes, which are of superior quality. Of the small fruits, strawberries succeed the best, but are grown only to meet the small local demand. Blackberries are produced, but are subject to rust. Of the tree fruits, pears do fairly well, but the trees are often subject to blight. Apples and peaches do not succeed. The fig tree grows here, but the quantity of the fruit is limited to home consumption. The pecan tree is a native of this part of Texas. The trees are plentiful, and quite a large quantity of pecans is obtained. These are all shipped to outside markets, where good prices are received.

As has been stated elsewhere in this report, the farmers are beginning to give some attention to truck crops, to which the sandy types of soil are well adapted. Irish potatoes were the first crop to be given a trial and have proved profitable. The product can be put on the northern markets early in the season, when good prices generally prevail. The acreage is rapidly increasing and the product is becoming important. Onions also have proved a profitable crop, and the acreage in this crop is increasing. Tomatoes are being grown, and a large acreage is to be devoted to cucumbers for pickling purposes. Beans and a few other vegetable crops are to be grown in quantities sufficient for shipment. To promote the trucking interests a number of truck growers' associations have been organized in the county, the main purpose being to give instruction to the farmers in growing the crops and to assist in disposing of the products to the best advantage.

The growing of tobacco has not been taken up so readily by the farmers, because of the lack of knowledge of the proper methods in cultivating, harvesting, and curing the crop. Some effort is being

made to produce a Cuban cigar-filler leaf. In the season of 1904 about 20 acres were cultivated, producing about 12,000 pounds. This acreage was owned by a local company organized for the purpose, and the tobacco was grown under the direct supervision of an experienced tobacco grower from another State. There was also grown less than an acre of Sumatra wrapper leaf under shade. The tobacco the past winter was manufactured into cigars, using the home product, filler and wrapper, entirely in the manufacture. The cigars have met with a ready sale and an increasing demand, the market thus far being confined to the surrounding towns. The quality of the tobacco can not be definitely stated, as the leaf of which the cigars were made had hardly been fermented long enough, but if the Cuban aroma is found and can be brought out by fermentation, then the success of tobacco growing ought to be assured.

The transportation facilities of the county are fairly good. The main line of the Southern Pacific Railroad passes a few miles north of the county, and a branch line of the same road passes through the county to the south. The San Antonio and Aransas Pass Railroad traverses the central part of the county from east to west, connecting Houston and San Antonio and also Port Lavaca and other points on the Gulf, and a branch line of this road crosses the northern part of the county, connecting Yoakum and Waco. The San Antonio and Aransas Pass system affords direct connections with all the trunk lines to the east, north, and west.

The county roads are generally poor. Over the black prairie during the winter they often become impassable, but during the summer the surface material wears down smooth, making an excellent roadway. These roads could be greatly improved by cutting ditches on the sides to drain them. The roads in the section of sandy soils with clay subsoils could be made the best in the county by surfacing them with clay or making what is known as a sand-clay road. There are, however, a sufficient number of roads laid out and all are straight. In the more remote parts of the county the roads are mere trails. But few bridges, and these only over the larger streams, are maintained in the county.

The local markets are limited and take only the staple products. The truck crops are shipped mainly to St. Louis and Chicago. Truck buyers, however, are coming to this section of Texas and the growers are being relieved of the responsibility of shipping.

Poultry and eggs are important local products and the shipments are steadily increasing, adding considerable to the farm income. Yoakum leads in this part of Texas as a shipping center for poultry products.

The rural free delivery service is being extended gradually over the county, and a few rural telephone lines have been built and are now in use.

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