

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
In cooperation with the Kansas Agricultural Experiment Station

SOIL SURVEY
OF
LABETTE COUNTY, KANSAS

BY
E. W. KNOBEL, U. S. Department of Agriculture, in Charge
and R. L. VON TREBRA and H. W. HIGBEE
Kansas Agricultural Experiment Station

Beginning with the 1923 Series, Soil Survey Reports have been issued separately. The reports of the individual areas are sent to libraries as soon as they are available and should be filed, preserved, and ultimately bound to take the place of the bound volumes of the Field Operations which were formerly supplied by the department. The reports for each year are consecutively numbered, the last report for a particular year bearing the conspicuous notice: "This number is the last Soil Survey Report for the Year 192-."



BUREAU OF CHEMISTRY AND SOILS

HENRY G. KNIGHT, *Chief*
A. G. McCALL, *Chief, Soil Investigations*
SYDNEY FRISSELL, *Editor in Chief*

SOIL SURVEY

CURTIS F. MARBUT, *in Charge*
H. H. BENNETT, *Inspector, District 4*

COOPERATION

KANSAS AGRICULTURAL EXPERIMENT STATION
L. E. CALL, *Director*
R. I. THROCKMORTON, *Head Department of Agronomy*

CONTENTS

	Page
County surveyed.....	1
Climate.....	2
Soils.....	3
Cherokee silt loam.....	4
Parsons silt loam.....	4
Parsons silty clay loam.....	5
Parsons very fine sandy loam.....	6
Parsons clay.....	6
Labette silt loam.....	6
Labette silty clay loam.....	7
Summit silty clay loam.....	8
Summit silty clay.....	9
Newtonia silt loam.....	10
Bates very fine sandy loam.....	11
Bates silt loam.....	12
Bates loam.....	12
Neosho silt loam.....	13
Riverton gravelly silt loam.....	14
Verdigris silty clay loam.....	14
Verdigris silt loam.....	15
Lightning silt loam.....	15
Osage clay.....	16
Osage silty clay.....	16
Agriculture.....	17
Summary.....	22

SOIL SURVEY OF LABETTE COUNTY, KANS.

By E. W. KNOBEL, U. S. Department of Agriculture, in Charge, and R. L. VON TREBRA and H. W. HIGBEE, Kansas Agricultural Experiment Station

COUNTY SURVEYED

Labette County is in the southeastern part of Kansas. It borders Oklahoma on the south, and one county separates it from Missouri. The county is almost square, being approximately 26 miles from north to south and about 25 miles from east to west. It includes an area of 650 square miles or 416,000 acres.

Although in general the county is part of an undulating or gently rolling prairie, there are some rather conspicuous surface variations. The eastern border, or a strip ranging from 1 to 3 miles in width and becoming more narrow at the southeastern corner, is mainly Neosho River bottom land, the lowest land in the county. On the western edge of this bottom the rise to the upland is abrupt; on the east it is very gradual. On the west a belt of upland about half a mile wide is moderately hilly. West of this belt lies an undulating prairie with several rolling areas in the southern part of the county, chiefly south, southeast, and southwest of Edna. That part of the county north and west of Mound Valley and along Big Hill Creek is the most broken. In the extreme northwestern corner the hills are more or less isolated, and undulating prairies intervene. The tops of these hills are flat, and the sides slope rather abruptly near the top and are rather rounded near the bottom.

The general range in elevation is from about 800 feet to 1,000 feet above sea level. Elevations at the railroad stations of the principal towns are as follows: ¹ Chetopa 826 feet, Edna 978 feet, Mound Valley 825 feet, Oswego 899 feet, and Parsons 902 feet.

Drainage is effected through two river systems, the Neosho and the Verdigris. Neosho River has cut a comparatively wide valley. Its low gradient, about 1.09 feet to the mile, and its extensive meanderings cause it to flood frequently when the volume of water becomes large, as it often does. Tributaries of Verdigris River drain the western part of the county.

On February 9, 1858, the Territorial Legislature of Kansas created the county of Dorn, which was later divided into Neosho and Labette Counties. Three years later Kansas was admitted to the Union under the Wyandotte Constitution. Settlement by white

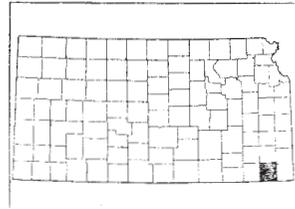


FIGURE 1.—Sketch map showing location of Labette County, Kans.

¹ GANNETT, H. A DICTIONARY OF ALTITUDES IN THE UNITED STATES. U. S. Geol. Survey Bul. 274, Ed. 4, 1072 p. 1906.

men began about 1850. Most of the earlier settlers migrated from Illinois, Indiana, Pennsylvania, New York, Ohio, and Tennessee. As their capital was very limited, their livelihood was largely dependent on their own efforts. Many of them did considerable hunting and fishing, and trading with the Indians.

According to the latest State census the total population of Labette County is 35,462. The rural population, which includes towns with less than 2,500 inhabitants, is 16,299. Oswego, with a population of 2,554, is the county seat. Parsons, the largest city, has a population of 16,609. Other towns and villages are scattered throughout the county.

The first natural-gas well was opened near Mound Valley in 1883. Shortly after this, gas was discovered in many wells in the county, those near Chetopa producing a large volume by 1898. At the present time there are many wells in the western part of the county, and gas is piped to the near-by towns. Parsons is supplied mainly with gas from beyond the county boundaries.

Coal, largely for local use, is mined from shallow beds in several places. Considerable coal is known to exist in the southwestern part of the county about Edna, but it lies too deep for surface mining.

Labette County is crossed by lines of the Missouri, Kansas & Texas Railway, the Missouri Pacific Railroad, and the St. Louis-San Francisco Railway. The Missouri, Kansas & Texas shops are in Parsons. An electric interurban railway connects Cherryvale, Montgomery County, and Parsons, affording good service.

The county highways are in good condition. Graveled roads connect Parsons with the larger towns. A hard-surfaced limestone and asphalt road runs from Chetopa to Edna, thence west to Coffeyville, Montgomery County. The secondary roads are kept in good condition in summer but are muddy during winter.

The principal local markets are Coffeyville and Cherryvale, which are in adjoining counties, and Parsons. The larger outside markets include Joplin, Kansas City, and St. Louis, Mo.

CLIMATE

The climate of Labette County, although rather mild, is more or less variable from year to year. The winters are open until the latter part of December, at which time cold waves and an occasional blizzard may cross the central plains from the northwest. The average seasonal snowfall is 14.3 inches, but this usually affords ample protection for wheat and various grasses. With prevailing daily winds from the south and southwest, the summers, although rather hot, are not oppressive. The dryness of the air makes both heat and cold more easily endured. A hot wind may occasionally cause considerable damage, especially during unusually droughty periods, but a complete crop failure is unknown.

The average earliest date at which frost may be expected is October 23 and the latest April 10. This gives an average frost-free season of 196 days, which is sufficient for maturing all the crops

commonly grown. The earliest and latest recorded killing frosts, respectively, occurred on September 30 and May 20.

Precipitation varies greatly from year to year. In view of the fact that most of the soils of the county have heavy and somewhat impervious subsoils, crop growth and farming operations may be more seriously retarded in either exceptionally dry or wet years than in areas where the subsoils are more porous and friable. In unusually wet seasons the downward movement of water is slow because of the stiffness and imperviousness of the subsoils.

Table 1, compiled from records of the United States Weather Bureau station at Oswego, gives the normal monthly, seasonal, and annual temperature and precipitation for Labette County.

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Oswego, Kans.

[Elevation, 899 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1894)	Total amount for the wettest year (1915)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	36.6	78	-10	1.90	1.23	2.18	3.6
January.....	35.6	76	-16	1.69	2.38	3.05	3.2
February.....	36.4	87	-30	1.74	1.10	3.65	4.5
Winter.....	36.2	87	-30	5.33	4.71	8.88	11.3
March.....	48.5	95	0	3.13	3.43	3.81	2.3
April.....	57.3	97	23	4.25	2.27	6.85	(1) .0
May.....	66.4	93	29	4.94	3.05	6.65	.0
Spring.....	57.4	97	0	12.32	8.75	17.31	2.3
June.....	75.2	107	41	5.07	3.61	5.55	.0
July.....	79.1	109	46	4.09	2.10	3.87	.0
August.....	79.1	109	43	3.48	1.11	5.93	.0
Summer.....	77.8	109	41	12.64	6.82	15.35	.0
September.....	72.2	108	37	3.61	6.74	8.75	.0
October.....	60.5	97	32	3.16	.59	2.25	.2
November.....	48.6	84	17	2.21	1.58	2.42	.5
Fall.....	60.4	108	17	8.98	8.91	13.42	.7
Year.....	57.9	109	-30	39.27	29.19	54.96	14.3

¹ Trace.

SOILS

The soils of Labette County were differentiated into 20 individual units or types. The details of their characteristics are shown in subsequent pages of this report, and their distribution in the county is shown on the accompanying soil map. Table 2 shows their acreage and proportionate extent.

TABLE 2.—*Acreage and proportionate extent of soils mapped in Labette County, Kans.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent	
Cherokee silt loam.....	41,152	9.9	Bates very fine sandy loam.....	14,848	} 3.7	
Parsons silt loam.....	124,672	30.0	Colluvial phase.....	128		
Parsons silty clay loam.....	4,032	1.0	Bates silt loam.....	9,088	} 2.2	
Parsons very fine sandy loam.....	896	.2	Bates loam.....	8,512		
Parsons clay.....	384	.1	Steep phase.....	8,192	} 3.9	
Labette silt loam.....	78,080	} 19.9	Neosho silt loam.....	3,776		.9
Rolling phase.....	4,480		Riverton gravelly silt loam.....	256	.1	
Labette silty clay loam.....	5,604	1.3	Verdigris silty clay loam.....	14,016	3.4	
Summit silty clay loam.....	33,472	} 8.7	Verdigris silt loam.....	18,432	4.4	
Shallow phase.....	2,944		Lightning silt loam.....	1,920	.4	
Summit silty clay.....	11,392	} 5.9	Osage clay.....	3,712	.9	
Shallow phase.....	13,248		Osage silty clay.....	4,864	1.2	
Newtonia silt loam.....	2,432	} 1.9	Total.....	416,000	-----	
Reddish phase.....	5,184					
Shallow phase.....	384					

CHEROKEE SILT LOAM

The surface soil of virgin Cherokee silt loam consists of a 1-inch layer of partly decayed brownish-gray organic material, mainly grass and weeds, underlain by dark brownish-gray or ash-gray floury silt loam which continues to a depth ranging from 10 to 18 inches. (Pl. 1, A.) In many places the lowest 2 to 5 inches of this layer is more intensely gray, especially where the land surface is exceptionally flat. Between depths ranging from about 14 to 18 inches and several feet a dark brownish-gray, dark-gray, or gray stiff impervious clay (claypan) occurs. When dry this is exceedingly hard, and when wet is very plastic and impervious. Below a depth ranging from 24 to 30 inches the material, although still a stiff clay, is not so pronouncedly stiff. In most places the color shades toward olive gray or other grays or even browns, and some small dark-brown concretions and stains are present.

The largest areas of this soil are in the eastern and central parts of the county, and the smaller areas are widely scattered. Areas are almost flat or gently undulating, but as a whole are more nearly level than those of any other upland soil in the county. Surface drainage is only fair, although in most places the slope is sufficient to effect the run-off of surface waters. Underdrainage is exceedingly poor, because the stiff clay subsoil virtually constitutes a claypan layer which is very impervious, especially during heavy rains of short duration.

This is a rather important agricultural soil, about 85 per cent of it being in cultivation, mainly to small grains, with some corn. The remainder supports a growth of virgin prairie grass.

PARSONS SILT LOAM

Parsons silt loam consists of brown or light brownish-gray floury silt loam to a depth ranging from 9 to 18 inches but averaging about 12 inches. Heavy clay (claypan) underlies this. (Pl. 1, B.) In several areas where the surface is very gently undulating, and especially in areas close to Cherokee silt loam, a secondary or lighter-colored layer from 2 to 5 inches thick directly overlies the heavy clay subsoil. This layer, however, is not so noticeable as in Cherokee

silt loam. The heavy stiff subsoil ranges from dark brownish gray to light grayish brown. In places, especially near the Cherokee soil, there is some dull-olive color in the claypan, and in some other places there is considerable tobacco-brown or mahogany color. This clay layer is extremely tenacious and waxy when moist and breaks on drying to a medium-fragmental structure. The fragments crumble somewhat after rains. The unworked dry clay is extraordinarily tough. Small reddish or rust-brown mottles are present in most places, the reddish mottling being more conspicuous near areas of Labette silt loam. At a depth ranging from about 20 to 28 inches this heavy layer grades in most places into slightly less stiff material, and the color merges into various gray and brownish shades. Small ferruginous concretions and dark-brown stains, which are probably concretionary, are present from the surface downward. A number of rather eroded or barren spots near small drainage ways probably signify the presence of alkali. Other spots appear to contain less alkali and more or less iron oxides.

This soil is widely distributed over the county except in parts of the southeast and southwest corners. It is closely associated with Cherokee silt loam and is derived chiefly from argillaceous shale. The largest development is southwest of Mound Valley. In some places along the Montgomery County line this soil joins areas mapped as Oswego silt loam in that county.

Owing to the gently undulating relief, surface drainage is good. Underdrainage, as in Cherokee silt loam, is inadequate.

This is the most extensive soil mapped in the county and is agriculturally important. It is estimated that about 90 or 95 per cent is in cultivation, the remainder being used for pasture and hay crops.

PARSONS SILTY CLAY LOAM

Typically developed Parsons silty clay loam consists of brownish or light brownish-gray silty clay loam to a depth ranging from about 6 to 10 inches. This layer is underlain by the usual stiff clay subsoil which is more conspicuously mottled with various yellowish, brownish, and gray shades than is that of Parsons silt loam. Brownish stains and small concretions appear in the lower part of the subsoil. The stiff subsoil continues downward several feet, the gray color becoming more prominent below a depth of 30 inches. The number of rust-brown stains or splotches also increases with depth.

An area of this soil lying about 3 miles northeast of Mound Valley in secs. 18, 19, and 30, T. 32 S., R. 19 E., and secs. 24 and 25, T. 32 S., R. 18 E., consists of rather dark brownish-gray heavy silt loam or silty clay loam from 15 to 18 inches deep, underlain abruptly by the typical heavy clay subsoil, which has a darker-drab color with less prominent mottles and is very similar to the typical subsoil of Cherokee silt loam. This variation from typical is probably owing to the more level surface of the area. This soil is better agriculturally than the average Parsons silty clay loam. Three small areas in the same general locality have dark grayish-brown or black silty clay loam layers extending to a depth of about 16 or 18 inches, underlain by dark grayish-black or black stiff tenacious clay mottled with faint yellowish, rust-brown, or bluish-black spots characteristic

of soils of the Oswego series. These areas were so small that they were included with Parsons silty clay loam in mapping.

This soil occupies rather undulating situations with fairly good surface drainage but inferior underdrainage. It is more difficult to cultivate than Parsons silt loam, and if the land is plowed too wet large clods form. The larger areas occur northwest, north, and northeast of Mound Valley. A large proportion of the land is in pasture, to which purpose it is best suited at present. Wheat is the most common cultivated crop.

PARSONS VERY FINE SANDY LOAM

Parsons very fine sandy loam, to a depth of 15 or 18 inches, is brown or grayish-brown very fine sandy loam. This grades into brownish-gray clay with reddish-brown, rust-brown, or yellowish-brown mottles, which continues to a depth ranging from about 24 to 30 inches, where the subsoil is slightly less plastic and when dry is slightly crumbly although it is very compact if undisturbed.

Areas of this soil occur as narrow belts along the lower slopes of the hills mapped as Bates very fine sandy loam, and the soil really represents areas where colluvial material from the adjacent hills has washed down over Parsons soil and caused the very fine sandy loam texture. Surface drainage is better than in other soils of the Parsons series, but the stiff compact subsoil renders underdrainage poor.

Methods of handling, crop adaptations, and land values are about the same as for Parsons silt loam.

PARSONS CLAY

The 6 or 8 inch surface layer of Parsons clay consists of brown or grayish-brown silty clay. This is underlain by heavy tenacious brown or grayish-brown clay, containing numerous rust-brown and yellowish-brown mottles, which extends to a depth ranging from 24 to 30 inches. The gray color becomes more pronounced with depth, and some brownish stains and small concretions occur.

The largest area of this soil occurs about 4 miles north of Mound Valley. Surface drainage is good. Cultivation has probably been partly responsible for the heavier texture of the surface soil. Cultivation is difficult, and if the soil is plowed when wet large clods form.

LABETTE SILT LOAM

The surface soil of Labette silt loam consists of a layer of brown, dark-brown, or dark grayish-brown silt loam from 12 to 18 inches in thickness. This is underlain by brown, dark-brown, or reddish-brown silty clay loam in most places containing some cherty fragments and continuing to a depth ranging from about 20 to 26 inches. Below this depth the color is variable. In places where there is more of the cherty material, especially in large fragments, together with some limestone fragments, the reddish color is more prominent, and the texture ranges from silty clay to clay. Areas lying near the reddish phase of Newtonia silt loam have a very pronounced reddish-brown color. In places where the cherty material is very scarce or is present

only in small fragments, the red color is less conspicuous, although mottles of red, yellowish-brown, rust-brown, and gray are common. This is especially true near areas of Parsons silt loam. In many areas the lower part of the subsoil is very heavy and closely resembles the Parsons silt loam subsoil. However, the material crumbles more easily and occurs at a greater depth. Areas from 1 to 4 miles south of Oswego contain noticeable quantities of small flinty fragments in both the surface soil and subsoil, but the amount of reddish material in the subsoil is less than elsewhere, the color resembling that of the subsoil of Parsons silt loam. Along the Montgomery County line this soil in places adjoins the Crawford soils in that county.

This soil is of limestone origin, but in many places the limestone material has weathered to such an extent that the subsoil is almost as impervious as that of Parsons silt loam, which is derived largely from shale.

This is an important upland soil, ranking second in extent in the county. It occurs mainly in the southern half on ridges and ridge slopes having an undulating surface. Surface drainage is good, but underdrainage is rather imperfect in many places, owing to the rather heavy texture of the lower subsoil layer. It is estimated that about 90 per cent of the land is in cultivation, chiefly to corn, wheat, and oats. The remainder is used for hay or pasture land. Corn is grown more extensively than on the Parsons or Cherokee soils, as the subsoil is less plastic and hard, allowing better underdrainage and a better root development of the deep-rooted crops.

Labette silt loam, rolling phase.—The surface soil of Labette silt loam, rolling phase, consists of brown or dark-brown silt loam. This grades at a depth ranging from about 10 to 14 inches into fairly dark-brown or reddish-brown silty clay loam containing some cherty material or limestone rock. At a depth ranging from 20 to 30 inches this layer passes into brown silty clay or clay mottled with yellowish brown, reddish brown, and gray. In many places, as along a few bluffs along Neosho River, the underlying material is olive gray and shaly. More or less limestone occurs over the greater part of the slopes as outcrops, ledges, or loose slabs scattered over the surface.

The principal development of this soil is along steep slopes bordering the bottoms of Neosho River and some of the smaller creeks. Its steep relief prevents the cultivation of crops except in a few small isolated patches. The greater part of the land supports a scattered growth of black oak, scrub oak, elm, hickory, ash, hawthorn, and locust, with numerous clumps or patches of buckbush.

LABETTE SILTY CLAY LOAM

The surface layer of Labette silty clay loam, to a depth ranging from 6 to 10 inches, ranges in texture from heavy silt loam to silty clay loam. In most places it is brown or dark grayish brown in color. It is underlain by brown or grayish-brown silty clay, mottled somewhat with reddish, rust brown, and gray. This layer, in turn, grades at a depth ranging from 15 to 20 inches into more pronounced brownish-gray silty clay or clay. A few areas contain some small chert fragments, especially below a depth of 20 inches. As a whole, this soil occupies positions similar to those on which Summit silty

clay occurs, but it is not so dark as the Summit soil. It shows evidence of lime in many places, especially in the subsoil. This is rather unusual in a Labette soil. The soil resembles the Parsons soils in color and mottling but has not so distinct a claypan subsoil and contains more calcareous material, with some limestone rocks in places.

This soil occurs in rather low situations near small drainage ways. Surface drainage is fair, but underdrainage is rather imperfect. The larger areas are from 3 to 5 miles northeast and east of Mound Valley.

SUMMIT SILTY CLAY LOAM

The surface soil of Summit silty clay loam consists of dark grayish-brown, dark grayish-black, or black heavy silt loam or silty clay loam, passing at a depth ranging from 6 to 12 inches into silty clay of somewhat lighter color, which continues to a depth ranging from 12 to 18 inches. Below this layer is dull olive-drab clay, which with increasing depth passes into more pronouncedly olive-drab clay. Olive-gray, or light olive-gray clay continues downward to a depth of 40 or more inches. Limestone is present in many places at a depth ranging from 30 to 40 inches, especially near areas of Summit silty clay loam, shallow phase. In areas adjoining Labette silt loam the surface soil is tinged with dark brown and the subsoil, from about 18 inches downward, contains some brownish or reddish mottles, although the material is predominantly olive gray in color. Locally this soil is known as "black limestone land."

Typical areas of this soil occur in the southwestern part of the county between Mound Valley and Edna. Other rather large areas are in the southeastern part from 1 to 4 miles north, east, and south of Bartlett. Several lie north of Labette in the northeastern part and in many widely scattered areas in the north and northwestern parts of the county. This soil is closely associated with the Labette and Newtonia soils and has a decided limestone origin, although in a number of places evidence of interbedded shales is very noticeable.

Areas of this soil are gently undulating or gently rolling. They occur along small drainage ways, especially at their heads, along slopes of hills, and on the crests of a few rather prominent hills. Surface drainage is good and underdrainage is fair, except where areas lie adjacent to the shallow phases of soils of the Summit, Newtonia, or Labette series.

This soil is extensive in Labette County and is a very important agricultural soil. It is estimated that about 96 per cent is in cultivation. The remainder consists of isolated patches of virgin prairie land and a few unbroken bluegrass pastures.

Summit silty clay loam, shallow phase.—This shallow soil covers a few small areas, most of them lying a few miles northwest of Mound Valley. In these areas the soil layer overlying the mixed shale and limestone ranges in thickness from a few inches to a little more than a foot. Where thinnest it consists of little more than a layer of disintegrated shale with some scattered limestone fragments. The dark-colored surface layer is not more than an inch or two thick in most places; it may, however, attain a maximum thickness of about 6 inches, but in such places the subsoil is thin or lacking.

Land of this kind is used mainly for pasture. The areas in which the surface layer is thickest may be used for grain production, and if the rainfall is well distributed through the year fair yields may be obtained. Such areas are small, and in few years are weather conditions such as to meet the exacting requirements of the soil.

SUMMIT SILTY CLAY

The surface soil of Summit silty clay consists of dark grayish-black or black silty clay or clay to a depth ranging from about 10 to 14 inches. This is underlain by dull-olive clay, which continues to a depth ranging from 15 to 20 inches in most places. The color of the underlying clay, which continues downward to a depth of 40 or more inches, is various shades of olive gray. In many small eroded areas and in areas near the shallow phase of Summit silty clay the surface soil averages heavier clay in texture. These areas, however, where large enough were included with Summit silty clay. In areas adjacent to the shallow phase some limestone fragments are mixed with the surface soil. In many places these fragments become rather numerous at a depth ranging from about 18 to 26 or more inches. Crops on such areas are more subject to injury during droughts.

The larger areas of this soil lie from 1 to 2 miles west and from 1 to 8 miles north of Oswego, from 1 to 2 miles east and south of Bartlett, from 1 to 3 miles north and south of Valeda, and in widely scattered areas in other parts of the county.

In topography, drainage, and general crop adaptations and yields this soil is practically the same as Summit silty clay loam. Possibly a smaller acreage is in cultivation because of the heavy texture of the surface soil. This is regarded as a strong soil but is more difficult to handle than the silty clay loam. If plowed wet it is likely to form extremely hard clods, and if plowed when dry the draft is very heavy and large heavy clods appear. However, after a good steady rain and a few days of exposure to the air the soil crumbles to a good tilth. The uncultivated areas are used for hay or pasture land. Pastures suffer less from drought than on other upland soils because of the greater moisture-retentive power of this soil and because the areas occur in comparatively lower situations.

Summit silty clay, shallow phase.—Summit silty clay, shallow phase, consists of a dark-brown or almost black silty clay loam, silty clay, or clay surface layer underlain within about 12 inches by either broken or solid bedded limestone. The surface is thickly strewn with thin bluish-gray limestone slabs, most of which are curved on the outer edges and measure from 1 to 3 feet in width and length and from about 2 to 4 inches in thickness. A few heavier and thicker slabs occur here and there.

This soil is most extensive a few miles north and south of Valeda and along the south county line southeast of Bartlett. Scattered areas occur in narrow strips along the slopes and ridges of Summit silty clay loam and Summit silty clay. The areas are mainly gently undulating but some are slightly rolling. Surface drainage is good, but underdrainage is poor on account of the underlying limestone. It is estimated that about 98 per cent of this soil is used as pasture land for livestock. In many places, various-sized seedlings of hedges

(Osage-orange) are conspicuous among the grass and limestone slabs. Some farmers in the south and southwestern parts of the county have built permanent fences of the limestone slabs.

NEWTONIA SILT LOAM

The surface layer of Newtonia silt loam consists of dull dark reddish-brown or dark chocolate-brown silt loam to a depth of 6 or 8 inches. This is underlain to a depth of about 18 inches by similar-colored friable silty clay loam which grades into dull reddish-brown silty clay material in most places containing more or less ferruginous concretionary material and dark-brown or black stains throughout the lower part.

Newtonia silt loam occurs principally in the southwestern part of the county. Areas are gently undulating or comparatively flat. Surface drainage is fair, and the subsoil is not so compact or impervious as to cause poor underdrainage. All the soil is in cultivation, mainly to corn.

Newtonia silt loam, reddish phase.—The surface layer of Newtonia silt loam, reddish phase, locally known as “red land” or “red limestone land,” consists of reddish-brown or very dark brownish-red mellow silt loam to a depth ranging from 15 to 18 inches. It is underlain by friable silty clay loam of similar color and this, in turn, is underlain by more pronounced reddish silty clay or clay which continues to a depth ranging from 40 to 50 inches. In many places small iron concretions and dark-brown stains are noticeable though not conspicuous. The thinly bedded limestone bedrock occurs in many places at a depth between 20 and 36 inches, especially near escarpments.

Areas of this reddish soil are widely scattered throughout the county in association with soils of limestone origin. Several areas occur from 2 to 3 miles northwest of Mound Valley; from 2 to 5 miles south, west, and north of Edna in the southwestern part of the county; and in widely scattered areas in the eastern part of the county north of Bartlett and from 1 to 6 miles west of Neosho River.

Areas are in general gently undulating or rather flat. Some, such as those northwest of Mound Valley, occur on rather high hill crests. Surface drainage is fair, and underdrainage is adequate. Although inextensive, this is an important agricultural soil. Crops and yields are the same as on typical Newtonia silt loam. Orchard fruits do especially well on areas in which the underlying limestone is at a great depth or is absent. As this is essentially a limestone soil many farmers have the impression that alfalfa will succeed, but in reality most of the soil is acid, and should be well limed before seeding to alfalfa.

Newtonia silt loam, shallow phase.—The surface layer of Newtonia silt loam, shallow phase, is reddish-brown or dull brownish-red silt loam passing at a depth of about 6 or 8 inches into dull reddish-brown silty clay loam which, in turn, gives way to dull-reddish or brick-red silty clay at a depth ranging from about 15 to 18 inches. Below this depth the presence of limestone fragments, cherty material, and limestone rock in varying quantities renders the lower part of the subsoil impenetrable to an auger. Sufficient limestone rock is pres-

ent on the surface to make cultivation almost impossible except in a few patches.

The largest area of this shallow soil lies 4 miles southeast of Edna. Other small widely scattered areas occur as small strips bordering Newtonia silt loam. Areas are rather flat but a few along small drainage ways are rolling. The soil differs from Labette silt loam, rolling phase, mainly in color. It has agricultural value only as pasture land.

BATES VERY FINE SANDY LOAM

To a depth ranging from 8 to 12 inches Bates very fine sandy loam consists of brown or rather dark-brown very fine sandy loam. Below this layer the color ranges from light brown to yellowish brown, with some mottles of rust brown and reddish brown. Below a depth of 20 inches the material is more highly mottled, red, brown, yellowish, and grayish colors predominating. This layer contains an appreciable amount of rotten or decayed fragments of sandstone. At a depth ranging from 24 to 28 inches the subsoil becomes heavier or more compact, and rotten reddish or rust-brown sandstone material is present. In places below a depth of about 40 inches there is pale-yellow or slightly greenish-yellow very fine sand, which continues to a depth of 60 or more inches. In many places bedrock is reached at a depth of 30 inches, especially along steeper slopes where erosion has been more active. Small spots of concretionary material and iron stains are common, especially in the more gently sloping areas.

This soil occurs in widely scattered areas on rather rounded hills and on hill slopes. Beginning about 6 miles east of Parsons and extending to the south county line east of Edna are a number of rather isolated areas. The largest single area is about 6 miles west of Parsons.

Surface drainage is good throughout areas of this soil. Generally the porosity of both surface soil and subsoil insures good underdrainage, but in some places underdrainage is rather imperfect owing to underlying sandstone strata. Along the steeper slopes erosion has been very active.

This is a fairly important agricultural soil. Probably not less than 90 per cent is in cultivation. The excellent drainage, warmth of the soil, and ease of cultivation allow early seeding, and crops are well advanced before dry weather sets in. Cotton, although not extensively grown in Labette County, does well on this soil, if not injured by unseasonable cold weather.

Bates very fine sandy loam, colluvial phase.—Bates very fine sandy loam, colluvial phase, consists of a layer of brown, dark-brown, or slightly reddish-brown very fine sandy loam 6 or 8 inches thick, underlain by yellowish-brown, light-brown, or pale reddish-brown fine sandy loam which extends to a depth ranging from 15 to 20 inches, at which depth the material is more mottled with red, gray, brown, and rust brown and contains small spots of rust-brown disintegrated sandstone material. These varicolored mottles occur at different depths, depending on the thickness of the soil material over the slopes. Small dark-brown iron concretions and stains are more or less common in the lower subsoil layer.

This soil occurs along the slopes of Big Hill Creek in the northwestern part of the county. Owing to the decided slope of the areas, surface drainage is good. The porous and fairly friable subsoil insures good underdrainage. The soil is derived from decomposed sandstone and sandy shales.

Practically all the land is in cultivation, mainly to oats, corn, and sweetpotatoes. Tests show the soil to be acid, but with the use of phosphatic fertilizers and finely crushed limestone, alfalfa would doubtless thrive.

BATES SILT LOAM

The surface soil of Bates silt loam is brown, yellowish-brown, grayish-brown, or dark-brown silt loam, underlain at a depth of about 10 or 12 inches by light-brown or yellowish-brown silty clay loam. At a depth ranging from about 15 to 18 inches various shades of yellow and brown mottling appear, and from about 20 to 24 inches the material is mottled with brown, rust brown, yellowish brown, and reddish brown. The texture at this depth is silty clay loam or silty clay. This material continues to a depth of 40 or more inches. The color of the lower subsoil layer between depths of 30 and 40 inches is predominately gray, yellowish gray, or light bluish gray, with some brownish, reddish, or yellowish mottling. Below a depth of 24 inches pockets of rotten, rather shaly fine-grained sandstone material are common. The pockets range in size from small to several rods in diameter, and when viewed along road cuts the top of this layer presents a rather billowy appearance. In many places a slightly heavier layer is noticeable between depths of 15 and 20 inches. It passes into less plastic mottled material beneath. In a few places a layer or pocket of heavy silty clay material occurs below the highly mottled friable layer. In other places the texture is silty clay loam from a depth of about 15 inches downward.

The most extensive areas of this soil are in the southeast corner of the county in the vicinity of Chetopa. A number of smaller areas lie in the northwestern part, and a few are east of Parsons. The soil occupies the crests and slopes of low hills having a gently rolling or undulating relief. Surface drainage is good and underdrainage is fair, although in some situations the tough compact subsoil retards drainage.

This is a fairly important soil. Approximately 94 per cent is in cultivation, and the remainder is in prairie grass. The most important crops grown are corn, wheat, and oats.

BATES LOAM

The surface layer of Bates loam is brown or dark-brown loam or shale loam which presents a rather light-brown or grayish-brown appearance in plowed fields. At a depth ranging from about 5 to 8 inches this layer grades into light-brown shaly material, mottled with reddish, rust-brown, and yellowish colors, which extends to a depth ranging from 20 to 30 inches. In many places thin slabs of fine-grained sandstone interstratified with shale are present at various depths. These slabs range from about one-half inch to almost 2 inches in thickness. Below a depth ranging from 20 to 30 inches

the material is soft and brittle and in most places is olive gray in color. On many lower slopes the subsoil material resembles the subsoil of Summit silty clay loam, shallow phase, but the percentage of clay is generally less.

The largest area of this soil lies from 3 to 6 miles west of Mound Valley. A smaller area extends eastward from the northwestern corner of the county. The areas occupy moderately rolling hills having excellent surface drainage. The underlying stratified material causes poor underdrainage, and crops can not withstand continued dry weather. Some of the more gentle slopes are cultivated, chiefly to corn and kafir, but probably about 90 per cent of the land is in virgin pasture. On many of the lower slopes the accumulations of soil material are deeper than typical.

Bates loam, steep phase.—Bates loam, steep phase, consists of a layer of brown loam or shaly loam from 4 to 8 inches thick, underlain by light-brown shaly material containing considerable mottling of yellow, rust brown, and reddish brown. Like Bates loam, it is very variable in color and in depth to the underlying strata. More shale or fine-grained sandstone material outcrops along the steeper slopes and the surface soil is thinner than that of typical Bates loam.

This soil occurs in the northwest corner of the county and west of Mound Valley in association with Bates loam. Its rolling and steep relief causes erosion to be more severe, and the soil material is very shallow in many places. Stratified outcrops are more common than in typical Bates loam. Practically all this land is used for pasture, for which purpose it is best suited.

NEOSHO SILT LOAM

Neosho silt loam consists of gray or ash-gray floury silt loam to a depth ranging from 12 to 18 inches. This is abruptly underlain by tough stiff clay (claypan). A lighter-gray layer, in most places about 3 or 4 inches thick, lies directly above the claypan layer in some of the very flat areas. The subsoil, or heavy clay layer, is dark brownish gray or dark gray and is exceedingly stiff and plastic when moist but crumbles to a medium-fragmental structure on drying. Below an average depth of about 24 inches, the dark-gray color changes gradually to brownish gray, with many brownish and grayish color variations. In most places at this depth some small dark-brown concretions and dark-brown stains are present.

Areas of this soil are flat, with a slight fall either toward the creek or in the general direction of stream flow. The soil is of alluvial origin and is derived from limestones, sandstones, and shales. Overflow water rarely reaches the areas, which occur as second bottoms or terraces lying from about 5 to 15 feet above the adjoining first bottoms of Labette Creek. The principal areas are between Oswego and Chetopa.

Owing to its flat surface and exceedingly stiff subsoil, drainage is poor. Consequently the soil is very strongly acid. The surface soil is low in organic matter. The land is used largely for livestock pastures and in the production of small grains.

RIVERTON GRAVELLY SILT LOAM

Riverton gravelly silt loam consists of brown or dark grayish-brown gravelly silt loam underlain, at a depth ranging from 6 to 10 inches, by brown or light-brown silty clay loam which grades into reddish-brown clay loam at a depth ranging from 14 to 18 inches. The surface soil ordinarily contains more or less gravel, but the real gravel stratum begins at a depth between 14 and 24 inches. In some places the gravel strata begin abruptly and continue downward to a depth ranging from 2 to 6 or more feet. The size of the gravel averages about as large as a common walnut. Some of the gravel are rather flat and all are rounded or subangular; that is, distinctly waterworn. They are extremely hard and are composed chiefly of chert and flint. In smaller areas, where the gravel occurs nearer the surface, the gravel beds are intermixed with more or less soil material. Such patches are more droughty than the typical soil.

This soil is of small extent. The main areas occur along the slopes or tops of hills lying west of and adjacent to the Neosho River bottoms. Most of them are north of Oswego. A few small patches occurring between Oswego and Chetopa were too small to be shown on the map and are included with surrounding soils.

Areas of this soil furnish an excellent source of road-building material which has been successfully used on the roads extending west, north, south, and east of Oswego. The gravel is used also in culverts and other concrete structures. The more gravelly areas are probably best suited to the production of berries and fruits; those which are less gravelly are fairly good farming land but are inclined to be droughty.

VERDIGRIS SILTY CLAY LOAM

Verdigris silty clay loam consists of a layer of brown, light-brown, or grayish-brown silty clay loam from about 6 to 10 inches thick, underlain by light-brown or grayish-brown silty clay which extends downward to a depth of 3 or more feet. In many places, the lower subsoil layer differs considerably in color and texture, owing to the various stages of recent overflows. Such variations are more common near the more prominent meanderings of the present water channels. At a depth ranging from 10 to 15 inches darker-colored material, representing old alluvium deposited before much cultivation was under way, occurs in many places. Below a depth ranging from 20 to 30 inches the soil material is generally mottled with yellowish, grayish, or brownish colors, predominantly light brown. Such mottling is scarce above a depth of 20 inches.

Typical areas of this soil occur on both sides of Neosho River in small strips up to about one-fourth mile in width. Along the more pronounced inner river bends the areas are slightly hummocky, being noticeably lower on the inner curves and higher on the outer ones. These inner river bends are, therefore, most susceptible to overflow, and most of them are more or less imperfectly drained. The porous and open subsoil affords good underdrainage. The occasional overflows are the greatest drawbacks to agriculture on this kind of land.

It is estimated that about 90 per cent of this soil is under cultivation. It is very productive and is highly esteemed for growing corn. Uncultivated areas are used as pastures for livestock. They support a vigorous growth of black oak, pin oak, elm, hickory, sycamore, black walnut, cottonwood, locust, willow, ash, and hawthorn.

VERDIGRIS SILT LOAM

Verdigris silt loam is somewhat variable in color and texture in different parts of the county. Along Big Hill Creek, where this soil is more typically developed, the soil consists of brown or dark-brown silt loam, passing at a depth ranging from 12 to 18 inches into brown or rather light-brown silt loam which continues to a depth ranging from 30 to 40 inches with little change. In many places, however, along the meanderings of the creek bends the soil throughout contains a comparatively high proportion of very fine sand which really constitutes a loam in texture. As such areas are of small extent, they were included with the silt loam in mapping.

Along Labette Creek and a few other small creeks Verdigris silt loam has a brown, grayish-brown, or dark grayish-brown surface soil continuing to a depth ranging from 12 to 16 inches. This grades down into grayish-brown rather heavy silt loam continuing to a depth ranging from about 18 to 24 inches, at which depth most of the material is silty clay loam. In many places grayish, yellowish, and rust-brown mottles are visible but not numerous. These continue to a depth of 40 or more inches. In some areas the lower part of the subsoil is silty clay.

Verdigris silt loam is most extensive along Labette Creek and its tributaries and a considerable part of the Neosho River bottoms. Drainage is good in most places, but a few flat areas are rather imperfectly drained, causing the subsoil to be stiffer and more mottled than typical. Crops suffer less from drought on this soil than on most of the upland soils. The main drawback to farming is overflows, which can be prevented only by levees. Water on the smaller bottoms, which are seldom completely overflowed, recedes more rapidly and consequently does less damage than on the larger bottoms.

From 80 to 90 per cent of this land is cultivated, chiefly to corn. Many farmers use all except the better-drained and most suitable areas as pasture. The land lying along the meanderings of the creeks supports a fringe of native trees.

LIGHTNING SILT LOAM

The surface soil of Lightning silt loam consists of a layer of grayish-brown or brownish-gray silt loam from about 12 to 18 inches thick. This is underlain by mottled silty clay loam which continues to a depth of 40 or more inches. The gray mottles predominate throughout the lower part of the subsoil. Numerous small dark-brown and black iron concretions are present throughout the subsoil and in a few places in the surface soil. About $3\frac{1}{2}$ miles northwest of Chetopa in the south half of section 8 and north half of sec. 17, T. 34 S., R. 21 E., a distinctly heavier-textured area, averaging silty clay loam, is included.

This soil occurs on the Labette Creek bottoms between Oswego and Chetopa in rather flat imperfectly drained situations in close association with Neosho silt loam. Its rather imperfect drainage makes it somewhat inferior to Verdigris silt loam, but good crops of corn are commonly grown. Tile drainage would improve a large part of the land.

OSAGE CLAY

The surface soil of Osage clay consists of a layer of very dark grayish-brown or black clay, locally called "gumbo," from 12 to 18 inches thick. It is underlain by dark grayish-brown or rather dark-gray clay which extends to a depth of 40 or more inches with little change except that the color gradually becomes slightly lighter with depth. Faint reddish-brown, yellowish-brown, and bluish-black mottles are in the lower part of the subsoil, and a few small dark-brown ferruginous concretions are in this layer in the more imperfectly drained areas. The clay is very plastic when wet and when dry breaks into a coarse-granular or medium-fragmental structure. In old marshy areas the material on drying cracks into rather warped cubical blocks from about 6 to 10 inches in width. The large cracks thus formed extend downward several feet during droughty periods.

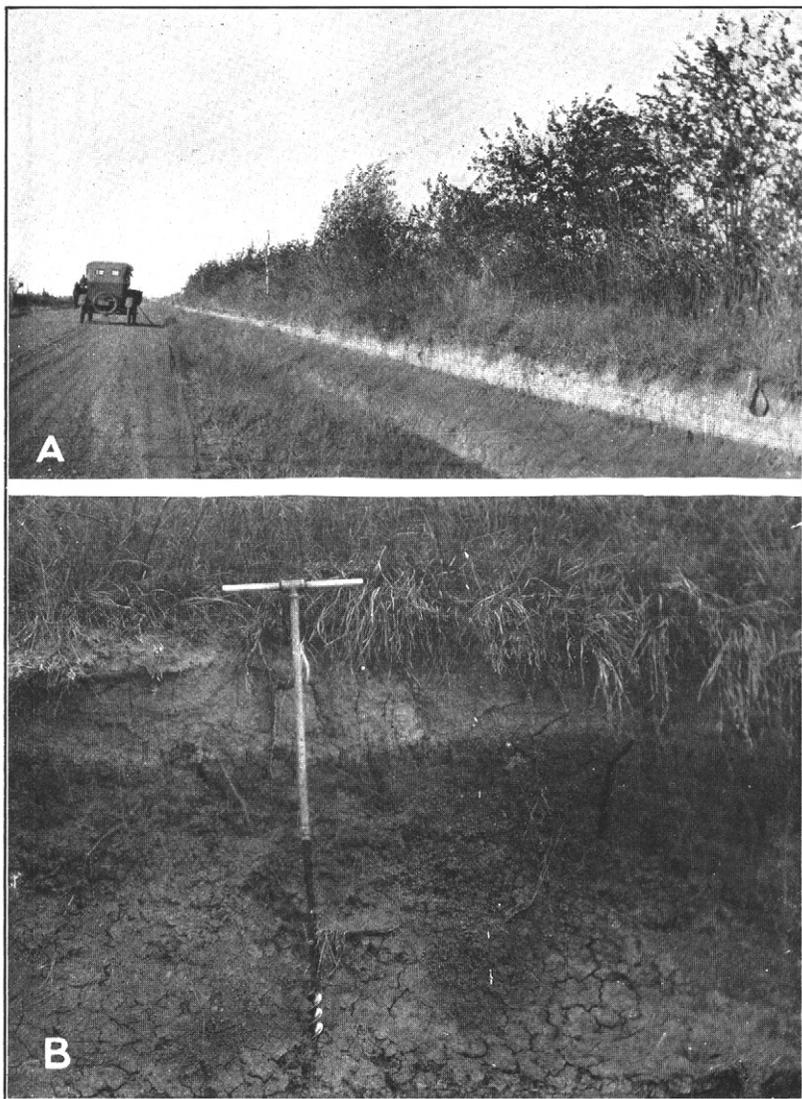
This soil occurs along the flatter parts of the Neosho River bottoms, occupying the central parts where the bottoms are widest and farthest from the active current of the river in time of overflow. Owing to the prevailing flatness of the areas surface drainage is imperfect. The subsoil is too heavy to allow good underdrainage. Where artificial drainage is provided, this is an excellent soil for corn, alfalfa, or small grains. Approximately 60 per cent of the soil is in cultivation and the remainder is in pasture and timberland. A small part, chiefly in the northeastern corner of the county, remains in virgin timber. The various marsh grasses grow luxuriantly.

OSAGE SILTY CLAY

The surface layer of Osage silty clay consists of dark grayish-brown or grayish-black silty clay from about 6 to 10 inches thick. This grades downward into dark-olive or dark-grayish clay. At a depth ranging from about 15 to 20 inches, the color is not so dark but is in most places some shade of grayish brown or olive gray, with rather faint mottles of reddish brown, yellowish brown, and bluish black. In this layer a few small concretions are present in many of the more poorly drained areas.

This soil occurs in flat poorly drained situations bordering Osage clay. The larger areas are in the northeastern part of the county.

Possibly about 75 per cent of the land is in cultivation, and the remainder is used for pasture or hay land. A part of the pasture land still supports a growth of timber similar to that on Osage clay. The crops grown and yields obtained are also about the same as on that soil. Ordinarily this soil is a little easier to handle and is not quite so subject to danger from overflow as Osage clay, because of its slightly more favorable surface drainage.



A, Cherokee silt loam along graded road, showing the light-gray surface layer and abrupt change into the stiff heavy clay subsoil; B, close view of Parsons silt loam, showing cracks which indicate the heavy texture of the subsoil



A, Prevailing condition of cornfields along hedge fences, showing the stunted growth 2 or 3 rods from the fence; B, vigorous growth of corn along a wire fence where the hedge has been removed

AGRICULTURE

The extension of settlement over southeastern Kansas was rather slow. Until the building of railroads in the region, which began about 1870, all supplies except those produced locally had to be brought by wagon from points on Missouri River over roads which in wet weather were extremely poor. Many large streams had to be crossed. On account of a certain amount of confusion regarding land titles, brought about through the granting of large tracts of land to railways, other conditions which caused slow development of the region were emphasized. The soils of the area were only moderately productive, and for several years after the region had been settled crops were injured by various insects, especially grasshoppers, which destroyed the wheat crop a number of times. As in all new regions, an attempt was made to grow a great variety of crops. Owing to the large area of grasslands, livestock raising was encouraged, especially in the southeastern part of the State where cattle were driven for winter pasturing.

Cattle raising encouraged the production of corn, and according to census statistics this crop has from the first been a dominant one. On account of the pressure for food production during the World War, much of the cornland was taken for wheat production. In recent years, the comparatively low market value of cattle and hogs, together with the high price of farm labor, machinery, and other equipment, has tended to further lessen the acreage of corn and to increase that of wheat. The varieties of corn most commonly grown are Pride of Saline, Commercial White, Midland Yellow Dent, Reid Yellow Dent, Hildreth, Kansas Sunflower, and a local strain of squaw corn. Corn yields from 15 bushels to the acre on the poorer prairie soils to about 75 bushels on the best alluvial soils. Until recently the crop was grown on both bottom and upland soils, but in recent years the acreage on the alluvial soils of the river valleys is much greater than on the uplands.

Wheat, which according to the 1925 census exceeded corn in acreage, is entirely of winter varieties. This is the main cash crop. According to local information it was first grown in the county in 1866. Many farmers who grow wheat as their chief cash crop pay no particular attention to rotation of crops. The varieties most commonly grown at present are Blackhull, Nigger (Fulcaster) Fultz, Mediterranean, and Currell. Of late years the chinch bug has damaged the wheat crop considerably, and in 1926 a few fields were almost ruined. The worst damage occurred within 100 yards of hedge (Osageorange) fences, which serve as hibernating quarters for the insects. As a result of experiments conducted by the Kansas State Agricultural College,² the creosote barrier was found to be the most practical and efficient means of eradicating this pest. Hedge fences, in addition to offering refuge to insects, materially decrease crop yields. (Pl. 2, A.) In several fields noticed the larger hedges had been removed, and yields of corn and wheat were greater within 2 rods of the original hedge than elsewhere in the field. (Pl. 2, B.)

² McCOLLOCH, J. W. CHINCH-BUG BARRIERS FOR ANSAS. Kas. State Bd. Agr. Bien. Rpt. (1923-24), 24: 36-45. 1925.

Oats rank third in importance among the grain crops and do well on most soils of the county. The crop occasionally fails to head in adverse seasons, but even then it furnishes good hay. Kanota and Red Rustproof (Red Texas) are the varieties most commonly grown.

There is probably more interest evinced at present in the growing of alfalfa than of any other crop. A very considerable proportion of the alfalfa is grown on the alluvial soils. Liming and inoculation of the land is generally a wise precaution, but this is not practiced by all farmers and may not be necessary on some soils. The advantage of growing alfalfa without liming or artificial drainage on the bottoms is probably largely offset by the damage caused by overflows. According to reliable reports, yields of alfalfa on the bottoms range from about 3 to 4½ tons to the acre, from four cuttings, and on the "black limestone land" (Summit soils) from 1½ to 3½ tons. Sometimes alfalfa, especially that grown on low or imperfectly drained areas, is either winterkilled or suffers from some root disease.

Wild hay is the most common hay crop, although its acreage has gradually decreased since the county was organized. The first tame grass was grown in 1873. Timothy and clover mixed is grown here and there for hay, but clover alone does poorly on the generally acid soils. The acreage of sweetclover is rapidly increasing but at present is small. This crop should be grown more extensively, as it is an excellent soil builder, as well as a good hay and pasturage crop. Sudan grass makes a good hay crop but is grown by only a few farmers. Soybeans and cowpeas are grown for hay or green manure by some of the more progressive farmers, and their use should be encouraged.

Cotton was introduced among the farmers along Labette Creek in 1873, and a gin was built. Another was built at Oswego in 1879. In 1880, 98 bales were ginned and in the following year 145 bales. The high cost of labor and an occasional wet year have since caused this crop to be practically abandoned. Flax was grown in a small way in the eighties, but low yields resulting largely from flax wilt, which was bad in fields where little rotation was practiced, caused the production of this crop to be discontinued.

Minor crops now grown in widely scattered parts of the county include sweetpotatoes, barley, rye, sorgo (sweet sorghum) for sirup or forage, and kafir, milo, and feterita for roughage. Orchard fruits and berries are produced only for local use, as the generally acid surface soils and stiff subsoils are not favorable to the development of large commercial orchards. As a rule little attention is given to pruning, spraying, or fertilizing. Apples are the principal orchard fruit, followed in importance by peaches, cherries, plums, and pears. Grapes do fairly well on some of the sandy soils, but vineyards are scarce. Some small home patches of strawberries and blackberries are grown.

The acreage and production of the principal crops grown in Labette County over a period of years are shown in Table 3.

TABLE 3.—*Acreage and production of principal crops in Labette County, Kans., in stated years*

Crops	1879		1889		1899	
	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>
Corn.....	82,628	2,460,220	102,155	2,890,665	94,413	2,228,190
Oats.....	11,404	188,434	26,728	571,329	39,933	1,109,800
Wheat.....	27,759	340,411	26,488	458,657	67,222	570,740
		<i>Tons</i>		<i>Tons</i>		<i>Tons</i>
Tame hay.....					8,287	12,699
Wild hay.....					24,566	27,842
All hay.....	23,676	26,657	50,055	67,053		

Crops	1909		1919		1924	
	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>
Corn.....	96,227	1,696,731	26,515	485,073	47,118	1,066,903
Oats.....	31,152	761,628	53,025	1,207,984	43,458	897,498
Wheat.....	16,599	192,439	106,788	1,647,758	54,664	568,536
		<i>Tons</i>		<i>Tons</i>		<i>Tons</i>
Tame hay.....	22,187	24,569	8,328	16,861	9,403	
Wild hay.....	23,675	27,223	20,336	23,958	22,446	
All hay.....						51,667

The adaptation of certain soils to certain crops has been recognized in a general way by the farmers of Labette County. The crops to be grown in a region are determined largely by three factors, the soil, the climate, and economic conditions. As previously stated, the soils of Labette County have developed under a humid climate which is somewhat warmer than that of the dominant wheat-growing region of the United States. The county lies south of the main Corn Belt of the country. Although the annual rainfall is high, its distribution during the growing season is sometimes unfavorable, especially for long-season crops. Injury from droughts, which are not uncommon, is emphasized by the character of the soil.

Corn, which is known as a gross feeder, does best on those soils which contain a good supply of mineral matter and humus. A good supply of moisture is also necessary. The soils most nearly satisfying these requirements are those of the nonclaypan group, especially the comparatively heavy but well-drained alluvial soils of the river bottoms. Verdigris silt loam and the lighter members of the Osage series, where well drained, are such soils. The upland soils best suited to corn are the Summit, Labette, and Newtonia, named in the order of their suitability. These soils are also productive of other crops, though wheat may be injured by freezing if much moisture is held in the soil.

The claypan soils, because of their low content of organic matter and nitrogen, their acidity, and the presence of the claypan near the surface, making moisture conditions unfavorable, are best suited to shallow-rooted short-season crops, and where they lie in such a position that they do not become excessively wet in winter and spring they may be fairly productive of wheat. The comparatively large acreage of wheat that has been grown since early settlement of the region is a more or less definite indication that the claypan soils are not suited to the production of corn.

Oats are grown in close association with corn, as the crops seem to have similar soil requirements.

The principal causes for failure of alfalfa have been not only the acid reaction of the soil but the stiff, almost impervious, condition of the subsoils of large areas on the prairies and some of the terraces. Such soils are excessively wet in wet weather and too dry for good crop growth in dry weather. Black limestone land, mapped as the various members of the Summit series, is recognized as the best upland alfalfa soil. A stand of alfalfa may be obtained easily enough on most of the soils which have been well limed and manured, and the crop may do fairly well for the first year or two, even on soils with extremely tough subsoils. However, if the latter part of the summer proves to be very droughty, the roots can not penetrate deep enough into the stiff subsoil of the claypan type of soils to keep the plants in good condition; consequently the leaves turn yellow, the stand becomes thinner, and weeds infest the field.

Commercial fertilizer, as bone meal and superphosphate, is used by the better farmers. The use of commercial fertilizers is increasing each year. In 1919 a total of 752 farmers reported an expenditure of \$70,522 for commercial fertilizers, chiefly bone meal and superphosphate. Most of the fertilizer is used on wheat. Bone meal is applied at a rate ranging from 80 to 150 pounds to the acre, about 100 pounds being the usual application for wheat. The use of fertilizers is generally considered profitable over a period of years, but in seasons when hot winds prevail, when rainfall is abnormally low, or when the spring is very wet, it is unprofitable. Owing to the scarcity and high price of bone meal, superphosphate is becoming the chief commercial fertilizer. Superphosphate is believed to be a better fertilizer for oats than for wheat. Several experimental tests carried out on various soils in southeastern Kansas, in Labette and adjoining counties, have shown that lime, phosphorus, and proper surface drainage and underdrainage are probably the controlling factors in alfalfa growth, aside from the character of the soil. The plots treated with either raw rock phosphate or superphosphate, in addition to either manure or lime, or both, gave increased yields. If the soils are acid, an application ranging from 2 to 3 tons to the acre of finely ground limestone (that passing through a 100-mesh sieve) is used. Other requisites being met, a good yield can be obtained by using an application of about 200 pounds to the acre of rock phosphate or superphosphate, preferably the latter, in addition to a very liberal application of manure.

Liming is becoming a general practice throughout Labette County. In 1925 the first limestone crusher in the county was purchased, and in 1926 more than 3,000 tons of crushed limestone were used. The beneficial effects of lime are readily seen in the improvement of the acid soils.

Systematic crop rotations are gaining in favor. The importance of a leguminous crop in the rotation is generally recognized, and some of the better farmers are making good use of these soil-improvement crops. A good rotation, which is beginning to be used to some extent, is the following 5-year rotation: First year, corn and kafir; second year, wheat; third year, wheat; fourth year, oats seeded with sweetclover; and fifth year, sweetclover or soybeans. Several different rotations are in use, but one in which sweetclover is turned under will probably always prove highly beneficial.

The livestock industry ranks second to general farming as a source of farm income. Those farmers who have not specialized in wheat production raise some hogs and cattle for market each year. According to the twenty-fourth biennial report of the Kansas State Board of Agriculture, in 1924 there were 8,486 milk cows, 15,159 other cattle, 13,508 hogs, 7,715 horses, 3,386 mules, and 4,837 sheep in the county. These animals had a value of \$1,508,473, and the value of field crops was \$2,896,688.

Hereford and Shorthorn are the most common breeds of beef cattle. In the southern part of the county some feeders are shipped in to be pastured and fattened. The principal dairy breeds are Jersey and Holstein, although several farmers milk the beef or dual-purpose cows. Several dairies in the vicinity of the larger towns deliver milk to patrons, but most of the cream is shipped. On March 1, 1924, 146 silos and 1,517 cream separators were in use in Labette County.

Hogs form an important source of revenue to the livestock farmer. The Duroc-Jersey, Poland China, and Spotted Poland China breeds are most common. Several registered herds are maintained. The 13,508 hogs in the county on March 1, 1924, were valued at \$148,588.

Sheep are kept on a few farms, especially on the rougher lands. In 1924, 24,053 pounds of wool were clipped. The number of sheep was 4,837 and the value \$29,463. Practically every farmer produces some poultry and eggs, and some have ducks, geese, and turkeys. The Federal census reports the value of poultry and eggs produced in 1924 as \$540,569.

Horses, mainly Percherons, and mules are largely used in farm operations. Some farmers ship a few mules to the Southern States. In 1924 there were 7,715 horses and 3,386 mules in the county.

Modern machinery is in general use throughout the county. The number of tractors in the county March 1, 1924, indicates that many farmers are using motor power rather than horses for the various farm operations.

The supply of labor is usually sufficient. At harvest time labor is sometimes rather scarce and high priced, but at other times single men hired by the month are paid from about \$30 to \$40 with board and married men from \$40 to \$50 without board but with other perquisites. A few landowners employ farm managers at a substantial yearly salary. Most of the farm hands are white.

The average size of farms in 1925 was 147.9 acres, of which a large proportion was improved land or pasture land. The average assessed valuation of land in the same year was \$35.47 an acre. The selling price ranges from \$12 to \$125 an acre. Little land has changed hands lately.

The percentage of farms operated by owners has steadily declined. In 1879, 71.7 per cent of the farms were operated by owners and in 1925 the percentage had decreased to 57.7. A few farms are operated by managers and 42 per cent by tenants. The change may be attributed to various causes. The high proportion of tenancy is one of the chief drawbacks to agriculture in the county, as the renters can not afford the necessary investment in seed and labor to grow purely soil-improving crops or, for the sake of crop rotation, to produce crops which give no immediate cash returns.

SUMMARY

Labette County is in the southeastern part of Kansas, bordering the Oklahoma State line. It includes an area of 650 square miles. The county lies within the Great Plains region, and the surface features are those of comparatively smooth prairie along the divide south of Parsons. The southern, western, and northwestern parts of the county are more or less rolling.

Drainage is effected largely through Neosho River and its tributaries in the eastern part of the county and tributaries of Verdigris River in the western part. Surface drainage is generally good, but underdrainage ranges from fair to very poor.

The elevation of the county ranges from about 800 feet to 1,000 feet above sea level.

According to the latest State census, the county has a population of 35,462, of which 16,299 are classed as rural. Oswego, situated in the east-central part, is the county seat. Parsons is the largest town, with a population of 16,609.

The average frost-free season is 196 days. Droughty periods are of frequent occurrence.

Agriculture consists of general farming. Wheat is the principal cash crop. The acreage planted to legumes is gradually increasing.

Land values on the upland soils ordinarily range from \$35 to \$70 an acre. Where improvements are exceptionally good and the location of the land especially desirable—that is, near improved highways, towns, or railroads—land commands a higher price. Some of the nonarable stony land, which is used only for grazing, brings from about \$12 to \$20 an acre. Some of the leveed areas in the Neosho bottoms are held at about \$125.

Cherokee silt loam, locally called "white ashy land," includes the flat or gently undulating imperfectly drained land which has reached the most advanced stage of maturity. The parent material is derived mainly from shale. The surface soil and subsoil are strongly acid in most places. Wheat is the most common crop grown on this soil.

The Parsons soils belong to the most extensively developed series in the county, the silt loam being by far the most extensive soil type mapped. On these soils wheat is the principal crop, followed by oats, corn, forage, and hay crops. Ordinarily surface drainage is sufficient but underdrainage is imperfect, thus causing strong acidity in most places.

Labette silt loam is an extensive soil, practically all of which is under cultivation. The subsoil is less plastic than in either the Cherokee or Parsons soils. All the common crops grown do well, and alfalfa succeeds when the acidity is corrected by the use of crushed limestone. Other inextensive Labette soils are mapped.

Soils of the summit series, or black limestone land, are more calcareous than any other upland soils. Alfalfa, wheat, oats, corn, and forage crops do remarkably well, but the shallow phase of Summit silty clay is used as pasture land only.

The Newtonia soils, or red limestone land, cover only a small acreage and are used mainly as pasture land, but the tillable areas are very desirable crop land. The Bates soils include good cultivable

land, with the exception of the loam, which is largely uncultivated and is still mainly in virgin pasture. Riverton gravelly silt loam is inextensive. Gravel for road material is obtained from many areas of this soil.

Neosho silt loam is almost identical with Cherokee silt loam, but it occupies the second bottoms or terraces, whereas the Cherokee is an upland soil.

The Verdigris and Osage soils are first bottom or alluvial soils. The Verdigris soils are planted to the general farm crops of the county, and excellent yields are obtained, especially under good conditions. The Osage soils occur in the wider first-bottom situations and are darker in color and more difficult to handle. They are cropped chiefly to corn, small grains, and hay crops. Large areas of the more poorly drained land are utilized as pastures.



[PUBLIC RESOLUTION—No. 9]

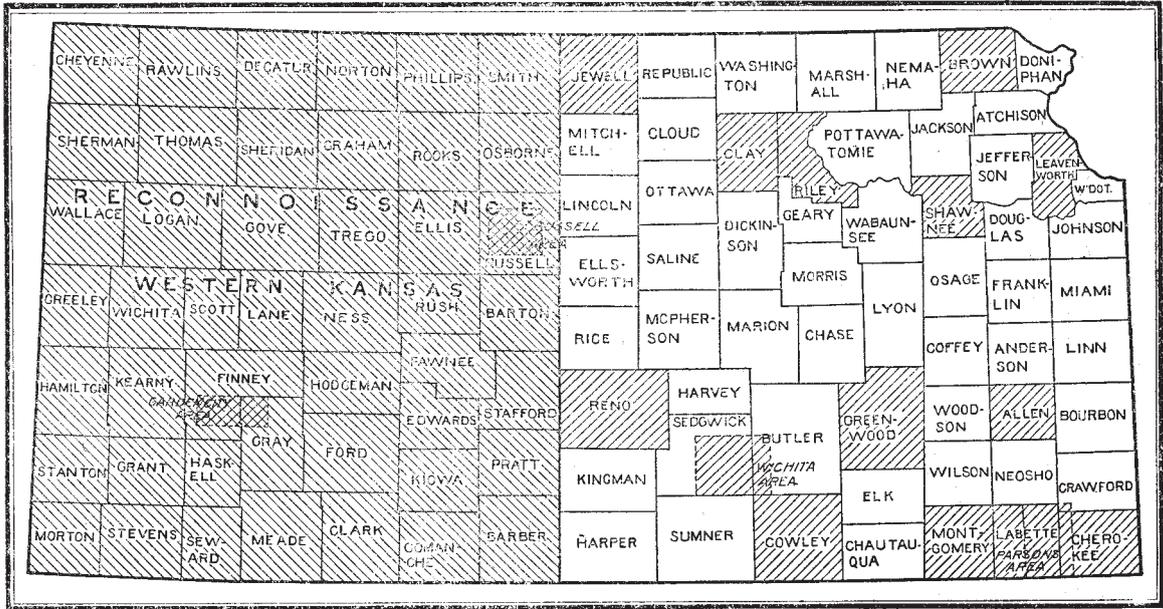
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils, and on July 1, 1927, the Bureau of Soils became a unit of the Bureau of Chemistry and Soils.]



Areas surveyed in Kansas, shown by shading

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers. If you believe you experienced discrimination when obtaining services from USDA, participating in a USDA program, or participating in a program that receives financial assistance from USDA, you may file a complaint with USDA. Information about how to file a discrimination complaint is available from the Office of the Assistant Secretary for Civil Rights. USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, complete, sign, and mail a program discrimination complaint form, available at any USDA office location or online at www.ascr.usda.gov, or write to:

USDA
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, S.W.
Washington, DC 20250-9410

Or call toll free at (866) 632-9992 (voice) to obtain additional information, the appropriate office or to request documents. Individuals who are deaf, hard of hearing, or have speech disabilities may contact USDA through the Federal Relay service at (800) 877-8339 or (800) 845-6136 (in Spanish). USDA is an equal opportunity provider, employer, and lender.

Persons with disabilities who require alternative means for communication of program information (e.g., Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).