

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Bourbon County, Kansas

By

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and

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Bureau of Chemistry and Soils

In cooperation with the
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SOIL SURVEY

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SOIL SURVEY OF BOURBON COUNTY, KANSAS

By M. H. LAYTON, United States Department of Agriculture, in Charge, and C. E. DORNBERGER, Kansas Agricultural Experiment Station

COUNTY SURVEYED

Bourbon County is in the prairie-plains section of Kansas, in the third tier of counties from the southern boundary of the State, and its eastern boundary is the Missouri-Kansas State line (fig. 1). Fort Scott, the county seat, is about 100 miles south of Kansas City. The county, almost square in outline, is about $25\frac{1}{2}$ miles long from east to west and 25 miles wide from north to south. It covers an area of 632 square miles, or 404,480 acres.

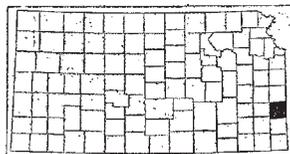


FIGURE 1.—Sketch map showing location of Bourbon County, Kans.

The county is part of a faintly dissected smooth plain. Differences in relief express differences in resistance to erosion of the underlying bedrock. They bring about especially marked differences in the width of the alluvial plains along the streams. Where the sandy shales dominate, these alluvial plains or valleys are broad; where the creeks cross the more resistant limestone beds they are narrow, and the bounding bluffs are steep and stony. The maximum differences of relief, however, are not great. As the limestone weathers more slowly than the sandstone and shale, the outcrops of this rock stand higher than those of the shales. The former belts of outcrops constitute low ridges with unsymmetrical slopes and are steeper on the eastern and southeastern slopes than on the western. The steep slopes constitute more or less well defined eastward-facing escarpments.

The range in elevation is not great. Bronson, in the western part of the county, lies at an elevation of 1,073 feet and Fort Scott, in the eastern part, at an elevation of 857 feet.

Surface drainage is generally good, and underdrainage is comparatively poor. Drainage is effected mainly through Marmaton and Little Osage Rivers and their tributaries. The streams are sluggish and have very meandering channels, with a gradient of about 8 feet a mile. Marmaton River drains the southern part of the county, with the exception of the extreme southwestern corner, which is drained by tributaries of Neosho River. Little Osage River drains the northern part. These are permanent streams, but their tributaries flow intermittently during the summer. The deeper pools in the channels, however, are rarely dry. Marmaton River enters Little Osage River after it leaves the county and flows into Osage River, a tributary of the Missouri.

The native vegetation on the upland consists almost entirely of grasses, of which little bluestem and big bluestem are the most abundant. Broomsedge grows abundantly on the lighter soils. Other

common grasses are Kentucky bluegrass, English bluegrass, switchgrass, Indian grass, prairie sedges, a number of wild legumes, such as prairieclover, vetch, hoary pea (or catgut) and *Psoralea* (or wild alfalfa). In long overgrazed pastures, many kinds of grasses and weeds have made their appearance. These include poverty grass, foxtail, little barley, cheat, some side-oats grama, and some water-loving sedges. The most common weeds are the annual ragweeds, goldenrod, pokeweed, rockweed, broomweed, wild onion, ironweed, false-indigo, buckhorn, buckbrush, dogwood, cactus, sumac, and daisy. On the heavier and more moist soils English bluegrass has established itself. On the steeper slopes grow shrubs and vines, such as butternut, wood vine, bittersweet, dogwood, wild grape, blackberry, wild cherry, persimmon, and various species of sumac, of which the aromatic is the most abundant. The alluvial lands were originally covered with trees and water-loving grasses. The trees are chiefly hackberry, ash, elm, pin oak, black oak, water oak, black walnut, hickory, cottonwood, almondleaf willow, sycamore, post oak, hawthorn, maple, and papaw. On the slopes, where erosion has removed the organic material and exposed the partly decomposed shales, needlegrass, broomsedge, and shrubs have come in to some extent, and some few square feet are void of vegetation, owing to the outcropping of shale rocks and ledges.

Under natural conditions the soil has a fair supply of organic matter. In the imperfectly drained soils the organic matter is seemingly not so abundant as in the well-drained soils, and vegetation is not so vigorous.

Bourbon County was organized in 1855, under the act of the "Roger" legislature, at the solicitation of S. A. Williams and William Barbee. It was named for Bourbon County, Ky. It became a part of Kansas when this State was admitted to the Union as a free State on January 29, 1861. The present boundaries of the county were definitely defined in 1867. Public schools were organized on May 4, 1868.

White men began to settle in the area now included in the county, about 1850. The early settlers were chiefly from Missouri, Kentucky, Pennsylvania, and Ohio. A long-continued drought started in September 1859. Very little rain fell for more than a year, and the temperature frequently exceeded 110° F. in the shade. During the summer and fall of 1860 a large proportion of the population left. The drought was broken during the latter part of 1860, and more prosperous times have ensued since. The situation of Bourbon County on the Missouri boundary caused a great deal of strife between the advocates of slavery and the free-soilers. There were border raids, in which several people lost their lives, but after Kansas became a free State the border strife soon stopped, and the people began to establish more permanent homes and to carry on permanent agriculture.

Fort Scott is the county seat and largest city. The fort was built on land belonging to the New York Indian tribe, and it was named for Gen. Winfield Scott. Other important towns are Uniontown, Bronson, Mapleton, and Fulton.

According to the United States census reports, the population in 1920 numbered 23,198 and in 1930 was 22,386, showing a slight de-

crease. The rural population represents 51.9 percent of the total, and its density is 17.8 persons to the square mile. About 95 percent of the rural population is engaged in some form of agriculture. A few of the rural residents in the southeast part of the county are engaged in coal mining, and most of the coal is used locally. A large proportion of the coal is mined from shallow beds by a steam shovel or from pits. Shallow gas and oil wells are scattered throughout the county, and considerable attention has been devoted to them from time to time.

Bourbon County has about 116 miles of main-line railway tracks belonging to the Missouri, Kansas & Texas Railway, the Missouri Pacific Railroad, and the St. Louis-San Francisco Railway. Most farms are within a short distance of shipping points. Side tracks are numerous, and from them carload lots of grain grown in the vicinity can be shipped by short hauling. Motor-bus lines cross the county, and transportation facilities in general are good. There are about 200 miles of hard-surfaced or graveled roads. Much of the material used for graveling is made by crushing the limestone that is obtained locally from several places throughout the county. The dirt roads are maintained in only fair condition. On the upland, travel is seldom hindered by bad roads, but on the bottom land the dirt roads are frequently in bad condition. Most of the county roads follow section lines.

The surplus farm products, including grain, hay, livestock, dairy products, and poultry products, are marketed outside the county, either by local dealers or private individuals. The greater part of the grain is handled through local elevators. Part of the hay is shipped to Kansas City. Because there is a hard-surfaced road extending from Fort Scott to Kansas City, many of the dairy and poultry products are trucked to Kansas City. Fruit and vegetables are grown for local markets, but a small quantity is marketed outside the county each season because local markets are inadequate to consume the supply. The sale of cattle, hogs, and grain is the main source of income among the greater number of farmers.

Rural mail routes and telephone service reach all sections, and school facilities are ample. Each town has at least one good school, and a junior college is located in Fort Scott. Hundreds of laborers are employed in many industrial plants, such as grain elevators, railroad shops, creameries, condensaries, wholesale houses, cement plants, brickyards, bottling works, drilling tools and supply plant, coal mines, gas wells, and oil wells.

Water is readily obtained in all sections. Several springs furnish a good supply of water for the livestock in many pastures. Water for livestock commonly is obtained by impounding the water of a small stream, and some of the towns obtain their water supply in the same way.

CLIMATE

The climate of Bourbon County is characterized by hot summers and moderately cold winters. The lowest temperature ever recorded is -24° F. and the highest, 111° . The mean annual temperature is 56.6° . Temperatures lower than 0° occur very rarely and are of short duration, seldom lasting more than 2 or 3 days in one winter.

In summer, the weather becomes very warm, especially during times of drought. Temperatures of 100° are common, but they usually occur during a dry period and last only a few days each season. Damage by drought is most likely to occur during July and August and is caused as much by the high rate of evaporation, wind movement, and excessive sunshine as by a deficiency of rainfall. The last part of March and the first part of April are considered the windiest periods of the year, and the least wind movement occurs in August. There is a marked variation in the average daily wind velocity which increases toward the warmest part of the day and falls at night. The most damaging winds are the so-called "hot winds" which occur during prolonged periods of high temperature and may reach high velocity, causing great injury to growing crops, but they are of rare occurrence. High northerly winds often precede and accompany cold waves.

The average date of the last killing frost is April 15, and the latest recorded is May 9. The average date of the first killing frost is October 18, and the earliest recorded is September 26. The average frost-free season extends over a period of 186 days.

The average annual precipitation is 41.09 inches. Of this amount 26.03 inches falls during the spring and summer. Summer rains are generally in the form of thundershowers and are of short duration. The late fall and winter months are normally characterized by light rainfall. A large proportion of the rainfall occurs during the growing season, and it often happens that in late spring and early summer it is excessive. This seriously interferes with planting and cultivation of the spring crops, as well as with wheat harvest. Plants are likely to suffer more from dry weather than the total precipitation would indicate, because abundant moisture in the spring causes shallow rooting of plants and puddling of the soil. On the claypan soils, plants are also injured during droughts because of their shallow rooting caused by the presence of a tough impervious subsoil at a slight depth.

Exceptionally heavy and continued rains in spring and early summer may cause flooding of the alluvial lands along the larger streams. The river channels are small compared to their drainage area and the width of the alluvial belts, their banks are low, and their gradient, being determined by the work of the stream at medium- to low-water stages, is too slight to prevent flooding during heavy rains. Flood periods are, however, of short duration.

Table 1 (shown on p. 5), compiled from records of the Weather Bureau station at Fort Scott, gives the normal monthly, seasonal, and annual temperature and precipitation for Bourbon County.

AGRICULTURAL HISTORY AND STATISTICS

The pioneers found a broad prairie covered with a heavy growth of grass, broken only by narrow wooded strips along the larger streams. These valleys furnished the natural locations for the early homes because of the nearness of both water and wood.

The earliest industry was livestock raising. A few acres of bottom land near the homes were cleared and planted to barley and corn. The cattle were raised and fattened largely on the range and were fed sparingly with grain. Part of the cattle were brought

from Texas and Indian Territory and fattened before marketing. As the county became more thickly settled this system of feeding gradually disappeared. The development of agriculture in this county has been slow. Supplies, except those produced locally, had to be hauled over bad roads and treacherous streams before the building of railroads, bridges, and better roads. The production of corn and barley was followed by the growing of small patches of wheat, oats, rye, flax, pumpkins, and potatoes. Later a larger acreage was devoted to these crops, but the farmers were greatly discouraged by the destruction of their crops by droughts; pests, such as chinch bugs and grasshoppers; and flax wilt.

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Fort Scott, Bourbon County, Kans.

[Elevation, 857 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1917)	Total amount for the wettest year (1844)
	°F.	°F.	°F.	Inches	Inches	Inches
December.....	34.9	77	-10	1.77	0.60	0.78
January.....	32.5	74	-19	1.82	.35	2.05
February.....	35.6	84	-24	1.87	.05	1.30
Winter.....	34.3	84	-24	5.46	1.00	4.13
March.....	47.1	95	0	2.30	1.43	3.78
April.....	55.8	94	16	4.21	3.05	6.91
May.....	65.3	103	25	5.43	8.03	14.79
Spring.....	56.1	103	0	11.94	12.51	25.48
June.....	74.2	108	42	6.19	.50	12.64
July.....	78.7	108	45	4.28	3.06	10.50
August.....	78.6	111	42	3.62	4.33	2.51
Summer.....	77.2	111	42	14.09	7.89	25.65
September.....	70.8	105	29	4.14	5.18	3.33
October.....	59.2	96	17	3.09	.83	2.49
November.....	46.9	85	5	2.37	.14	1.52
Fall.....	59.0	105	5	9.60	6.15	7.34
Year.....	56.6	111	-24	41.09	27.55	62.60

The type of farming has changed slightly since pioneer days, in the direction of more diversified farming; but the raising of livestock continues to be an important part of the industry, although its relative importance is less than formerly. Dairying and poultry production have greatly increased in the last quarter of a century.

Corn has been the most important cultivated crop since early settlement, except during the World War when the acreage of wheat surpassed that of corn. Corn originally was planted on a very large part of the arable land, but the actual acreage and the percentage of crop land devoted to corn growing decreased for a period of several years. During the last decade, however, competition from the specialized wheat-producing areas, where large-scale production

and modern machinery are better adapted, have rendered the growing of wheat less profitable. The low price paid for wheat and the demand for feedstuffs, combined with competition with other areas, have brought about a decided decrease in the wheat acreage. The acreage of corn, grain sorghums, and other feed crops has therefore increased.

Corn is grown on all the soils but most extensively on the dark-colored soils free from claypan and on the alluvial soils. Most of the corn is fed on the farms to hogs, dairy cattle, and beef cattle, and a small quantity is shipped out during years of high production. Some corn is shipped in during years of less favorable production. Frequent droughty periods during July and August tend to decrease yields on the heavy dark-colored soils. Corn was grown on 73,964 acres in 1879, and the average yield was 31 bushels to the acre, and in 1929, it was grown on 59,682 acres, with an average acre yield of 19.1 bushels. Sweet and pop corn are grown in small patches for local consumption. Grain sorghums, mainly kafir, are becoming very important crops in this part of the State. They have already attained a position close to that of corn and on a great many farms are largely displacing the latter. This is not due to the superiority of grain sorghum as a feed, so much as to its better drought-resistant qualities and the consequent greater certainty of the crop. In 1919, kafir was grown on 4,929 acres with an average yield of 18.9 bushels to the acre, and in 1929, grain sorghums, mainly kafir, were grown on 10,521 acres with an average acre yield of 12.2 bushels.

Some wheat is grown by most farmers, and some plant several hundred acres to this crop annually. It is grown on most of the soils, but the acreage on the lighter colored claypan soils is proportionally larger than that on the other soils. The largest production of wheat was reported in 1919, when 62,570 acres yielded a little less than a million bushels, or about 15 bushels to the acre. According to the 1930 census, 7,219 acres were planted to wheat in 1929 which produced 64,047 bushels, or an average acre yield of 8.87 bushels. The decrease in wheat acreage is principally due to economic conditions, mainly low prices; whereas the decrease in yields is due to a number of factors, such as the exercise of less care in seeding because of the low price of the grain, the selection of the poorer land for the crop, and impoverishment of the soil through poor management practices. Better varieties of wheat have been introduced, yet the acre yield has decreased.

Oats have been grown since the early settlement of the county, being grown on all kinds of soils, but yields are best on the heavier soils. This crop is grown mainly because it fits well into a rotation of corn, oats or sorghum, and grass. Oats are considered by most farmers as better feed than wheat, as the straw is much more palatable than that of wheat. Practically all the oats grown are consumed locally by the farm livestock. According to the 1930 census, oats were grown on 12,652 acres in 1929, and produced an average acre yield of 17.2 bushels.

Rye and barley have long been grown on a small scale by many farmers, and they are valuable feed for livestock. Rye produces better on the more sandy soils and makes excellent winter pasture.

The small acreage devoted to barley is largely owing to the ravages of the chinch bug. Flax has been grown since early times, but the acreage devoted to this crop has fluctuated greatly from time to time, according to economic conditions. According to the 1930 census, 1,213 acres were planted to flax in 1929, with an average acre yield of 5.06 bushels of seed.

Wild hay is the most important hay crop, but its acreage is gradually decreasing. In 1919 the acreage in wild grasses was 29,885 acres, and the production 37,035 tons; and in 1929, the acreage was 20,101 acres, and the production 20,750 tons.

Alfalfa has gained in importance since its introduction and is now grown extensively. In 1899, there were only 115 acres devoted to alfalfa which produced 350 tons, and in 1929, 3,154 acres produced 6,000 tons.

The acreage devoted to clover and other leguminous crops has increased greatly since their introduction. Biennial white clover and soybeans are of great importance as soil builders and in supplying feed for livestock. Generally the most profitable returns are brought about by putting one-fourth of the total land under cultivation into some leguminous crop.

Both potatoes and sweetpotatoes are grown, mainly in small quantities for home use. In 1929 a total of 232 acres was devoted to potatoes, with a yield of 15,821 bushels; and sweetpotatoes on 11 acres produced 913 bushels.

Most farmers have a small orchard, mainly of apple and peach trees, with some apricot, pear, and plum trees. Fruit is grown for home use only, though in a few of the larger orchards enough fruit is produced in some years to afford a surplus for local sale. Fruit is often damaged by late frosts, and in some years the crop is a complete failure. Some of the small orchards are well kept, but in general they receive little attention. The quality and quantity of the crop are both low because of the prevalence of diseases and insect pests, which cannot be controlled without expensive apparatus and materials.

Small home gardens are planted on most farms, and many of them are watered on a small scale from wells. Vegetables are grown commercially near the towns only, and considerable market gardening is carried on near Fort Scott.

Strawberries are a relatively important crop. In the eastern part of the county, they are grown in patches of 1 to 2 or more acres each. Most of the strawberries are grown on Bates fine sandy loam, and most of the other well-drained soils are well adapted to this crop. The production of strawberries offers excellent opportunities, but the crop requires intensive cultivation and cannot be grown on a larger acreage than can be given proper attention. The strawberries are sold mainly at local markets. Small patches of raspberries, blackberries, and dewberries are grown. Grapes are grown for home use only.

The census of 1930 reports 8,382 horses, 1,740 mules, 37,841 cattle, 27,414 hogs, and 212,536 chickens on the farms of Bourbon County, on April 1 of that year. Most of the beef animals are produced on the owner-operated farms. In general, the beef animals are of

rather inferior grade and are crossed with dairy animals, but herds of purebred or high-grade animals are owned by a few farmers. Hogs are raised on nearly all farms operated by owners and on many of the tenant farms as well.

The 1930 census reports 14,415 milk cows. Several dairy farmers near Fort Scott sell milk and cream to supply the daily demands of that city, and a condensary and creamery in the same city use a large quantity of milk. In the vicinity of the smaller towns, a few small herds of dairy cattle are kept, and cream and butter are sold for shipment.

Poultry and eggs are produced in a small way on nearly every farm.

Figure 2 shows the acreage devoted to corn, wheat, oats, and sorghums, over a period of years.

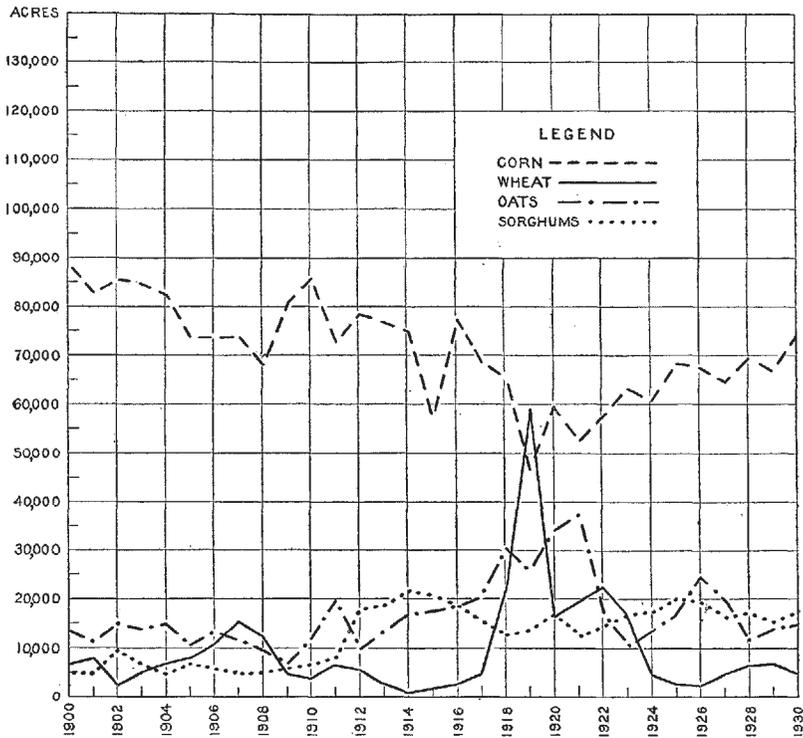


FIGURE 2.—Acreage devoted to corn, oats, wheat, and sorghums in Bourbon County, Kans., from 1900 to 1930.

Bourbon County offers attractive opportunities for the development of dairying and the production of pork, beef, and poultry products for market. An abundance of nutritious pasturage and forage can be provided by growing such crops as bur clover, lespedeza, vetch, cowpeas, soybeans, velvetbeans, oats, rye, corn, and sorghum. Transportation facilities are favorable for shipping dairy products and livestock products.

The census reports commercial fertilizers used on 4.8 percent of the farms in 1929, at a total expenditure of \$6,773. Commercial fertilizers are used almost exclusively on the upland soils and mainly for wheat and alfalfa. Very little, if any, of the fertilizers are mixed on the farm. Ready-mixed fertilizers containing some nitrogen and a high percentage of phosphorus give the best results. Bone meal, superphosphate, and rock phosphate are commonly used.

Farm labor is plentiful and adequate to meet ordinary demands. Monthly wages for farm labor range from \$25 to \$40, with board, depending on the experience and efficiency of the laborer. Day laborers are paid from \$1 to \$2.50. In 1929, a total expenditure of \$117,684 for farm labor was reported on 675 farms.

According to the 1930 census, 58.2 percent of the farms were operated by owners, 39.6 percent by tenants, and 2.2 percent by managers. The average size of the farms was 162.8 acres. The most common form of rental is on the crop-share plan. Only a very small percentage of the farms are rented for cash.

The farmhouses are, as a rule, substantial and fairly well constructed. Most of the barns are large enough to house the work animals and store the various crops, and most of the fields are well fenced. Grain drills and harvesters, tractors, mowers, rakes, cultivators, disks, hay presses, and plows are used on farms where the acreage in crops is sufficient to require such machinery. The work animals include horses and mules of light or medium weight. Automobiles and trucks have replaced horses for heavy hauling and driving. The 1930 census reports the following distribution of property values on the farms: Land, 58.4 percent; buildings, 21.4 percent; implements, 4.4 percent; and domestic animals, 15.8 percent.

Table 2, compiled from United States census reports, gives the acreage and production of the principal crops grown in 1879, 1889, 1899, 1909, 1919, and 1929.

TABLE 2.—Acreage and production of principal crops in Bourbon County, Kans., in stated years

Crop	1879		1889		1899	
	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>
Corn.....	73,964	2,307,528	95,593	2,463,755	107,112	2,274,480
Oats.....	8,170	112,070	13,258	277,654	9,319	198,620
Wheat.....	9,823	95,829	531	9,308	3,192	41,280
Grain sorghums ¹					1,038	16,163
Flaxseed.....		15,668	9,797	73,026	17,151	112,980
Potatoes.....		43,465	1,151	71,046	728	60,750
Hay.....	33,276	<i>Tons</i> 32,145	54,685	<i>Tons</i> 69,926	54,799	<i>Tons</i> 50,436
Apples.....	<i>Trees</i>	<i>Bushels</i>	<i>Trees</i>	<i>Bushels</i>	<i>Trees</i>	<i>Bushels</i>
Peaches.....			197,386	119,863	222,001	24,631
			33,207	16,680	21,682	137
Grapes.....	<i>Vines</i>	<i>Pounds</i>	<i>Vines</i>	<i>Pounds</i>	<i>Vines</i>	<i>Pounds</i>
					74,217	91,180
Strawberries.....	<i>Acres</i>	<i>Quarts</i>	<i>Acres</i>	<i>Quarts</i>	<i>Acres</i>	<i>Quarts</i>
					32	42,240

¹ Mainly kafir.

TABLE 2.—*Acreage and production of principal crops in Bourbon County, Kans., in stated years—Continued.*

Crop	1909		1919		1929	
	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>
Corn.....	91, 212	1, 980, 072	42, 924	862, 464	59, 682	1, 146, 221
Oats.....	7, 025	156, 160	27, 357	653, 191	12, 662	218, 675
Wheat.....	5, 371	69, 439	62, 570	953, 543	7, 219	64, 047
Grain sorghums ¹	3, 191	60, 637	4, 229	79, 942	10, 521	128, 349
Flaxseed.....	3, 447	23, 736	1, 202	8, 814	1, 213	6, 143
Potatoes.....	769	58, 025	492	35, 505	232	15, 821
Hay.....	61, 307	<i>Tons</i> 64, 805	52, 706	<i>Tons</i> 76, 979	38, 272	<i>Tons</i> 42, 630
Apples.....	<i>Trees</i> 82, 097	<i>Bushels</i> 18, 529	<i>Trees</i> 45, 095	<i>Bushels</i> 6, 793	<i>Trees</i> 11, 605	<i>Bushels</i> 1, 883
Peaches.....	33, 504	803	15, 185	7, 200	5, 849	2, 666
Grapes.....	<i>Vines</i> 20, 992	<i>Pounds</i> 117, 570	<i>Vines</i> 10, 424	<i>Pounds</i> 37, 937	<i>Vines</i> 7, 843	<i>Pounds</i> 19, 970
Strawberries.....	<i>Acres</i> 30	<i>Quarts</i> 34, 907	<i>Acres</i> 22	<i>Quarts</i> 37, 670	<i>Acres</i> 68	<i>Quarts</i> 114, 276

¹Mainly kafir.

SOILS AND CROPS

Bourbon County lies in the prairie plains section of southeastern Kansas, where the underlying rock formations consist of limestone, sandstone, and shales. A large number of distinct soil types, which differ from one another both in chemical and physical composition, have been developed from the weathered products of these formations. As climatic conditions are practically the same over the county, the soil differences are not caused by unequal climatic factors, but the controlling factors in the formation and diversity of the soils consist of differences in the character of the underlying materials, in surface relief, and in native vegetation.

Many of the soils are developed in continuous areas or are separated by streams, whereas others include a comparatively small acreage and are widely scattered. The topography, or surface relief, is a modifying factor in the development of the soils, particularly as it affects the depth and character of the surface soil. Most of the soils are well drained, and they control the agriculture and also govern the distribution and concentration of the farms.

About 60 percent of the land is tillable, and the remainder consists of rough stony land, mine pits, and gullied land, most of which is in pasture. The tillable land is topographically fairly well suited to farming and allows the use of labor-saving machinery. Hedge fences mark many of the land lines. Small quantities of timber are grown along the bottom lands and stream courses. Oak, walnut hickory, elm, cottonwood, and sycamore are the main trees used for lumber. Catalpa and hedge posts bring in a small revenue.

The agriculture is typical of that of southeastern Kansas. It is and has been diversified and is to a considerable extent self-sufficing. Most of the farms are small, and the greater part of the farming operations are accomplished by work animals, although tractors are common. The large acreage of land not suitable for cultivated crops has favored livestock raising which, in turn, has stimulated the growth of crops on the tillable land, that can be used as feed rather

than for sale for cash. Wheat and flax constitute the important cash crops. The dairy and poultry industries are relatively more important than feeding operations.

Fort Scott affords practically the only local market for truck and garden products, although trucking from this vicinity to Kansas City is common. Many of the farmers depend on dairying, poultry raising, and trucking for their livelihood. The soils of this locality produce a good growth of native bluestem, Kentucky bluegrass, and other good pasture grasses which make dairying practical. The agriculture consists of the production of corn, wheat, oats, flax, grain and forage sorghums, and hay as general farm crops. Alfalfa, clover, and the annual legumes, such as lespedeza and soybeans, are becoming more common. Corn, wheat, oats, and flax are grown rather indiscriminately over the county on the various soil types. There is a marked difference in the yields obtained from each of these crops on the several types of soil. Seasonal variations and methods of handling crops on the various soils have a great influence on the yields. These relationships will be discussed under the individual soil types.

Corn, the principal crop, is grown on nearly all the farms, but the higher yields are produced on the soils with friable subsoils. Wheat is grown mainly on the claypan soils, oats are grown chiefly in the rotation between corn and wheat, and flax is grown on the more friable heavy soils, as it leaves the land in a very mellow condition. Hay is a very important crop, as it is used by almost all farmers. It is produced on all types of soil. Alfalfa, sweetclover, red clover, lespedeza, and soybeans are increasing in acreage and are important as soil builders. Korean lespedeza and alsike clover are grown in many places.

In order to bring out the relationship existing between the various soil types and the agriculture of Bourbon County, the soils are divided into five groups, representatives of which occur on many farms. These groups have some common features in agricultural use and soil characteristics, and they include the following soil types: (1) Cherokee silt loam, Parsons silt loam, and the heavy-subsoil phase of Labette silt loam; (2) Summit silty clay loam and Summit silty clay loam, shallow phase; (3) Labette silt loam, Labette silt loam, cherty phase, Newtonia silt loam, and Newtonia silt loam, shallow phase; (4) Bates very fine sandy loam and Bates silt loam; (5) Verdigris silty clay loam, Verdigris silt loam, Osage silty clay loam, Osage clay, and Lightning silty clay loam.

Group 1 occupies 23.2 percent, group 2, 38.1 percent, group 3, 21.9 percent, group 4, 9.1 percent, and group 5, 7.6 percent of the area of the county. The soils in group 1 occur in large continuous areas in the northeastern, central, and southern parts. Group 2 occupies the largest area and is well represented in many areas, the largest of which are in the western and southeastern parts. The soils of group 3 are closely associated with those of group 2, and they occur in scattered areas over the county, principally in the northern and central parts. The soils of group 4 occur in the southern part. The soils of group 5 are developed mainly along Marmaton and Osage Rivers and their larger tributaries. Each group of soils dominates the agriculture in its particular section.

In the following pages the soils of Bourbon County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Bourbon, County, Kans.*

Type of soil	Acres	Per- cent	Type of soil	Acres	Per- cent
Cherokee silt loam.....	384	0.1	Bates very fine sandy loam.....	26,368	6.5
Parsons silt loam.....	92,544	22.9	Bates silt loam.....	10,368	2.6
Labette silt loam, heavy-subsoil phase.....	832	.2	Verdigris silt loam.....	21,440	5.3
Summit silty clay loam.....	80,000	19.8	Verdigris silty clay loam.....	1,792	.4
Summit silty clay loam, shallow phase.....	73,920	18.3	Osage silty clay loam.....	6,016	1.5
Labette silt loam.....	69,056	17.1	Osage clay.....	832	.2
Labette silt loam, cherty phase.....	15,936	3.9	Lightning silty clay loam.....	704	.2
Newtonia silt loam.....	1,472	.3	Mine pits and mine dumps.....	320	.1
Newtonia silt loam, shallow phase.....	2,496	.6	Total.....	404,480	-----

SOILS OF GROUP 1

The soils of group 1 have grayish-brown or dark grayish-brown surface soils and heavy dense claypan subsoils. They are favorable to a special type of farming and special crops, such as hay, wheat, flax, and sorghums. As the surface soils are shallow and the dense claypan subsoils are comparatively tough, these soils are adapted to crops having a shallow, dense root system. The moisture conditions in these soils are especially variable and depend closely on the amount of rainfall, as the soil is shallow and does not retain moisture long. The greatest part of the moisture is held in the surface soil or is allowed to run off, as only a small amount can penetrate the lower soil layers. During periods of low moisture, crops do not thrive and the dominant agriculture is held to crops which mature before the dry period.

These soils lie on smooth or gently undulating surface relief and are comparatively light in color. Natural surface drainage is fair or good, but internal drainage is slow or poor, as indicated by mottlings in the subsoil. The structure of the subsoil is not favorable to the movement of moisture and air. Sheet erosion is somewhat active on the greater part of the land under cultivation but is noticed principally along the steeper slopes.

The surface soils of these soils are dominantly silt loams, and they range in color from light grayish brown to very dark brown. They have a soft, smooth, silty feel. The subsoils are dominantly heavy claypans, ranging from drab to reddish brown in color, with some red and rust-colored mottlings. They are plastic and waxy when wet and hard and stonelike when dry. They contain different quantities of soluble salts, probably magnesium, calcium, and sodium sulphates. These salts, principally calcium sulphate, are very noticeable along road cuts and ditches, when the soils become dry. In all soils of this group the parent shale material lies from 40 to 70 inches below the surface.

The soils are low in organic matter, and they range from slightly acid to acid. They do not favor deep rooting of plants on account of the heavy claypan which restricts underdrainage and causes the

formation of a high water table. This heavy clay subsoil is too dense for plant roots to penetrate, and the small roots are exposed on the outer surface and between cracks and cleavage planes. Optimum moisture conditions endure for only a short time. When the soil is too wet the plants feed only at the surface as the deeper roots drown out; and when it is too dry the roots cannot penetrate to a great depth. Good tilth is hard to obtain. Heavy spring rains cause the soils to crack and puddle, and in many places water stands on the surface until it evaporates, leaving crops in poor condition to withstand dry weather. Only shallow-rooted plants with wide-spreading root systems, such as grain sorghums, wheat, meadow fescue, flax, timothy, corn, and a few annual legumes are adapted to these soils. The sorghums do fairly well, as they remain dormant in dry periods and mature later when the season is more favorable. As corn cannot withstand the adverse moisture conditions as well as the sorghums, it is a less certain crop.

The best varieties of corn for this section of the State are Midland Yellow, Kansas Sunflower (yellow), Pride of Saline, Commercial White, and Freed White. Freed White is the best adapted variety for the thin claypan soils. The grain sorghums yield about the same as corn and are more certain. Blackhull, Sunrise, and Red varieties of kafir are especially suited to the soils of this group. Atlas is the best adapted variety of the forage sorghums. The Kawvale variety of wheat yields from 2 to 4 bushels more grain to the acre on thin claypan soils than does any other variety. Currell, Fulcaster, and Dunbar Currell are other varieties of wheat which produce well in this section of Kansas. In favorable years such legumes as cowpeas, soybeans, red clover, and sweetclover are grown. The varieties of soybeans that do well on these soils are A. K., Peking (Sable), and Laredo. These are grown for hay, grain, and as soil builders. Flax is grown to some extent, and Linota is the best adapted variety.

The light-colored claypan soils are more uniform in their surface features than the darker colored soils. This allows seed crops to mature more uniformly and simplifies harvesting. The soils of this group return comparatively low crop yields, with the exception of the native grasses. The cause of the low yields is especially due to lack of drought resistance, because droughts, often accompanied by hot winds, occur occasionally. Experiments have shown that grain sorghums will give higher yields on soils of this group than will corn, but many farmers still grow considerable corn. The average acre yield of corn on these soils is about 20 bushels. Wheat averages 15 bushels, kafir 30 bushels, and tame hay about 1 ton.

Cherokee silt loam.—Cherokee silt loam, locally called "ashy land", has developed in the more nearly level areas of the county. The profile characteristics are very distinct. The lack of relief, together with the heavy claypan subsoil, renders drainage poor. The physical condition is generally poor, and plowing when wet causes the soil to puddle.

The surface soil, to a depth ranging from 7 to 18 inches, is grayish-brown or dark-gray silt loam of porous structure. The lower part of the surface layer, or that part just above the claypan, has been severely leached of available plant nutrients and after plowing gives

the field a light-gray appearance. This soil is almost white when dry and contains many small rounded ferruginous concretions. The ground water table is very high. Water accumulates over the claypan layer after spring rains and either seeps off or evaporates. The claypan begins abruptly at a depth of about 14 inches. It is drab or grayish-brown heavy compact clay mottled with reddish-brown and yellow stains. On drying the granules are hard, coarse, and angular. The larger granules are coated and have a distinctly glazed appearance. With increasing depth the subsoil becomes lighter in color and texture and, at a depth of about 40 inches, changes to yellowish-gray shaly silty clay. Partly weathered shale and sandstone, from which the Cherokee soil material is derived, in most places occurs at a depth ranging from 5 to 6 feet. In plowed fields the surface soil is almost ash gray when dry, but it is almost black when wet.

This soil is very acid. Crop yields are a little less than the average for soils of group 1.

Parsons silt loam.—Parsons silt loam differs from Cherokee silt loam mainly in surface relief and the degree of development of the surface layer, which is somewhat darker, and in the layer just above the claypan which is not so light in color and which contains more organic matter to a greater depth than the corresponding layer in the Cherokee soil. Owing to the greater content of organic matter in the subsurface layer, the roots of plants penetrate it more easily than they do the corresponding layer of the Cherokee soil.

Surface drainage is better than in Cherokee silt loam, and the claypan is exposed in more places on the slopes, owing to erosion. In general, the physical condition is a little better, the subsoil is not so uniformly dense, and plants can feed to some extent in it. Corn produces a little more than average yields for group 1, if moisture is sufficient during the last part of the growing season. Soybeans and cowpeas do fairly well, and corn following these legumes does better than the average.

Labette silt loam, heavy-subsoil phase.—The heavy-subsoil phase of Labette silt loam is inextensive and occurs principally in the northwestern part of the county. This soil is a little more productive than Parsons silt loam. It differs from Parsons silt loam in that the subsoil is not quite so heavy and has diagonal cleavage lines rather than horizontal or perpendicular lines like the Parsons soil. The change to the dense subsoil is not so abrupt as in the Parsons soil. The contact lines between the surface soil and subsoil are generally irregular.

This soil is not farmed separately but in association with the surrounding soils. It is an intermediate soil type between the Parsons and the typical Labette soils. In many places small bodies of this soil are included with both soils.

SOILS OF GROUP 2

The surface soils of the soils of group 2, or the Summit soils, are grayish brown or gray black, and the subsoils are dark drab. The change between the surface soil and subsoil is not abrupt, but the whole soil is rather heavy. The members of this group are the most extensive in the county, and they occur on many farms, mainly in

the western and southeastern parts of the county. These soils include the greater part of the so-called "black gumbo" or "clay land."

Chemical analyses of these darker soils indicate a higher content of nitrogen and in general a larger supply of available plant nutrients, to a depth ranging from one-half foot to 2 feet, than in the lighter colored soils. The dark soils show less marked response to fertilizers than the lighter colored claypan soils, and they are almost neutral in reaction, whereas the light-colored soils are acid. The organic matter is so intermixed with the mineral constituents that it is an integral part of the soil. It imparts the soft crumb structure so desirable for good tilth and is highly favorable to the maintenance of good moisture conditions, thus allowing a large feeding range for plant roots. It is also the chief source of nitrogen necessary for plant growth. It is almost entirely in a form which does not suffer rapid decomposition under tillage, and losses under cultivation seem to have been small. Nitrification is not stopped or retarded in the Summit soils except in extremely wet or extremely dry periods. The physical condition of these darker soils is generally good, enabling crops to better endure dry weather and to recover rapidly from the effects of heavy rains.

In a few places erosion has removed much of the organic matter from the surface soil, and the soil has a tendency to bake, puddle, and crack. In long-cultivated fields the soils of this group crack and allow great quantities of the surface soil to pass into the subsoil. This gives an uneven textural appearance, and the plowed surface soil becomes heavier. This form of erosion is noticed only where organic matter is depleted. In virgin fields the heavy texture of the surface soil has caused the land to crack to different depths during extremely dry periods. The cracks have been filled with lighter textured material. Soils of this group influence the agriculture where they occur, in that more alfalfa and corn are grown on the better tillable areas, and clover and lespedeza are grown on the more broken areas.

Wheat, flax, and kafir are not grown to a great extent on the Summit soils, as it has proved more profitable to grow corn, alfalfa, and clover. Crop yields average much better than on the soils of group 1. Corn in general yields about one-fifth more an acre than on the soils of group 1.

Summit silty clay loam.—Summit silty clay loam is the most extensive soil of group 2. It is characterized by a dark-colored surface soil. The lower part of the surface soil, between depths of 12 and 20 inches, averages lighter in color but slightly heavier in texture than the overlying silty clay loam layer, but it retains a distinctly granular structure. The subsoil is heavy dull-drab clay loam containing mottlings of gray and yellow. This material is coarsely granular and cloddy. When the granules are crushed the color is lighter, indicating that the dark material exists as a coating on the outsides of the granules. This layer gradually passes into yellowish-gray clay.

About 95 percent of this soil is in cultivation, mainly to corn, although many other crops do well. The high organic content and the fine texture cause the soil to be somewhat too moist for wheat and for easy cultivation in early spring. Some plants growing on this soil have a pale-green color, owing to too much moisture and lack of

nitrification. The best adapted varieties of corn are Midland Yellow Dent and Commercial White. They mature about 1 week later than most varieties, but the yield is higher.

Summit silty clay loam, shallow phase.—The shallow phase of Summit silty clay loam is similar in its upper layers to typical Summit silty clay loam, except for the presence of scattered fragments of limestone on the surface and at different depths in the soil. This shallow soil is used principally as pasture. Clover seems to do fairly well, when the season is not too dry, and many pastures contain small amounts of clover.

SOILS OF GROUP 3

The soils of group 3 are widely scattered over all parts of the county, the principal areas lying north and south of Fort Scott. Many odd-shaped patches are south of Devon and north of Bronson.

The soils of this group have reddish-brown or dark grayish-brown surface soils and moderately friable dark-brown or reddish-brown subsoils. The soils are favorable to a special type of farming and to special crops, such as corn, wheat, and kafir. These soils are loose and porous and allow the rapid oxidation of organic matter. In moist years they are the most productive soils in the county, and in dry years they are the least productive. They are referred to by many farmers as "push soils."

The soils of this group have smooth or gently undulating surface relief and are dominantly silt loams. Natural surface drainage ranges from fair to good. Internal drainage ranges from good to excessive in the lighter red soils and is fair in the darker soils. The structure of the subsoil is very favorable for aeration and movement of moisture. Iron pellets are common in these soils. The parent material lies a little nearer the surface than in the soils in group 1. It occurs from 24 to 60 inches below the surface. The cultivated soils are low in organic matter and are much lighter in color than the uncultivated soils. They range from slightly acid to acid. Good drainage makes them favorable for early crops, as optimum moisture is better obtained in early spring. As droughts are noticed first on soils of this group, it is especially essential to plant the early-maturing crops on them.

As farming is accomplished much more easily on these soils and because of the presence of stones in a few places, the soils are better suited to cultivation with horsepower than with tractors. Practically, the same varieties of crops and cultural practices are used as on the soils of group 1. Leguminous crops, such as clover, soybeans, and alfalfa, are grown to some extent, with the addition of lime. The surface soil is not uniform in its organic content, and crops do not mature so uniformly as on other types of soil. This makes the growing of wheat undesirable, as part of the crop is ready to harvest before the other part has matured.

Labette silt loam.—Labette silt loam has developed from parent material residual from gypsiferous shales and limestone. It occupies the smoother areas and is the most extensive soil in group 3. The profile characteristics are not uniform. The physical condition is generally good, and, as a rule, the land can be plowed shortly after rains or early in the spring.

The surface soil, to a depth of about 8 inches, is dark grayish-brown porous silt loam, the shade of color depending on the content of organic matter. The lower part of the surface soil is somewhat lighter in color, that is, reddish brown, and it contains numerous iron pellets, or concretions. In plowed fields the surface soil is reddish brown when dry and almost black when wet. There is no distinct line of demarcation between the surface soil and subsoil, but the subsoil begins at a depth of about 14 inches. It is dark reddish brown, mottled and splotched with gray, yellow, and rust-brown stains, and with increasing depth it becomes lighter in color, the gray and yellow stains increase in number, and the dark organic stains become fewer. The lower part of the subsoil has a greasy feel and is high in iron. The surface soil is softly granular in structure, and the subsoil is of softly granular prismatic structure. Limerock and the partly weathered shales occur in most places at a depth ranging from 3 to 5 feet.

Yields on this soil are much better than the average for soils of this group.

Labette silt loam, cherty phase.—The cherty phase of Labette silt loam is very similar to the typical soil in surface features, but the presence of the cherty material at irregular intervals, ranging from 18 to 24 inches below the surface, makes this soil a little difficult to handle, especially where erosion is active. The chert fragments, locally called "niggerheads", appear on the surface if the topsoil is allowed to wash away, making cultivation difficult. Many farmers use this soil for orchards and early garden spots, but, in general, its agricultural use is the same as that of Labette silt loam.

Newtonia silt loam.—Newtonia silt loam, or so-called "red land", ranks high as an agricultural soil and is one of the strongest and best soils in the county for early crops. It is one of the heaviest producing soils during years in which no droughts occur. It is a soil that responds to fertilizers, especially manure, as this increases its water-holding capacity. This soil can be farmed with small work animals and light machinery.

The color of the 8- to 12-inch surface soil ranges from dark reddish brown to pale reddish brown. The subsoil is dark-red, smooth, and fairly friable silty clay which continues to a depth ranging from 30 to 50 inches, where it passes into soft marl and hard crystalline limestone. In places there are included in mapping small eroded or gullied spots of red heavy silty clay which are much heavier than the surrounding soil.

This soil can be readily plowed after rains, and does not puddle. It occurs on the higher benchlike areas in association with Labette silt loam. Approximately 95 percent of the land is in cultivation, principally to corn, wheat, kafir, and alfalfa. Alfalfa and clover are produced only in small acreages. During dry years an alfalfa field shows a striped effect, owing to the fact that roots penetrate the crevices of the rocks and receive more moisture, causing the alfalfa to grow irregularly. Alfalfa land receives about 2 tons of lime to the acre, wheat receives about 100 pounds of bone meal, and many farmers use mixed fertilizers, as 2-12-2 or 4-20-4.¹ Any crop thrives

¹ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

much better following alfalfa or clover, and the yields are materially increased.

Newtonia silt loam, shallow phase.—The shallow phase of Newtonia silt loam differs from typical Newtonia silt loam mainly in the stone content of the surface soil, which contains different quantities of fragmental slabs of limestone. This fragmental limestone occurs both on the surface and throughout the soil. This shallow soil is similar to Newtonia silt loam in color of the surface soil and structure of the subsoil. It is used principally as pasture, although a few small patches are used for small grains, principally oats.

SOILS OF GROUP 4

The soils of group 4 occur most extensively in small areas in the central and southern parts of the county. The surface relief ranges from smooth or undulating to rolling, steeply sloping, and hilly. These soils have good surface drainage, and internal drainage ranges from fair to good. On most of the land in cultivation sheet erosion is active, and some gullying on the steeper slopes is noticeable.

The surface soils are dark grayish yellow or grayish brown, and they are predominantly sandy. The subsoils are stiff sandy clays which are rather heavy, brittle, and readily penetrated by water. In all the soils of this group the parent material from sandstone lies at a depth ranging from a few inches to about 40 inches below the surface.

Most of these soils can be plowed after rains without any ill effects or the formation of clods. They are low in organic matter and range from slightly acid to acid. Most of them are shallow and lack uniformity in profile characteristics. They respond well to manure or commercial fertilizers.

The subsoils, although rather heavy, brittle, stiff sandy clays, are not plastic or waxy, but are slick and sticky when wet. In many places gypsum has influenced both the surface soil and the subsoil, causing the finer particles to concentrate in the lower part of the subsoil. This causes the subsoil to be rather heavy in small areas within short distances.

The soils of this group have a marked influence on the agriculture in the southern part of the county. Most of them are included in the pasture section. When crops are grown they are generally fed to the livestock during the winter. Corn, oats, forage, sorgo, and kafir are the principal crops.

Bates very fine sandy loam.—Bates very fine sandy loam, locally called "sandstone soil", is fairly productive when handled with care. In years of high rainfall it will produce good yields of corn and kafir. As in all the Bates soils, this soil is low in organic matter. It is almost free of stones and can be built up to fairly high productivity with the use of organic matter, such as manure. Light machinery and small work animals can be used in farming the land.

The 5- to 8-inch surface soil is grayish-yellow or pale yellowish-brown very fine sandy loam, and the subsoil is yellowish-gray sticky sandy clay which continues to a depth ranging from 30 to 40 inches, where it passes into the soft decomposed sandstone. Small eroded or gullied spots of heavy sandy clay, which are heavier than the

surrounding soil, are noticeable, but such areas are too small to indicate separately on the soil map. Deep erosion has a tendency to bring small fragmental sandstone to the surface.

Bates very fine sandy loam, together with Bates loam, occurs in small patches on the lower slopes of, and adjoining, Parsons silt loam. About 25 percent of these soils is in cultivation to kafir, wheat, and corn. The kind of crop grown differs from year to year, depending on economic conditions. In years of low grain prices such crops as sorgo or kafir, cut for forage, are grown. These soils respond readily to commercial fertilizers, especially those high in nitrates and phosphates.

Bates silt loam.—Bates silt loam is the most productive soil in this group and compares well in productivity with the best soils of the county. The principal crops grown are hay, corn, sorghums, soybeans, and pasture grasses. The soil responds well to the use of commercial fertilizers and manure. It erodes easily and is generally very spotted, owing to erosion. Seed beds in the eroded areas are hard to prepare, and uniformity in crop growth is lacking. Light machinery and small work animals can be used in working this soil.

The 8- to 12-inch surface soil is yellowish-gray silt loam, and the subsoil is yellowish-brown sandy clay which continues to a depth ranging from 20 to 40 inches, where it passes into the soft gypsiferous shales. This soil is of small extent and is generally farmed with other soils. Crop yields are, in general, a little better than on Bates very fine sandy loam. Many pastures produce some lespedeza and clover.

SOILS OF GROUP 5

Group 5 includes all the soils developed from alluvium, and they are the most productive in the county. They are Verdigris silt loam, Verdigris silty clay loam, Osage silty clay loam, Osage clay, and Lightning silty clay loam. They occur along Marmaton and Little Osage Rivers and their larger tributaries. All the soils of this group have rather smooth surface relief. Natural drainage is good in the Verdigris soils and ranges from fair to poor in the Lightning and Osage soils.

The surface soils range from silt loam to clay in texture, and from dark brown to black in color. All the soils near the streamways have heavy textures and are mottled with red, yellow, and gray in the subsoils. The subsoils are rather heavy, brittle, and readily penetrated by water. The depth to the parent rock varies greatly along the larger streams, where the rock lies at a depth ranging from 3 to more than 10 feet from the surface, but the rock is much nearer the surface along the smaller streams. The fine texture of the surface soils causes them to run together when wet, and, if they are not plowed under proper moisture conditions, they will break up into large clods and some of the clods will remain intact for a long time.

These soils are generally low in organic matter, but, taken as a whole, they contain more organic matter than the soils of any other group. They range from neutral to acid. The heavy character of the surface soil and their topographic position enables them to receive and hold large quantities of soil moisture. With the exception of Verdigris silty clay loam and Verdigris silt loam, these soils warm

up slowly in the spring, owing to their heavy texture and to the fact that they do not drain so readily as the more undulating soils. They receive fresh nutriments through inwash from the surrounding upland and also from the flood waters. Their slow drainage prevents them from leaching rapidly.

The subsoils of these soils, although rather heavy and brittle, are not plastic and waxy but are slick and sticky when wet and hard and compact when dry. The soils are rather high in calcium, especially calcium sulphate. As a group, they produce larger acre yields of all crops than the soils of the other groups. Corn and alfalfa are the principal crops, although wheat and clover are grown to some extent. All these crops are grown on the different soils wherever the relief is favorable. Verdigris silt loam and Verdigris silty clay loam, however, are the best soils in the county for the production of corn and alfalfa, and most of their area is devoted to these two crops. Verdigris silt loam, because of its texture and water-holding capacity, makes an excellent trucking soil for growing potatoes, tomatoes, and all small garden crops. Many of the better orchards are situated on this type of soil.

The soils of this group are well distributed throughout the county and have a marked influence on the productiveness of the farms. The fact that they flood occasionally makes them unsure for crop production, but the yields far outweigh the menace of damage from flood. If all the farms included areas of Verdigris soil, there probably would be no alfalfa planted on the upland soils.

Verdigris silt loam.—Verdigris silt loam ranks high as an agricultural soil and is one of the strongest and best soils for alfalfa and corn. It retains its productivity for a long time, as it is rejuvenated by floods and inwash from the uplands. As in all the Verdigris soils, the subsoil is rich in calcium. Small work animals and light machinery can be used in farming this soil.

The surface soil is grayish-brown or yellowish-brown silt loam ranging from 7 to 12 inches in thickness, and the subsoil is dark-brown or yellowish-brown heavy silty clay loam which continues to a depth of about 40 inches, where it passes either into the underlying bedrock or into yellowish-gray alluvium. The texture is not uniform but is extremely variable, as in most bottom soils. On account of the silty texture of the surface soil, the land plows easily and remains mellow even when wet.

Verdigris silt loam occurs along Marmaton and Little Osage Rivers in the northern and central parts of the county. Approximately 95 percent of the land is under cultivation, principally to corn and alfalfa. Small patches of kafir, clover, potatoes, tomatoes, and a few other crops are grown. Corn yields from 30 to 50 bushels an acre, alfalfa from 2 to 3 tons, and most other crops correspondingly high. Little or no fertilizer is used, but some lime is used in growing alfalfa.

Verdigris silty clay loam.—Verdigris silty clay loam occurs principally along Little Osage River, and small areas lie along Marmaton River. This soil differs from Verdigris silt loam in that it is heavier and includes slick spots containing calcium sulphate. Practically the same crops are grown as on the silt loam. Wheat is also grown to some extent. If the land is artificially drained, excellent yields

of corn, alfalfa, and wheat are obtained. Yields, however, are not so certain as on the silt loam, and the land is slow to warm up in the spring and does not drain out readily. Cultivation is not so effective as on the silt loam, and this type of land is in most places foul with various kinds of weeds. The soil is a little harder to farm and yields are a little less than on the lighter textured soils.

Osage silty clay loam.—Osage silty clay loam occurs along the Marmaton and Little Osage River bottoms a short distance from the main streams. It is a low, poorly drained, dark grayish-brown or black soil producing a native vegetation of sloughgrasses and water-tolerant shrubs.

The 7- to 9-inch surface soil is dark grayish-brown or black heavy silty clay loam. The subsoil begins as dark grayish-brown silty clay mottled with gray, rust-yellow, and brown stains. It is rather heavy and in places is cemented with iron rust. It is not compact but is fairly friable, considering its heavy texture. Between depths of 20 and 50 inches the subsoil is underlain by old alluvium or the underlying bedrock.

About 60 percent of the land is under cultivation, principally to red clover, alfalfa, corn, and wheat. Where the land is drained this soil is fairly productive. Corn yields from 20 to 40 bushels an acre, wheat from 10 to 25 bushels, and alfalfa and clover about 1½ tons each. This soil requires heavy machinery and strong work animals for cultivation. Crops grow slowly in the spring, and toxic effects are noticed in places where the soil is submerged by water for a long time.

Osage clay.—Osage clay differs from Osage silty clay loam principally in texture and in being more poorly drained. In favorable years, yields are about the same as on Osage silty clay loam.

Lightning silty clay loam.—Lightning silty clay loam is very extensive. It occurs principally in the southeastern part of the county along West Fork Drywood Creek. It is very poorly drained and has developed a semiprofile, owing to the high flocculating effect of the gypsum and the leaching effect of the water which remains on the land for long periods after heavy rains. The soil is very similar to Parsons silt loam in profile characteristics, but it does not have the dense claypan layer. The land is cultivated principally to wheat or is left in prairie grasses. This is the least productive soil derived from alluvium.

The surface soil is light grayish-brown or yellowish-brown silty clay loam underlain by a distinct gray layer. The subsoil is light yellowish-gray material cemented with iron stains and splotted and stained with various stains of organic infiltrations.

Crop yields are comparatively poor. Hay is the best crop and produces about 1 ton an acre. Corn yields range from 7 to 15 bushels and wheat yields from 3 to 5 bushels. This soil responds well to applications of barnyard manure or commercial fertilizers. Artificial drainage is necessary for profitable production on this kind of land, and yields are thereby greatly increased.

MINE PITS AND MINE DUMPS

Representing no soil type but occupying several acres of land in Bourbon County is a classification of land known as mine pits and

mine dumps. The pits represent excavations for old coal mines, and the dumps represent areas near the mines where waste material from the mines has been dumped. The dumps in some places cover several acres and range from a few feet to many feet in height.

AGRICULTURAL METHODS AND MANAGEMENT

The productiveness of a soil can be increased or diminished by its treatment. The farmer's success depends largely on his knowledge and treatment of the soils. Different soils present different problems as to treatment and kinds of crops to be grown. The requirements of the soils may differ greatly, and both their fertility and physical condition must be understood. The requirements of plants also differ, and those crops whose needs can best be satisfied by the soil will return the greatest income for the labor involved.

The system of farming followed in Bourbon County for the last 50 years has not maintained the fertility of the land, as the soils are not so productive today as were the virgin soils. The soils are somewhat lacking in available plant nutrients, but their most serious need is organic matter. Many of them have heavy claypan subsoils and are not adapted to tile drainage, but improving the surface drainage by properly constructed ditches would be of much value. On some first-bottom soils, as the Osage, tile drainage may greatly improve the land, but owing to excessive cost, not much has been done in recent years.

Owing to high rainfall in this section, considerable soil erosion is taking place, even on some areas having very gentle slopes. This is particularly true where the crop rows run in the same direction as the slope rather than across the slope. A recommended precaution against soil erosion may be provided by the use of broad terraces, as such terraces allow the water to be removed slowly, thus reducing surface erosion and allowing a greater quantity of water to soak into the soil. Where terraces are not used, contour planting, when the land is in row crops, is practical if the slopes are not too irregular. The chief precaution against soil erosion consists of following such cropping systems that the land is covered with a close-growing crop most of the year or a cropping system which includes some small grain or soybeans in close rows and a sod legume, like clover or alfalfa, in addition to the cultivated crops, such as corn and sorghum. This system will be still more effective if the row crops are planted approximately on the contour so as to prevent rapid run-off while the land is under cultivation.

The productivity of the Bourbon County soils can be improved by growing alfalfa, sweetclover, red clover, and soybeans. These legumes will aid in supplying the needed nitrogen and organic matter, which are deficient in the soils. Under a carefully planned cropping system, approximately one-fourth of the acreage may be planted to legumes which may be fed to livestock and the manure returned to the soil. Experiments with sweetclover and red clover are being conducted on the heavy claypan soils, such as the Parsons and Cherokee. Lime, drilled in with the inoculated seed at the rate of about 300 pounds an acre, has given favorable results. Soybeans and cowpeas seem to thrive, and they improve the soils to some extent without the use of lime. The hay of these annual legumes is

approximately equal in nutritive value to that of alfalfa or clover. The popular varieties of soybeans are Peking, A. K., Morse, Virginia, and Laredo. The Virginia produces the best hay crop on the claypan soils, but the Laredo, a late variety, is recommended for the other upland soils. A. K. is the best soybean for seed purposes. A description of outstanding varieties of soybeans is given in Farmers' Bulletin 1520² and may be used to advantage when considering the growing of this crop. The popular varieties of cowpeas are Whippoorwill, Clay, and New Era.

The use of commercial fertilizers is well established. They are used principally on the small-grain crops and the legumes, particularly alfalfa. Some farmers are using a small quantity of commercial fertilizer on row crops. Lime and phosphatic fertilizers are necessary for the successful production of alfalfa on all types of upland soils in the county, especially those of the claypan group. The soils are low in content of phosphorus, and the use of phosphatic fertilizers on wheat has given good increases. The fertilizers more commonly used are bone meal, superphosphate, and rock phosphate. Finely ground raw rock phosphate has given good increases on the Cherokee and Parsons soils. A limited quantity of nitrogenous material may be used in mixed fertilizers, but the nitrates are most economically supplied by growing inoculated leguminous crops. Ammonium sulphate or sodium nitrate may be used to good advantage on lawns and pastures. They can also sometimes be used to advantage on late-prepared wheatland when the nitrogen-fixing bacteria have not had an opportunity to sufficiently supply the nitrate content of the soil. Land plowed during July generally produces from 2 to 4 bushels more wheat an acre, owing to a larger amount of available nitrogen, than land plowed in August. Some potash has been used experimentally in mixed fertilizers in this section, but the results obtained indicate that it is not profitable.

Systematic rotations of crops are not generally practiced. The importance of a leguminous crop is generally recognized, and its use is very practical in diversified farming. A practical rotation used by the more aggressive farmers is a 5-year rotation consisting of (1) sorgo or kafir, (2) oats and sweetclover, (3) corn, (4) flax, and (5) wheat. This is a flexible rotation which may be varied from time to time, in order to meet certain needs or economic conditions. It is sometimes advisable to grow flax as a nurse crop with sweetclover or alfalfa, or it may be grown as a cash crop instead of wheat, when wheat prices are low. All the better rotations include a legume. The size and kind of farms govern the specific rotation system followed and the kind of fertilizers used.

At the experiment substations at Columbus, Fort Scott, Parsons, and Rest, alfalfa, corn, and wheat were planted in plots of Cherokee, Summit, Parsons, and Labette soils, respectively. All crops were much better on the Summit than on the Cherokee soils, but where fertilizers were used the crops were more uniform. The response to fertilizers was much greater on the Cherokee soils, but the total crop production was greater on the Summit soils.

² MORSE, W. J., SOYBEANS: CULTURE AND VARIETIES. U. S. Dept. Agr. Farmers' Bull. 1520, 33 pp., illus. 1927.

The data in table 4, taken from the reports of the southeastern Kansas experiment fields, show the value of different fertilizer treatments on alfalfa on four of the more extensive soils in this section of the State.

TABLE 4.—*Summary of the increase in yield of alfalfa on southeastern Kansas experiment fields, due to different fertilizer treatments*

Treatment	Cherokee silt loam at Co- lumbus	Summit silty clay loam at Fort Scott	Woodson silt loam at Moran	Parsons silt loam at Par- sons	Labette silt loam at Rest
No treatment.....	Tons 0.96	Tons 1.69	Tons 1.60	Tons 1.19	Tons 2.21
Lime.....	2.26	1.77	2.62	2.28	2.50
Increase attributable to lime.....	1.30	.08	1.02	1.09	.29
Lime.....	2.26	1.77	-----	2.28	2.50
Lime and superphosphate.....	2.75	2.14	-----	2.99	3.32
Increase attributable to superphosphate.....	.49	.37	-----	.71	.82
Lime and manure.....	3.06	2.29	3.25	3.12	3.35
Lime, manure, and superphosphate.....	¹ 3.22	3.36	3.97	3.45	4.11
Increase attributable to superphosphate.....	.16	1.07	.72	.33	.76
Lime.....	2.26	1.77	2.62	2.28	2.50
Lime and manure.....	3.06	2.29	3.25	3.12	3.35
Increase attributable to manure.....	.80	.52	.63	.84	.85
Lime and superphosphate.....	2.75	2.14	-----	2.99	3.32
Lime, manure, and superphosphate.....	¹ 3.22	3.36	-----	3.45	4.11
Increase attributable to manure.....	.47	1.22	-----	.46	.79
No treatment.....	-----	1.69	1.60	1.19	2.21
Manure.....	-----	2.22	2.05	2.15	2.65
Increase attributable to manure.....	-----	.53	.45	.96	.44
Average increase from superphosphate.....	.32	.72	.72	.52	.79
Average increase from manure.....	.63	.76	.54	.75	.69

¹ Yields from lime, manure, and rock-phosphate plot used because of apparent soil variation on lime, manure, and superphosphate plot.

About 55 percent of the land in Bourbon County is in pasture and waste land. Most of the farm pastures are used for all the farm livestock and are in poor condition. The first step to be taken in improving the pastures is to eradicate the weeds and brush. In most places this can be done by mowing, where the surface relief allows, at the proper time. This is important because all perennial plants use reserve food to start growth in the spring. This supply is drawn on until the plant has made enough leafy growth to manufacture food in sufficient quantity to supply the growing needs of the plant, after which the reserve supply is gradually restored. Eradication of weeds is most effective if done about the time food reserves are lowest in the plant, as it is weakest at this time and has the least power of resistance. The time that weeds can be eradicated most effectively differs with different plants, also in different parts of the State, according to altitude and latitude. With most plants on which experimental work has been done the most effective time of eradication is about the time the flower buds make their appearance.

Mowing is perhaps the most effective method to be used in controlling weeds or brush in tame-grass pastures. Some of the most

common perennial weeds, such as ironweed and vervain, should be mowed about the first of June. Stiff-leaved goldenrod should be mowed about the middle of July, and ragweed and broomweed can be most effectively mowed about the middle of August. The most effective time for cutting buckbrush is the early part of May, whereas the time that sumac can be killed most easily is about a month later. If the clippings are made a month earlier or later than this date they have little or no effect on killing the plants.³

After the weeds have been eradicated, steps may be taken to increase the stand of palatable pasture plants. This may be accomplished by protection or partial protection and by reseeded. Reseeding with grasses is only feasible on soils that can be disked thoroughly. Experiments have shown that orchard grass can be used most successfully for this purpose, seeding it at the rate of 10 to 14 pounds to the acre or in a mixture with Korean lespedeza, using 10 pounds of orchard grass to 4 pounds of the lespedeza. This seeding is usually most successfully done in early spring. The seed can be drilled in after the ground has been double disked and harrowed or it can be broadcast and harrowed in.

Korean lespedeza may be seeded in the pasture without soil preparation by broadcasting before freezing weather is over, but wherever possible the seeding should be preceded by some soil preparation, thereby insuring a better stand and yield of forage.

Where all the perennial pasture plants have not been killed, considerable improvement in the pasture can be made by protection from grazing, particularly during the first part of the grazing season or until about July 15. By this method it is possible to restore the original vegetative cover at least partially. The length of time necessary to accomplish this will depend on the condition of the pasture at the time the protective measures are started.

The improvement and maintenance of pastures can be accomplished to a large extent by eliminating overgrazing, particularly during the first part of the season. Temporary pasture crops, mainly winter wheat or rye, may be used to good advantage to provide feed in the spring, when the permanent pasture should be protected, and in the fall when it provides little or no forage. These crops will supply pasturage for 1 or 2 cows an acre, depending on the soil and on seasonal conditions during fall and spring. Either of these crops will supply ample forage until the latter part of May. The land can then be plowed and sorghums, Sudan grass, or other summer-pasture crops planted. Sweetclover makes an excellent supplementary pasture for early spring, in places where it can be grown. Sudan grass is the best pasture crop for summer.

SOILS AND THEIR INTERPRETATION

Bourbon County lies in the prairie plains region of southeastern Kansas, where the surface features and an adequate supply of moisture favor a grass vegetation over the smooth upland. The native vegetation at the time of settlement of this country by white men was grass over the comparatively smooth uplands and forest along the rougher stream valleys.

³ ALDOUS, A. E., and ZAHNLEY, J. W. TAME PASTURES IN KANSAS. Kans. Agr. Expt. Sta. Bul. 253, 39 pp., illus. 1931.

The soils have developed under the influence of a grass vegetation and a rainfall heavy enough to keep the soil moist or saturated part of the year, giving rise to large quantities of organic matter, but the high seasonal temperature during late summer has caused the decomposition of the greater part of the organic matter, and that remaining and incorporated in the soil through the decay of grass roots imparts to the prairie soils their characteristic dark-gray color. With a mean annual rainfall of nearly 42 inches and a mean annual temperature of 56.6° F., the soils are dark gray rather than black.

Local differences of surface relief and parent material have brought about the important differences in the soils, since climate and native vegetation are essentially alike throughout the area of the county.

In fundamental features, two groups of soils are present in Bourbon County. They are soils with dense clay subsoils on the one hand and soils without such subsoils on the other. The Parsons soils are representative of the first group and the Summit soils of the second.

The less extensive soils are those of the claypan group which includes the Cherokee and Parsons silt loams. These soils occupy a large proportion of the county and are well distributed. The Cherokee soils occur on the more level areas and the Parsons occupy the more undulating or sloping areas. Areas of these soils are very closely associated, and, as their greatest difference is in the surface soil, their separation in the field is somewhat difficult, especially under the various moisture conditions. The differences in characteristics are principally owing to differences in surface relief. All other factors are nearly the same, except that the parent material in some places is gypsiferous shale and in other places is gypsiferous sandstone.

In a pit $2\frac{1}{2}$ miles northeast of Uniontown, at the SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T. 25 S., R. 23 E., an area of Parsons silt loam showed the following profile:

- (1) 0 to 2 inches, dark grayish-brown structureless or faintly laminated porous silt loam. The color is uniform, except that the material contains different quantities of organic matter and a few rust-colored specks which blend with the surrounding matrix.
- (2) 2 to 8 inches, porous dark grayish-brown laminated or faintly granular silt loam which is a little lighter than the material in the layer above. It contains a few pale rust-colored specks and organic stains; otherwise the color is uniform. This layer is slightly more acid than the overlying layer.
- (3) 8 to 14 inches, a transitional light grayish-brown layer merging with claypan material. The material in this layer is very granular, the granules are thickly coated with gray silty material, and the insides of the particles are drab clay. Tongues of the gray silty material extend into the clay particles along cracks, and knobs of clay particles extend into the surface horizon. The lower part of the layer contains more clay particles than the upper part, and the gray silt material gives way to a prismatic columnarlike clay.
- (4) 14 to 20 inches, reddish-yellow mottled dense clay which breaks into irregular sharp-cornered semicubical clods several inches in diameter. The structure particles lie close together and when moist adhere to one another so firmly that they can scarcely be separated. A lump, however, when dried or sliced shows definite structure particles. The outsides of these structure particles are coated with dark bluish-gray colloidal material. Many particles have red and yellow or rust-brown

centers, and black streaks are common, giving the whole mass a rather mottled appearance. The material on drying breaks down into fine fragmental particles with sharp angular corners. The material as a whole appears rather dark reddish brown or drab. On drying thin rust-brown stains are present on the soil particles in many places. This is the layer of maximum density.

- (5) 20 to 40 inches, yellowish-gray, brown, or drab dense clay similar to the material in the layer above but not quite so dense and a shade or so lighter in color. The red, rust-brown, and black specks become lighter with depth and gradually change to yellow and gray. The lower few inches of this layer contain gypsum crystals just above the partly weathered shales.
 - (6) 40 to 60 inches, grayish-yellow clay.
- Beyond a depth of 60 inches the material is yellowish-gray partly weathered soft gypsiferous platy shale which becomes harder with depth.

Studies made of Parsons silt loam at different places and under different moisture conditions differed somewhat from the profile described. Great variations in the thicknesses of the different horizons were noticed within short distances of one another. The color of the B horizon ranges from almost red to yellow or dark drab within short distances, according to local differences in relief. The essential features of this soil are uniform, and minor variations are too numerous to show on the soil map. Many slick spots were noticed throughout areas of this soil. The surface soil of the slick spots is very shallow, and the subsoil, or B horizon, is very dense and almost black. All the columns of the B horizon are rounded, and the cracks between the columns are much larger than those in the typical Parsons soil. At a depth ranging from 18 to 30 inches below the surface the soil material is thoroughly impregnated with gypsum, and traces of sodium sulphate are also present.

Cherokee silt loam differs from Parsons silt loam in degree of development, and it is slightly more acid in the upper layers and more dense in the lower layers. In Cherokee silt loam, the soil horizon lying immediately above the heavy clay is lighter in color and more laminated than is the corresponding horizon in Parsons silt loam. The whole mass of this horizon is porous, almost white floury silt. The upper part of the heavy clay horizon is a claypan similar to that of the Parsons soil, in most places being a little darker in color and very dense. The lower part of the heavy clay horizon is very similar to that of the Parsons soil, except no gypsum crystals are present. Tests with barium chloride showed the sulphate radical present, however. The material beneath the heavy clay horizon is very similar to that of the Parsons soil, but gypsum is not so abundant.

The Summit soils, comprising the second group, have dark-colored surface soils and heavy friable subsoils. They have developed from calcareous and gypsiferous shales and occur in large areas in all parts of the county, more especially in the western part, on the lower slopes and around stream heads. They are fairly well drained.

In a pit in the northwest corner of sec. 28, T. 25 S., R. 22 E., an area of Summit silty clay loam showed the following profile:

- (1) 0 to 2 inches, very dark grayish-brown or black faintly laminated or slightly granular silty clay loam. This is a dense sod containing much organic matter.
- (2) 2 to 10 inches, granular silty clay loam, in which the granules are heavily coated with organic matter and have semirounded corners.

A slight sprinkling of gray is noticeable on the granules when dry. Ferruginous pellets, the peripheries of which are black and the centers brown, are present. The soil appears brown when crushed, but it is almost black on a broken face.

- (3) 10 to 16 inches, material similar to that in the horizon above, except the granules seem to be a little firmer, the organic coating is thinner, and root hairs seem to follow the cleavage planes between the structural particles. The soil material contains less organic matter and is more dense, and the structural particles are larger and more columnarlike.
- (4) 16 to 26 inches, dark-brown, yellow, or drab granular silty clay, in which the granules are lighter in color and a little firmer than in the layer above. The organic coatings, which give the dark color, become thinner with depth. The insides of many particles are red or rust brown, and the outsides are grayish red. The clay content gradually increases with depth.
- (5) 26 to 50 inches, drab or yellowish-brown clay, in which the structural particles are small and not well defined. This layer is moderately compact and contains ferruginous pellets ranging from one-sixteenth to one-eighth inch in diameter. The material in the lower part of this layer has more or less columnar breakage and in a few places contains some siliceously coated lime nodules and gypsum crystals.
- (6) 50 inches +, bluish-gray partly decomposed gypsiferous shales and bluish-gray limestone.

In studies made of the Summit soils under different moisture and cultural conditions, and at different places, some interesting features were noticed that did not appear in the profile described. Cultivation tends to make the soil lighter gray in color, owing to loss of organic matter, and heavier in texture, owing to cracking of the topsoil and the organic material washing into the cracks, which gives the solum in excavations a latticelike appearance. Siliceously coated lime nodules appear at irregular intervals, and the material in these places is a little darker and not so thoroughly weathered. Calcium sulphate and calcium carbonate are present in different quantities in the lower part of the subsoil. The surface soil is slightly acid, and the subsoil is neutral or alkaline.

Table 5 gives the results of pH determinations of three soils mapped in Bourbon County. The samples were taken at different depths, and the determinations were made in the laboratories of the Bureau of Chemistry and Soils, by the hydrogen-electrode method.

TABLE 5.—pH determinations of three soils from Bourbon County, Kansas

Soil type and sample no.	Depth	pH	Soil type and sample no.	Depth	pH
Parsons silt loam:	<i>Inches</i>		Cherokee silt loam—Continued.	<i>Inches</i>	
382528	0-2	5.16	382503	7-14	5.10
382529	2-7	5.39	382504	14-24	5.15
382530	7-16	5.63	382505	24-40	5.43
382531	16-17	5.55	Newtonia silt loam:		
382532	17-25	5.49	382515	0-2	5.80
382533	25-40	6.57	382516	2-7	5.80
Cherokee silt loam:			382517	7-20	5.20
382501	0-3	5.12	382518	20-38	5.52
382502	3-7	5.12			

SUMMARY

Bourbon County is in southeastern Kansas. It includes a total area of 632 square miles, or 404,480 acres. It occupies part of

the prairie-plains section of the State, and the greater part of the land is flat or gently undulating.

The population in 1930 numbered 22,386, about one-half of which was classed as rural. Fort Scott is the county seat and largest city. Agriculture and, to some extent, coal mining are the principal pursuits of the rural residents.

The climate is characterized by hot summers and moderately cold winters. The length of the frost-free season in the vicinity of Fort Scott is 186 days. The average annual rainfall is sufficient for the maturing of the crops commonly grown, but, owing to the heavy claypan underlying many of the soils, the high rate of evaporation, and excessive sunshine, droughts and erosion are likely to occur.

Corn, prairie hay, wheat, oats, sorghums, soybeans, and alfalfa are the principal crops grown. Livestock raising is an important industry, and much of the grain, hay, and grain sorghum produced is used in connection with this industry.

About 60 percent of the land is tillable. The soils are placed in five groups, according to common characteristics and crop adaptations.

Bourbon County offers attractive opportunities for the development of dairying and the production of pork, beef, and poultry products for market. An abundance of nutritious pasturage and forage is afforded by such crops as sweetclover, lespedeza, wheat, oats, cowpeas, soybeans, corn, and grain sorghums.



Authority for printing soil survey reports in this form is carried in the Appropriation Act for the Department of Agriculture for the fiscal year ending June 30, 1933 (47 U. S. Stat., p. 612), as follows:

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 soil area surveyed by the Bureau of Chemistry and Soils, Department of Agriculture, in the form of advance sheets bound in paper covers, of which not more than two hundred and fifty copies shall be for the use of each Senator from the State and not more than one thousand copies for the use of each Representative for the congressional district or districts in which a survey is made, the actual number to be determined on inquiry by the Secretary of Agriculture made to the aforesaid Senators and Representatives, and as many copies for the use of the Department of Agriculture as in the judgment of the Secretary of Agriculture are deemed necessary.

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