

UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF CHEMISTRY AND SOILS  
In Cooperation with Iowa Agricultural Experiment Station

SOIL SURVEY  
CHEROKEE COUNTY, IOWA

BY

D. S. GRAY, Iowa Agricultural Experiment Station, in Charge  
and B. H. HENDRICKSON, U. S. Department of Agriculture



Beginning with the 1923 Series, Soil Survey Reports will be issued separately. These reports of the individual areas will be 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 have previously been supplied by the department. The reports for each year will be consecutively numbered, the last report for a particular year bearing the conspicuous notice: "This number is the final and last Soil Survey Report for the Year 192-."



UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON

1928

# BUREAU OF CHEMISTRY AND SOILS

HENRY G. KNIGHT, *Chief*  
A. G. McCALL, *Chief, Soil Investigations*

## SOIL SURVEY

CURTIS F. MARBUT, *in Charge*  
T. D. RICE, *Inspector, District 3*

---

## COOPERATION

### IOWA AGRICULTURAL EXPERIMENT STATION

C. F. CURTISS, *Director*  
W. H. STEVENSON, *in Charge Soil Survey,*  
P. E. BROWN, *Associate, in Charge*

---

## CONTENTS

---

	Page
County surveyed.....	1
Climate.....	3
Agriculture.....	4
Soils.....	10
Marshall silt loam.....	14
Marcus silt loam.....	19
Clarion silt loam.....	20
Clarion loam.....	20
Carrington silt loam.....	22
Carrington loam.....	22
Dickinson loam.....	23
Dickinson fine sandy loam.....	24
Lakeville sandy loam.....	24
Webster silty clay loam.....	24
Afton silty clay loam.....	25
Waukesha silt loam.....	26
Sioux silt loam.....	26
Sioux loam.....	27
Bremer silty clay loam.....	27
Judson silt loam.....	28
Judson loam.....	29
Wabash loam.....	29
Wabash silt loam.....	29
Wabash silty clay loam.....	30
Lamoure loam.....	31
Lamoure silt loam.....	32
Lamoure silty clay loam.....	32
Summary.....	33

# SOIL SURVEY OF CHEROKEE COUNTY, IOWA

By D. S. GRAY, Iowa Agricultural Experiment Station, in Charge, and B. H. HENDRICKSON, United States Department of Agriculture

## COUNTY SURVEYED

Cherokee County is in the northwestern part of Iowa. It is separated from Minnesota on the north by two counties and from South Dakota on the west by one county. Cherokee, the county seat, is about 60 miles northeast of Sioux City. The county is square and comprises 16 townships. Its area is 366,720 acres, or 573 square miles.

Cherokee County comprises a smooth or comparatively smooth plain which has been somewhat modified by erosion. The land is of two general types, upland, which shows relief because of the ramification of drainage ways, and flat alluvial lands. The upland presents a somewhat varied relief. The prevailing surface features are those of a gently rolling plain characterized by smooth, even slopes and gently rounded hilltops. Some small upland areas along Little Sioux River, some of its tributaries, and a few of the larger creeks are more strongly rolling or broken. Others, scattered over the county but occurring especially in Marcus Township north of Marcus, have a rather flat surface.

The prevailing slope of Cherokee County, with the exception of the north half of Marcus Township, is from the north to the south. The eastern half of the county is lower than the western and mid-western sections, as is evidenced by the drainage systems and the following elevations:<sup>1</sup> Marcus, 1,451 feet above sea level; Meriden, 1,402 feet; Aurelia, 1,387; Cherokee, 1,201; Quimby, 1,190; and Washta, 1,157.

Over the greater part of Cherokee County the natural drainage is good. It is effected by the principal streams and their tributaries, which ramify the upland areas. Locally, however, as in an occasional bulbous-shaped rather flat area at the head of a drainage way, the natural drainage may be somewhat inadequate. Such areas vary in size from 2 or 3 to 20 acres, and a few are as large as 80 acres. Three poorly drained pondlike areas, aggregating about 225 acres, also occur in the upland. A flat area in central and north-central Marcus Township has somewhat inferior natural drainage. Natural drainage on the first-bottom lands is somewhat variable, being poor on the particularly low areas immediately bordering streams and fair or

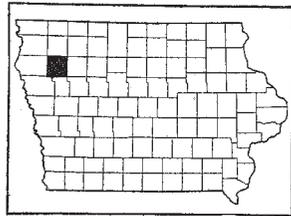


FIG. 1.—Sketch map showing location of Cherokee County, Iowa

<sup>1</sup>Gannett, Dictionary of Altitudes.

good on some of the more desirable first-bottom lands back from the streams and at a slightly higher elevation.

Nearly the entire county is drained by the Little Sioux River and its immediate tributaries. A few smaller drainage systems, in the extreme western part of the county, are tributaries to the Floyd River, which runs through Plymouth County on the west and enters the Missouri River at Sioux City. Little Sioux River runs through the county in a southwesterly direction. In the northern half of the county the upland bordering this river on both sides and in the southern half that bordering it on the west side, is rough and broken. This broken land, however, seldom extends back from the river more than one-half mile, except where it borders some of the larger tributaries, the most important of which is Mill Creek. Probably none of the drainage systems of Cherokee County have attained base level. All streams have a well-defined course and an appreciably rapid current. Some of the larger drainage ways, particularly Mill Creek, are characterized by numerous small rapids.

The first settlement by white people in Cherokee County was made in 1856, when a group of settlers immigrated from Milford, Mass., to a site on the Little Sioux River just north of the present city of Cherokee. The county was at first part of Woodbury County but was established as a separate county in 1857. Subsequent settlers, many of whom were of German and Irish descent, came from different sections of the country farther east. The population of the county, as listed in the 1920 census, was 17,760, of which 5,824, or the population of the city of Cherokee, was classed as urban. The remainder, or 11,936, was classed as rural and includes inhabitants of the small towns of the county as well as of the farms. The rural population averages 20.8 persons to the square mile and is fairly evenly distributed over the county, although there is a somewhat greater density in the immediate vicinity of the larger towns, particularly of Cherokee.

Cherokee County is well supplied with towns, both within its limits and a short distance from its boundaries. Cherokee, the county seat, Marcus, with a population of 1,091, and Aurelia, with 708, are the towns of most importance. Other towns, with their populations, are Washta, 508; Quimby, 363; Cleghorn, 232; Meriden, 218; and Larrabee, 206.

Transportation facilities are good, no town being more than 9 miles from a railroad. All railroads in the county are of the Illinois Central Railroad system. The east and west line reached Cherokee from the east and was completed from Sioux City in 1870. The north and south, or Sioux Falls branch, was completed in time to move the crops of 1887.

The road system of the county is very complete. Roads follow nearly all section lines, except in rough broken country or along stream courses, in which cases they are adapted to the local topographic characteristics. The main highways east and west and north and south through the county are permanently graded and surfaced with gravel; hence highway facilities are good the year round. The other roads of the county are of dirt and are kept graded and dragged. Bridges and culverts are practically all of steel or concrete construction. High grades on the State highways are fenced.

A telephone system traverses the county, affording a complete means of communication. Country schools are maintained at 2-mile intervals throughout the county except in consolidated districts where the rural pupils are called for and returned with motor or horse-drawn busses. High school instruction is offered in the larger towns.

There are no important local markets in the county. In some towns some of the locally produced truck crops, dairy products, and livestock are sold. The principal market is probably Sioux City, to which is shipped a large part of the dairy products and livestock. Chicago, Omaha, Minneapolis, and St. Paul also furnish markets for farm products.

#### CLIMATE

The climate of Cherokee County is typical of that of the mid-western Corn-Belt area. It is healthful, being characterized by comparatively cold winters and hot summers.

The data which follow are compiled from records of the United States Weather Bureau station at Washta.

The mean annual precipitation is 28.73 inches. That for the driest year (1910) is 18.29 inches and for the wettest year (1903) is 39.86 inches. Most of the precipitation comes during the growing season. It is favorably distributed; droughts are practically unknown; and dry weather usually prevails at harvest time. Blizzards and occasional thaws are apt to occur at any time during the winter.

The mean annual temperature is 46.1°. January and February are the coldest months, their temperature means being 16.4° and 18.7°, respectively. July is the hottest month, with a mean temperature of 72.7°. The coldest temperature on record was -47° in January, and the absolute maximum, 106°, occurred in July.

The average date of the last killing frost is May 14 and that of the first is October 3. The latest killing frost recorded was on May 29 and the earliest was on September 15.

The prevailing winds are from the northwest, except in the summer when they are usually from the east, southeast, or south.

The following table gives the normal annual, seasonal, and monthly temperature and precipitation. It was compiled from records of the Weather Bureau station at Washta.

*Normal monthly, seasonal, and annual temperature and precipitation at Washta*

[Elevation, 1,157 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1910)	Total amount for the wettest year (1903)
December.....	° F. 22.5	° F. 57	° F. -40	<i>Inches</i> 0.80	<i>Inches</i> 0.10	<i>Inches</i> 0.20
January.....	16.4	58	-47	.72	.55	.05
February.....	18.7	66	-36	.82	.25	1.20
Winter.....	19.2	66	-47	2.14	.90	1.45

*Normal monthly, seasonal, and annual temperature and precipitation at Washita—Continued*

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1910)	Total amount for the wettest year (1903)
March.....	° F. 31.7	° F. 86	° F. -21	<i>Inches</i> 0.93	<i>Inches</i> T.	<i>Inches</i> 0.90
April.....	47.1	96	12	2.41	0.55	1.95
May.....	59.0	95	18	5.15	2.68	10.80
Spring.....	45.9	96	-21	8.49	3.23	13.65
June.....	67.4	101	35	4.08	2.39	4.72
July.....	72.7	106	43	4.20	2.27	7.14
August.....	71.2	100	33	3.13	4.36	5.08
Summer.....	70.4	106	33	11.41	9.02	16.94
September.....	63.3	99	21	3.52	4.09	5.19
October.....	49.6	89	2	2.04	.90	1.93
November.....	33.4	77	-9	1.13	.15	.70
Fall.....	48.8	99	-9	6.69	5.14	7.82
Year.....	46.1	106	-47	28.73	18.29	39.86

#### AGRICULTURE

Agriculture has been the chief industry of Cherokee County since its organization. The farming of the early pioneers consisted of raising enough crops for subsistence, but not much more because of the lack of means of transporting a surplus. Hunting and trapping were also lines of activity and served as a source of some revenue. Previous to the building of the railroads, the increase in population was very slow.

The first crops grown were corn, wheat, and oats. Vast areas of wild grass were available, and no seeding of this crop was necessary. The earliest date for which statistics relative to agriculture are available is 1880. At this time corn had a greater acreage than wheat. It is probable, however, that the reverse was true at an earlier date.

Early settlement was made along streams, usually in forested areas, which gave access to water and fuel. Farming operations were carried on in the immediate vicinity. Hence, probably the most desirable prairie farm land was not the first to be settled and farmed.

With the construction of the railroads, the development of these lands was rapid, as the homestead act had made the acquisition of land attractive.

The various acreages and yields of the major crops for the year 1880 were: Corn, 55,000 acres and 2,300,000 bushels; wheat, 36,000 acres and 306,000 bushels; oats, 9,000 acres and 244,000 bushels; hay, 14,100 acres and 20,500 tons; barley, 2,000 acres and 36,000 bushels. Small acreages were also devoted to a number of other crops, including peas, beans, potatoes, sorghum, flax, rye, and tobacco. The number of farms is given as 1,268 and the average size as 142 acres. The population of the county was 8,240.

The 10-year period succeeding 1880 showed a large increase in the acreage of corn, oats, hay, barley, and the various crops of minor importance. The number of farms had increased by more than 600 and the average size by 30 acres. The area of farm land increased by 142,100 acres. This, coupled with an increase of 4,000 in rural population, showed a great development in the county.

Of the specifically mentioned crops for 1880, wheat showed the greatest contrast, with a reduction in acreage from 36,000 acres in 1880 to 16,000 in 1890. The value of land and equipment to the farm had more than doubled during the 10-year period. Tenancy increased about 10 per cent during this decade. This is a characteristic change in land tenure borne out during each 10-year period since 1880.

From 1890 to 1900 only 32,732 acres more land were put under cultivation, and this is accounted for more through the increased size of farms already established than through the formation of additional farms. The value of all property to the farm had increased by about 66 per cent and improved land to the farm by a trifle more than 3 per cent.

Substantial increases in crop acreages and total yields as well as average yields were accomplished between 1890 and 1900. Corn had attained an acreage of 113,400 acres and a yield of 4,500,000 bushels; oats, 56,000 acres and 1,918,000 bushels; wheat, 36,000 acres and 489,000 bushels; and barley, 7,000 acres and 202,820 bushels. Of these crops, barley is the only one to show a very marked decrease. Wheat showed a gain of more than 100 per cent over 1890 but was about equal in acreage to 1880. Hay crops, by 1900, showed a remarkable gain over any preceding date and had changed from a purely natural crop to one including various legumes, such as clovers and alfalfa, and seeded grasses.

Improved means of soil management, the use of better cultural methods, and seed selection were by this time coming into vogue and resulted in much higher average acre yields for many crops. Of the 1,908 farms in operation in 1900, 57.8 per cent were operated by owners, 41.8 per cent by tenants, and 0.4 per cent by managers. The total population of the county was 16,570. Of these 12,705 were classed as rural.

Animals sold and slaughtered were valued at \$1,218,843; dairy products, exclusive of home use, at \$107,836; and poultry at \$64,623. Unfortunately the value of the cereal and hay crops is not available, but it was very high and indicated a thrifty condition of the county as an agricultural district.

The census figures for 1910 indicate considerable advancement in agricultural pursuits within the county during the preceding 10-year period. These involved greater total yields of the crop of major importance, brought about partly by increased acreage and partly by higher acre yields; nearly a trebling in the value of livestock; and a large increase in the value of dairy products and of poultry. Accompanying this development was an adjustment in the acreage of some crops, involving a decrease in that of wheat to only 1,106 acres, but an increase in those of tree and bush fruits, vegetables, and other crops of minor importance.

The total value of all agricultural products in the county in 1910 was \$7,246,042. The value, by classes, of the more important crops was as follows: Cereals, \$2,955,412; hay and forage, \$658,500; vegetables, \$132,198; animals sold and slaughtered, \$2,944,432; dairy products, excluding those for home use, \$227,808; and poultry and eggs, \$258,655.

The total number of farms in the county was 1,901, and the average size was 190.1 acres, of which 90.5 per cent was improved land. The average value of all property to the farm was \$24,581. The tenure of farms was marked by an increase in the percentage of tenancy to 50.6 per cent. The increase in population was not marked; the rural population decreased but that of Cherokee increased more than enough to match the loss.

Cherokee County has attained its present agricultural development over a period of about 65 years and is now a highly developed and progressive Corn-Belt farming section. The agricultural industry consists mainly of breeding hogs, cattle, poultry, and sheep and of raising field crops for feeding this livestock and for sale as cash crops.

According to United States census data, the total value of all agricultural products in Cherokee County in 1919 was \$18,003,431. Of this amount the cereal crops comprised \$9,937,957. Corn is the chief grain crop, followed in importance by oats, barley, and wheat. Hay and forage crops, consisting mainly of tame and cultivated grasses of which timothy and clover mixed is the most important, are valued at \$1,553,778. The crops of minor importance, including vegetables and fruits, had a value of \$314,408. Of livestock and livestock products, the 1920 valuation given for animals sold and slaughtered is \$5,236,604; for dairy products, excluding those for home use, \$410,525; for poultry and eggs, \$530,235; and for wool, \$6,301.

Corn, the most important crop in the county, was grown on 131,160 acres in 1922.<sup>2</sup> The total yield was 5,508,720 bushels, and the average acre yield was 42 bushels. Most of the corn is fed to livestock on the farm where it is produced, but it is also the principal cash crop. Practically all the crop is grown from locally produced seed. The most common varieties grown are early strains of Reid Yellow Dent and Wimples Yellow Dent of the yellow varieties, and Silver King and Silvermine of the white types. More yellow than white corn is grown. Considerable of the yellow corn grown has been bred from the Armstrong variety and much is scrub corn—that is, corn that can not be classed as varieties.

In recent years a growing proportion of the seed corn has been selected from the field before the time of the first frost rather than at the time of picking or from the crib. Most of the crop is harvested from the standing stalks in the field and is picked by hand or by machines which pick and husk it in one operation. The corn-picking machines are coming into more common use. The matured crop is sometimes cut with a binder, shocked, hauled to feed lots during the winter, and fed to cattle. Practically all the crop, including about two-thirds of that grown for silage, is check planted in hills. In the year of the survey (1924) the seed was listed in a few fields on the bottom land of Little Sioux River. This practice is so uncommon

<sup>2</sup> All statistics for 1922 are from the Iowa Yearbook of Agriculture for that year.

at present that it is hardly worthy of mention. Many farmers "hog down" a small acreage of corn each year; soy beans are frequently seeded with corn so utilized. Few farmers, however, seed soy beans in corn grown for silage.

Oats are grown on practically every farm and are the crop second in importance. In 1922 they were grown on 84,524 acres and yielded 2,789,292 bushels. They are grown chiefly for feed for horses and pigs and as a nurse crop for alfalfa and clover. There is a constantly increasing popularity of the early varieties, chief among which is the Iowa 103. Other early varieties grown are Iowa 105 (Richland), Iowar, and strains of Kherson oats. Green Russian is the most popular late variety. Some hull-less oats are grown, but there is considerable diversity of opinion as to their practical value. In the usual rotation oats follow corn and are broadcast on disked corn-stubble land. The crop is shocked when it is cut and is either threshed from the shock or stacked, depending on the date of threshing.

Hay and forage crops follow the cereal crops mentioned in importance in both acreage and value. The area of tame or cultivated grasses in 1920 was 29,278 acres, 19,600 acres of which were in clover and clover and timothy mixed. A little more than 3,000 acres were devoted to alfalfa. More than 8,000 acres were in wild hay of various kinds. Clover and clover and timothy, mixed, are seeded with early oats or other early small grain and make sufficient growth following the removal of the grain crop to withstand the succeeding winter. The crop is sometimes lightly pastured late in the season of the first year but is not cut for hay. The first crop of the second year is cut for hay and the second growth is either cut for hay, pastured, or plowed under as green manure. The land is generally planted to corn the following spring. Alfalfa is generally seeded in the same manner as clover but is sometimes sown in late summer on ground that has been kept fallow since spring. The alfalfa crop is not utilized until the following year. Three cuttings of hay, giving a yield varying from 3 to 7 tons to the acre, are obtained in one year. Land is left in this crop for from three to seven years, depending on the rapidity with which it is crowded out by bluegrass. Cultivation of the stubble with a disk or special spring-tooth harrow assists greatly in maintaining a good stand of alfalfa over a period of years. This crop is also followed by corn. Alfalfa is commonly grown on a great many farms, but the acreage to the farm is generally only from 4 to 20 acres. Extensive acreages are not popular because of the frequency of cutting, which, on a large scale, interferes with other seasonal farm duties coming at the same time.

Various native grasses constitute the wild hay of the county. These are cut from cleared land too rough for cultivation or from bottom lands not suitable for tillage.

The area in pasture in 1922 is given as 75,300 acres. This is largely bluegrass pasture but includes some forest and bottom-land areas whose pasture growth is largely other native grasses. Bluegrass pastures in which there is a heavy stand of white clover are not uncommon.

About 1,000 acres are devoted to the production of barley, the chief use of which is for hog feed. Potatoes are grown on about the same acreage, and their average yield in 1922 was 98 bushels to the

acre. Vegetables of various kinds and bush and tree fruits are grown to a greater or less extent on practically every farm.

Wheat is a crop of almost no importance in Cherokee County at the present time. Only 120 acres were devoted to wheat in 1922. The 1919 acreage was 1,856 acres, but the average yield was less than 10 bushels to the acre. A bad scald in that year has so discouraged wheat production that farmers have not since been interested in this crop.

Although fruit crops are grown very commonly over the entire county they are not produced extensively on any one farm. The census of 1922 reports 19,614 apple trees, 3,267 plum trees, 863 cherry trees, and 45 acres combined of strawberries, raspberries, and blackberries in the county.

Soy beans are seeded with corn more extensively than they are grown alone for seed or hay. The acreage devoted to soy beans grown for seed and hay is, however, much greater than that devoted to wheat. The popular varieties of soy bean are the Manchu and Ito San.

Cherokee County is an important livestock feeding and breeding section. Great numbers of hogs and beef cattle and some sheep are fed and shipped annually. There are in the county a great many breeders of purebred livestock. Sixty or more of these are organized into one of the best local breeders associations in the State.

The number of hogs on farms in the county on July 1, 1922, is given as 176,792. The most popular breeds are Poland China, Duroc-Jersey, Spotted Poland China, Hampshire, and Chester White. Pigs are farrowed in both spring and fall, and the hogs are finished for market on the farm. Sows are marketed when they are no longer suitable for breeding stock. About two-thirds of the cattle and hogs marketed are disposed of between January and July, inclusive.

The feeding and breeding of beef cattle is an important industry. The local production of feeding stock is augmented by animals shipped in from market centers, principally Sioux City and Omaha. These cattle are fed for periods of time ranging from three to six months and are marketed when the desired weight and finish are obtained and the market conditions are favorable. Beef cattle and hogs are marketed at Sioux City and Chicago. The Iowa Yearbook of Agriculture reports the number of feeder cattle in the county on January 1, 1923, as 37,880.

Dairying, in conjunction with general farming, provides a substantial source of revenue over the county as a whole, and is an agricultural pursuit which is gaining in favor. It is not, however, so highly developed as it is in the adjoining counties, and there are no local creameries except in the city of Cherokee. The State hospital for the insane, located at the edge of the city of Cherokee, has a very fine herd of Holstein cattle which are excelled by only one herd in the State of Iowa. On January 1, 1923, 7,880 cows and heifers were kept as dairy cattle.

Although there are no farms devoted entirely to the production of poultry, many farmers have large flocks, and all farmers keep some poultry. On January 1, 1923, there were 253,953 birds on farms, and the production of eggs during the preceding year was 1,725,961 dozen.

A few sheep are fed and bred in the county. The industry is most popular on areas of rougher land along Little Sioux River. On January 1, 1923, 1,787 head of sheep were reported on the farms. In 1922, 710 head were shipped into the county to be prepared for market. About 8,000 pounds of wool was clipped in 1922. The Iowa Fleece Wool Growers' Association does not operate in the county and the clip is sold to local buyers or is marketed with an adjoining county's wool pool.

Horses are raised and used in considerable numbers. The county auditor's figures in 1924 placed the number of horses over 3 years old, exclusive of stallions, at 8,437. The total number of all ages, on January 1, 1923, was 11,966. There are only a few outstanding horse breeders in the county, the greatest source of production being the average farm on which is produced a colt or two each year. Mules are popular work animals with some farmers. There were 500 of them in the county in 1922.

There is, in general, very little difference over the county in the method of farming. The greatest difference in adaptability of the soil is evidenced in the rougher areas. The roughest areas are left in permanent pasture or forest, and the less rolling ones, which are cultivable with reservation, are seeded to clover more frequently than smoother farm land. Hilly and sharply rolling lands are not generally cropped to corn for more than one year without an intervening crop of small grain.

The prevailing crop rotation in Cherokee County is a four-year one—with corn, two years, followed by oats with which clover is seeded, one year, and clover hay, one year. Alfalfa is sometimes substituted for the clover, in which case the alfalfa remains as long as it produces well, usually a period varying from three to seven years. Other variations are sometimes practiced. A great many tenant farmers in the county do not seed any, or at the most only a small occasional acreage, to clover. Common red clover is the variety most widely grown. Many farmers are beginning to grow sweet clover, although there is some difference of opinion as to its value and practicability.

The most notable soil adaptation in the county is that of the Marshall and Clarion soils to leguminous crops. Difficulty is sometimes experienced in growing legumes on Marshall silt loam in the eastern part of the county but not elsewhere. The lower part of the subsoils is rich in lime carbonate, which is present in places within 18 inches of the surface. The surface soils are, however, generally slightly acid.

Equipment on most farms is entirely adequate for the operation of the farm. Although there are many fine farmhouses over the county, this improvement on some farms is less pretentious than other buildings. Most farms have, besides house and barn, a corncrib, tool house, granary, henhouse, windmill, and some are equipped with an implement shed and silo. Other improvements and the number of farms possessing them, as listed in the 1922 Iowa Yearbook, are: Heat, 245; bath, 199; light, 275; silos, 232; tractors, 333; automobiles, 1,874; and auto trucks, 266. All farmers have a sufficient number of work animals to do the farm work. The number of cattle to the farm varies with the type of farming performed. All farmers have one

or more milk cows and a few feeder cattle. Some make a specialty of livestock farming and have good-sized herds.

Barnyard manure is the fertilizer material most generally used. This is commonly applied to clover or corn stubble and is plowed under. Only 28 farmers reported expenditures for commercial fertilizers in 1920. The total expense to these users was \$4,372. Many farmers use a part of their clover crop as green manure and a few depend upon crop residues for maintaining the fertility of their land.

Farm labor, largely native American, is insufficient to harvest certain crops, so that outside help is needed. As a whole the available supply of labor is efficient. The prevailing monthly wage varies from \$35 to \$45. Day help is paid from \$2 to \$4.

The area of individual farms ranges from 40 to 1,000 acres. The prevailing size is from 80 acres to a quarter or half section. The average size for the county is 190.9 acres, of which 87.2 per cent, or 166.4 acres to the farm, is improved land.

Only 40.4 per cent of the farms in Cherokee County are operated by owners. Tenanted farms comprise 58.2 per cent and those operated by managers, 1.4 per cent. Most rented farms are rented on a share basis, the owner getting from two-fifths to one-half of the crop. Cash rent ranges from \$6 to \$10 an acre and pasture rent from \$3 to \$5.

Land values in Cherokee County range from \$50 to \$225 an acre, the prevailing range being between \$150 and \$225, depending on the type of land, the location, improvements, and state of cultivation. Sales at \$250 an acre were made in 1924, but that is a little above the prevailing price for choice farm land. United States census figures report from 95 to 100 per cent of the county as cultivable land.

### SOILS<sup>3</sup>

Cherokee County is in the prairie region of the United States where climate and surface features have favored a heavy growth of grasses. The greater part of the county is a gently rolling plain, and the first settlers found it treeless and grass covered. The soils are true prairie soils and have the dark-colored surface layer common to prairie soils developed in the Temperate Zone under the influence of a moderate supply of moisture. The sparse stand of trees along some of the larger streams and on the eroded slopes is of comparatively recent growth and has not greatly influenced the soils.

The composition of the glacial drift and loess materials from which the soils of Cherokee County have developed was presumably rather uniform over large areas, and the marked differences in the soils are the results of the soil-forming forces. Their characteristics, including color, structure, composition, texture, and the thickness and arrangement of the different layers, have been determined largely by weathering under varying drainage conditions. The dark color of the surface soil is imparted by finely divided organic matter derived from the partial decay of grass roots. The organic material is

<sup>3</sup> Cherokee County adjoins Buena Vista County on the east. In some places along the boundaries the soil maps do not seem to agree. This is due to changes in correlation resulting from a fuller knowledge of the soils of the State. The Carrington silt loam of Buena Vista County is now, for the most part, mapped as Marshall silt loam and a phase of that soil, and only a small area is retained in Cherokee County as Carrington silt loam.

intimately mixed with the mineral constituents of the soil. On the well-drained rolling upland large quantities of dark-colored organic matter have reached a depth varying from 6 to 18 inches, depending on the relief. On the more gently rolling upland, the depth to which organic matter has penetrated ranges from 15 to 24 inches, and on flat, poorly drained areas the range is from 18 to 36 inches.

In view of the important part that drainage has played in their formation, the soils of the county may be divided into two groups, well-drained and poorly drained soils. In well-drained areas the soil-forming forces have acted without interruption and the soils produced under these conditions are regarded as normally developed. The poorly drained soils are those in which the soil-forming forces have been retarded or modified by poor drainage or by an excess of moisture.

Most of the upland soils of the county have developed from silty material known as loess. Along the stream valleys in the northern and central parts, especially along the Little Sioux River and its tributaries, there are many comparatively small areas of soils developed from ice-laid or glacial-drift material. The soils which occur on the well-drained uplands and terraces of the county may be regarded as typical normally developed soils. The surface layer, to an average depth of 12 inches, is very dark grayish brown. The structure of the material is finely granular, the granules averaging about one-sixteenth inch in diameter. The texture varies according to the character of the parent material. Most of the soils are silt loams, and the others are mostly loams.

The surface layer is underlain, to a depth of about 18 inches, by a granular layer which is transitional in color between the surface layer and the layer below. The upper part of this subsurface layer is very dark grayish brown, but the color grades to brown or yellowish brown in the lower part. A close examination shows that the dark color is on the surface of the granules; it is caused by organic matter that has penetrated from the surface. When the granules are crushed, the resulting powder is much lighter brown than the surface of the granules. The dark coating becomes thinner with depth and finally almost disappears in the lower part of this subsurface layer. The texture is usually little, if any, heavier than that of the surface material. Here the granules are well formed and are about twice as large as those of the surface layer.

Beneath the subsurface layer is a subsoil layer of brown or yellowish-brown granular material which is typically slightly heavier in texture than the material above and which continues to a depth ranging from 22 to 27 inches. Where the surface soil is silt loam, the texture of this material is heavy silt loam and, in places, silty clay loam. Except for a few tongues or streaks, the dark coloring does not appear in this third layer.

The material of the next deeper, or lower, subsoil layer, is commonly coarser in texture than that of the layer above it, though it varies with the character of the parent material. The color may be brown or yellowish brown, the material may be either structureless or indistinctly granular, and it may continue to a depth ranging from 40 to 60 or more inches without any marked change.

The material beneath the fourth layer is structureless and breaks into soft irregular clods. The color is grayish yellow, and the ma-

terial is often spotted and streaked with white carbonate of lime. In this substratum material lime concretions are abundant, and the soil material is calcareous. Iron stains and concretions are uncommon in the upper part, but they increase with depth. According to observations, the lime is present as far down as the parent material extends.

The soils which occur on smooth, nearly level areas have the characteristics just described. Here the depth to lime varies from 40 to 66 inches below the surface. On slopes where erosion has been active lime is found nearer the surface and, in places, the lime-bearing layer is exposed.

The Marshall, Clarion, Carrington, Dickinson, Lakeville, Sioux, Judson, and Waukesha soils are the normally developed soils of the county. The Marshall soils, developed from loessial material, show the depth of lime carbonate already given. The Clarion, Carrington, Dickinson, Lakeville, Marcus, and Webster soils have developed from glacial-drift material. The characteristics by which these soils are differentiated have resulted in part from the composition of the parent material and in part from the action of the soil-forming processes. The Carrington and Clarion soils differ principally in the depth to which they have been leached of their carbonates, which in the Carrington soils is more than 3 feet and in the Clarion is less. The Dickinson soils have the same general features but, on account of the porosity of their subsoils, lime has been removed either entirely or to a considerable depth. The Lakeville soils occur over beds of unassorted sand, gravel, and boulders. Considerable limestone is found among these coarser rock fragments. The Clarion, Carrington, Dickinson, and Lakeville soils have developed under conditions of good drainage, and their differences are largely the result of the texture and lime content of the parent materials. The Marcus and Webster soils have the characteristics of poorly drained soils.

Loessial and glacial materials transported and redeposited by water make up the parent materials of the alluvial soils of the county. The older alluvial soils, which occur on the higher and better-drained terraces, have been subjected to the same soil-forming forces as the better-drained upland soils and have developed similar characteristics. Such soils include the members of the Sioux, Waukesha, and Judson series. The Judson soils occur on colluvial slopes and are composed almost entirely of loess which has been moved only a short distance down the slope and redeposited.

The poorly drained soils have very dark grayish-brown or black surface layers, thicker than those of the well-drained soils. Their structure is finely granular and their texture averages heavier than that of the well-drained soils. The topsoils are underlain by subsoils which are gray or mottled with gray and yellow, and which are heavier, as a rule, than the surface materials. Below the topsoil the details of the profiles of these soils are variable and depend on the depth to which the effects of good drainage and oxidation have extended. In some cases both topsoil and subsoil have developed under permanently wet conditions. Where calcareous drift material has weathered in position under such conditions, the Webster soils have developed. Where loess was the parent material, the Afton soils are found. The Bremer soils are poorly drained soils of the higher terraces.

The soils of the lower bottoms are subject to inundation and accretion by river deposits and naturally lack uniformity. Sufficient time for the development of well-marked horizons has not elapsed since these soil materials were deposited. Soils in this position have been grouped in the Wabash and Lamoure series. The Lamoure soils differ from the Bremer and Wabash in having a higher lime content. The Marcus soils have developed on calcareous glacial drift under conditions which have resulted in the formation of fairly well drained topsoils and subsoils which are frequently saturated. The various soils of the county are grouped in series on the basis of similarity in color, structure, and other characteristics of the various layers, or horizons. The soils included in each series are called types, and they are differentiated on the basis of the texture of the surface materials. Brief descriptions of the series of soils mapped in Cherokee County follow. These descriptions will hold good not only for Cherokee County but for similar soils wherever they may occur.

The soils of the Marshall series have very dark grayish-brown topsoils and yellowish-brown or buff-colored subsoils. The subsoils are in some places calcareous within 3 feet of the surface and are invariably calcareous at a depth varying from 4 to 6 feet. Marshall silt loam and a shallow phase of this soil are mapped.

Soils of the Clarion series have very dark grayish-brown topsoils and yellow or brown calcareous boulder-clay subsoils. Clarion silt loam, Clarion loam, and a steep phase of the Clarion loam occur in the county.

The Carrington soils differ from the Clarion in that they have been leached of lime to a depth of more than 3 feet. The loam and silt loam members of the series are mapped.

The topsoils of the members of the Dickinson series are dark colored, but the subsoils are gravelly or sandy and are droughty. Dickinson loam and Dickinson fine sandy loam occur in Cherokee County.

The Lakeville series is represented in Cherokee County by Lakeville sandy loam. The topsoil is very dark brown sandy loam about 6 inches deep, and the subsoil is calcareous sand and gravel.

The soils of the Sioux series have very dark brown topsoils and open sandy and gravelly lower subsoil layers. These soils occur on flat terrace formations from 5 to 20 feet above overflow. Sioux loam and Sioux silt loam were mapped.

The Judson soils have nearly black topsoils over friable subsoils of about the same color and structure. These soils occur in swales, in outwash plains, and in narrow belts at the base of bluffs bordering stream bottoms. The material is colluvial. Judson loam and Judson silt loam are mapped.

The Waukesha soils occur on flat but well-drained terraces along streams. They are characterized by very dark topsoils underlain by yellowish-brown subsoils of silty clay loam texture. Waukesha silt loam is mapped.

The Webster soils have deep black topsoils and gray or drab mottled subsoils underlain by calcareous drift of heavy texture. Webster silty clay loam is the only member of the Webster series found in this county.

The Afton soils have developed over loess weathered in position under conditions of poor drainage. The topsoils are black and the

subsoils are mottled gray and drab material heavy in texture. Afton silty clay loam occurs in Cherokee County.

The Bremer soils are represented by Bremer silty clay loam, which has a black topsoil underlain by a heavy drab subsoil. Natural drainage is somewhat deficient. This is a terrace soil occurring on flat or depressed areas.

The Marcus soils have very dark grayish-brown or black topsoils. The upper part of the subsoil is grayish-brown material and the lower part is gray and brown mottled. Poor drainage has affected the soil below a depth of 24 inches. Lime also occurs below this depth. These soils are derived from loess weathered under conditions of poor drainage. Marcus silt loam was mapped in Cherokee County.

The Wabash soils have black topsoils over gray, drab, or mottled gray, drab, and brown heavy subsoils which in many places are stained with iron. Wabash loam, Wabash silt loam, and Wabash silty clay loam are mapped.

The Lamoure soils differ from the Wabash only in that the subsoils contain sufficient lime to effervesce with acid. Lamoure loam, Lamoure silt loam, and Lamoure silty clay loam are mapped.

The distribution of the soils of Cherokee County is shown on the soil map which accompanies this report. The names and the proportionate extent of the various soils are given in the following table:

*Acres and proportionate extent of the soils of Cherokee County*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Marshall silt loam.....	257,984	70.8	Sioux silt loam.....	512	0.1
Shallow phase.....	1,856		Sioux loam.....	960	.3
Marcus silt loam.....	15,616	4.3	Bremer silty clay loam.....	192	.1
Clarion silt loam.....	5,120	1.4	Judson silt loam.....	2,496	.7
Clarion loam.....	4,672	7.6	Judson loam.....	704	.2
Steep phase.....	23,168		Wabash loam.....	1,408	.4
Carrington silt loam.....	3,840	1.0	Wabash silt loam.....	12,096	3.3
Carrington loam.....	1,408	.4	Wabash silty clay loam.....	18,880	5.1
Dickinson loam.....	1,216	.3	Lamoure loam.....	2,368	.6
Dickinson fine sandy loam.....	896	.2	Lamoure silt loam.....	1,024	.3
Lakeville sandy loam.....	1,152	.3	Lamoure silty clay loam.....	896	.2
Webster silty clay loam.....	256	.1	Pits.....	64	.1
Afton silty clay loam.....	4,736	1.3			
Waukesha silt loam.....	3,200	.9	Total.....	366,720	---

#### MARSHALL SILT LOAM

Marshall silt loam, to an average depth of 15 inches, consists of very dark grayish-brown friable silt loam. The surface soil appears almost black when wet. The color is evenly distributed throughout the layer and is about the same shade in any undisturbed area of the soil. The structure is finely granular, the granules being one-sixteenth inch or less in diameter. Some loose interstitial silt is present. This layer is underlain by what may be regarded as a subdivision of the topsoil. The color is similar, but the texture is silt loam very slightly heavier than the surface layer. The combined thickness of the two upper dark-colored layers varies in different parts of the county, according to the relief. The average depth of these two layers on the almost level interstream divides is about 12 inches. On slopes

the surface soil is thinner, and on small areas on steep slopes and on the tops of sharp knolls and ridges it may be entirely removed and the light-colored material below may be exposed.

The next lower layer is dark grayish brown in its upper part but grades downward to lighter-colored material. The dark color, which occurs on the surface of the granules or on the breakage-plane surfaces and is caused by black organic matter which has penetrated downward from the surface soil through cracks, root holes, and worm and insect burrows, is not solid but occurs in indistinct tongues and sheets which decrease in size downward and almost disappear in the lower part of the layer. The granulation becomes more distinct in the lower part, and the granules increase in size to about one-eighth inch in diameter. This transitional layer reaches an average depth of about 26 inches. The next lower layer consists of brown or yellowish-brown heavy silt loam material. Granulation, which is very distinct in the upper part of this layer, decreases toward the lower part and ends with it. Below a depth of about 35 inches a marked change takes place. The material is generally yellow or yellowish brown, is soft and structureless, and breaks into irregular clods. This is the parent loess very little changed in color, texture, and structure. Leaching has evidently taken place, as carbonates are not present. Over the smooth upland this material varies in depth from 36 to 72 inches. The average depth is probably about 60 inches. On slopes it comes much nearer the surface. The next lower material is grayish-yellow, friable, highly calcareous silt loam. Spots of gray or bluish gray and numerous small iron stains are present. Lime concentrations are abundant, and the interstitial soil material, so far as was observed, continued downward to the glacial drift.

Minor variations in Marshall silt loam occur over the county. These include a thinner soil on ridge tops and points of hills and a slightly deeper and darker-colored surface soil than is typical, on some of the lower slopes. These variations are not sufficiently large to be shown on the map as their size ranges from only a fraction of an acre up to 1 or 2 acres. In the eastern part of the county, glacial drift occurs in the lower part of the subsoil in certain areas mapped as Marshall silt loam. In areas in which drift was not present above a depth of 28 or 30 inches the soil was mapped as Marshall silt loam. The material above the drift, up to the surface, is loess and, to the greatest extent, the soil derives its characteristics from its loessial content and could well be considered loess.

Marshall silt loam is the predominating soil in the county and comprises 70.8 per cent of its area. It occurs in all parts of the county, interspersed in certain areas, particularly along Little Sioux River, with other less extensive soils. The most extensive unbroken areas are in the southwestern and the southeastern parts of the county. Such areas are broken only by an occasional ribbonlike area of bottom land along drainage ways or by narrow areas of drift soil in like positions.

The prevailing land surface of this soil is gently rolling, with gentle, gradual slopes which adapt it very well to cultivation. Some areas are more gently and some more steeply rolling, but such areas are not extensive.

Natural drainage of Marshall silt loam is good. The surface slope and the character of the subsoil are favorable to the absorption and

retention of sufficient moisture for crop needs, and crops withstand prolonged periods of dry weather without damage.

Artificial drainage is never necessary on typical Marshall silt loam, but lines of tile are in places run down the bottom of a swale to facilitate the removal of excess water.

Marshall silt loam is the most important soil in the county and is consistently the highest producing one. Practically all of it is under cultivation or is suitable for tillage, but on farms composed solely of this soil a part must be used for pasture. Generally, however, where a less desirable soil occurs on a farm, it is used for pasture and Marshall silt loam for cultivated crops.

Corn, oats, and hay are the principal crops grown on this soil. Other small grains, potatoes, and some other crops are grown intensively. The feeding and breeding of livestock is the most important industry. Corn is planted on from 40 to 60 per cent of the soil, small grain on 20 or 30 per cent, hay on from 10 to 20 per cent, and the remainder is in pasture, buildings, and lots.

Crop yields are good, but the continuous cropping practiced on tenanted farms lowers the average yields. For corn the average yield is about 45 bushels to the acre. On soil which is rotated with leguminous hay crops, part of which are plowed under, the average is between 55 and 65 bushels. Yields varying from 70 to 90 bushels are reported where corn followed a pastured or manured legume crop. On farms where a systematic rotation, including a legume, is followed and where livestock is fed and manure is applied to the soil, the yields are consistently high. A good soil, such as this, even if it is allowed to run down, is not so difficult to return to a profitable or high state of fertility as would be the case with a poorer soil.

Oats on Marshall silt loam yield from 30 to 50 bushels to the acre and average about 40 bushels. Better than average land yields from 45 to 60 bushels, dependent largely on the season. When clover and timothy mixed, alfalfa, or sweet clover are seeded with the oats or other small-grain crop early varieties are used. Clover and timothy yields from 2 to 3 tons to the acre, alfalfa from 4 to 7 tons, and timothy alone from 1 to 1½ tons. There is practically no wild hay. Pastures are largely of bluegrass, although a good many are seeded also to white clover.

Practically all of the corn is check planted. A small acreage is drilled on freshly broken sod ground for silage, but it is more frequently check planted than drilled even under these circumstances. Oats are seeded on corn-stubble land which has been thoroughly disked. When the oats serve as a nurse crop for clover or alfalfa the two grains are seeded together. When it is possible fall plowing is practiced for spring-seeded crops.

Normally Marshall silt loam is maintained in a good state of tilth without any particular difficulty. As natural drainage is good and the soil is mellow and friable, it may be worked under a comparatively wide range of moisture conditions. Not a large percentage of the farmers practice a systematic crop rotation. Many crop the land largely to corn, oats, other small grain, or hay (consisting largely of timothy), but they frequently have a very small acreage of leguminous hay which is either of too small extent to be of material benefit to the land from a soil-improvement viewpoint or is not grown with

that object in mind. Probably as many as 50 per cent of the farmers on this soil are endeavoring to follow a systematic crop rotation which includes a leguminous hay crop, a part of which is utilized for the purpose of soil improvement. Since large acreages of alfalfa are not popular on the average farm because its frequent harvest interferes with other farm operations, when a portion of the farm is seeded down each year or two it is to either red or sweet clover. Greater recognition is yearly being given to the desirability and importance of the clover crops in maintaining soil fertility.

Marshall silt loam, because of the generally high lime content of its subsoil and its great extent, is the most important soil in the county for the production of the various clovers and of alfalfa. Sweet clover and the common red and white clovers grow commonly along roadsides, and particularly where sweet clover grows in this manner alfalfa will thrive on the adjoining land. This natural adaptability of Marshall silt loam to the growth of these crops is greater in the western part, or rather the western half or two-thirds of the county, than in the eastern part.

In general, there is less lime in the soil in the eastern part of the county, and farmers sometimes have difficulty in getting good stands of alfalfa. The acidity in no place, however, is great, and the use of 1 or 2 tons of limestone to the acre and inoculation of the seed insure a good stand of either alfalfa or sweet clover. Difficulty in growing red clover or alsike is seldom, if ever, experienced.

Three cuttings of alfalfa a year are obtained. No hay is cut from either clover or alfalfa the year it is seeded. The crops are sometimes lightly pastured late in the season when a vigorous growth has been made to carry it through the winter season. The first clover crop the following year is cut for hay. The second growth is either removed for hay or is pastured and the remaining growth plowed under, or the entire second crop is plowed under as green manure. The first two plans are the most commonly practiced, and the latter of these two is the more desirable. The use of the entire second growth as green manure is the most desirable plan from the viewpoint of adding to the fertility of the soil and to the improvement of its physical condition. The great increase in the yields of corn on land so treated is being more generally realized, and the practice is gaining favor as a means of adding not only nitrogen from the air but large quantities of fresh organic matter which are not only beneficial in themselves but so improve soil conditions that much unavailable plant food in the soil is changed to a form in which it can be used by succeeding crops.

Marshall silt loam is naturally a fertile soil; and where the cropping system includes a legume, part of which is utilized for green manure, includes the application of barnyard manure, and the use of good cultural methods, a high and profitable state of fertility can be maintained. It is on farms so managed that repeatedly high yields, averaging from 40 to 70 per cent higher than the average for the continuous grain-cropping system, are obtained.

The feeding of beef cattle and hogs is the most important livestock industry on this soil. A few dairy herds are maintained or are being developed, but this line of development has not been active to

any great extent up to the present time. Recognition is being given to the value of dairying as a means of diversification. Poultry, garden truck, and fruits are raised to a small extent on each farm. A few small fields of pop corn were observed, but the big production of this crop on Marshall silt loam is centered in Ida and Sac Counties, to the south and southeast of Cherokee County.

Commercial fertilizers are used by only a few farmers on this soil. Limestone has been used to a greater extent, but only in small quantities. The fertilizing materials in most common use, and those which will be found most profitable at the present time, are barnyard manure, leguminous green-manure crops, and crop residues such as small-grain straw and cornstalks.

Current values of this soil range from \$150 to \$250 an acre, depending on improvements, location, state of cultivation, and associated soils. Several sales at \$250 an acre were reported in 1924, but this price is above the average.

*Marshall silt loam, shallow phase.*—The topsoil of Marshall silt loam, shallow phase, is dark grayish-brown mellow silt loam, 7 or 8 inches deep. The upper part of the subsoil, to a depth of 16 or 18 inches, is compact, slightly heavier, lighter-brown silt loam, in which the color becomes lighter with increasing depth. The lower part of the subsoil is more friable yellowish silt loam which contains some very fine sand. Most of this soil has calcareous material in the subsoil within 3 feet of the surface, and lime nodules occur in the soil in many places even at the surface.

This soil is inextensive and occurs exclusively on blufflike loessial hills along Little Sioux River and some of its larger tributaries, between the city of Cherokee and the south county line. Two areas, the largest continuous ones in the county, occur a few miles east of Washta on both sides of Stratton Creek.

Probably 50 per cent of this soil is under cultivation. Some of the more broken areas, especially those which occur in sections 31 of Willow Township and 36 of Grand Meadow Township, are too rough to be suitable for cultivation and are used for pasture. This soil is strongly rolling or broken and natural drainage is good or excessive.

Crop yields on shallow Marshall silt loam are not so large as on typical Marshall silt loam. Corn yields from 20 to 35 bushels to the acre, oats from 20 to 30 bushels, and clover hay from 1 to 2 tons. Although these average yields are comparatively low, the soil has good potential fertility and with careful management can be made very productive. A legume crop, such as red clover, should be grown and the second growth plowed under as green manure, and barnyard manure and crop residues should be used. Plowing should be deep and cultivation thorough, and both operations should follow the contour of the land on steep slopes. Care must be exercised in the selection of areas for cultivation. Too rough areas should remain in pasture or should be used for forestry. A three-year rotation of corn, oats, and clover would be more desirable on this soil than one including two successive years of corn.

## MARCUS SILT LOAM

The topsoil of Marcus silt loam, to an average depth of 18 inches, is dark grayish-brown, very dark grayish-brown, or in places nearly black mellow silt loam. The upper part of the subsoil, to a depth varying from 26 to 30 inches, is somewhat lighter grayish brown than the surface soil, and the texture is heavy silt loam or silty clay loam. Below this material the subsoil is yellow mottled with brown and stained with iron. True and incipient concretions of iron also are present in the subsoil.

Some variations, largely the result of drainage conditions, occur. In the eastern and southern parts of the county a large proportion of the soil which occurs in a position similar to terraces along well-developed drainage ways is especially well drained. Aeration of the subsoil has been very thorough and, although the typically deep, dark surface soil is present, the subsoil has more of a solid brown or yellowish-brown color and less mottling and iron stains. Drainage is not so well established on flat areas north of Marcus, distant from drainage courses, or on the area in northwestern Cedar Township. The topsoil in these areas is consistently very dark colored and frequently attains a depth of 24 inches. The upper part of the subsoil has more of a grayish cast, and the lower part is more commonly mottled with yellow and brown, stained with iron, and not infrequently is rather friable, highly calcareous silty material.

Marcus silt loam occurs in various parts of the upland, but particularly along Maple River and its headwaters, in the eastern part of the county, and in the northwestern part. It is commonly associated with Marshall silt loam. North of Marcus it occurs on drainage divides as flat upland areas of considerable extent. Elsewhere in the county it occurs on level or slightly sloping land between areas of gently rolling Marshall silt loam and drainage ways. These positions resemble terraces, but the soil is undoubtedly loessial material laid down by wind action on what may originally have been stream bottoms or terraces.

Drainage of this soil varies in different places from fair to deficient, and it is commonly necessary to install tile drainage for maximum crop production. This is more particularly true in the areas of greatest size, especially north of Marcus.

A higher percentage of this soil is under cultivation than of Marshall silt loam. The same crops are raised on both soils and in the same proportion as to extent on each. The soils are so closely associated within the same farm and in general farming practice that they are farmed in the same manner.

Crop yields on well-drained areas of this soil average higher, by from 5 to 15 bushels to the acre, than on Marshall silt loam. Where drainage is not well established yields may be less, except in particularly favorable seasons. The means of improvement given for Marshall silt loam apply to this soil, although this is a stronger soil and will stand, for the present at least, heavier grain cropping than the Marshall soil. Good drainage must be established where the soil is naturally deficient in this respect.

Marcus silt loam ranges in value according to drainage, improvements, and location, from \$140 to \$225 or even \$250 an acre.

## CLARION SILT LOAM

Clarion silt loam, to an average depth of 12 inches, consists of very dark grayish-brown mellow silt loam. The upper part of the layer is loose and powdery but the lower part, although not compact, is very slightly more firm in position and is finely granular. This layer is underlain, to a depth of 24 inches, by heavy silt loam or silty clay loam. The color is moderately dark brown in the upper part of the layer but becomes brown in the lower part. Granulation is very distinct in the upper part but disappears with depth. The next lower layer is grayish-yellow friable silt loam with a light-grayish cast caused by the presence of finely divided lime. A few bowlders, including some of limestone, occur in this material, and in many places coarse sand and gravel are present at a depth of about 36 inches.

There is no extensive variation in this soil. In some instances the surface material is silty or is loess overlying drift at a depth varying from 18 inches to 2 feet.

Clarion silt loam occurs in areas scattered over the entire county. Small areas may be found on exposures of drift bordering streams and on hilltops and ridges where the loess has been removed by erosion. A few more extensive areas occur on smoother land in the eastern part of the county. Areas are prevailingly gently rolling. Where they border stream courses they slope in the direction of the drainage way.

Clarion silt loam is not an important soil because of its small extent. It is, however, fertile and productive and is generally considered as being equal in desirability to Marshall silt loam. Crops are similar to those grown on the Marshall soil, and similar yields are obtained. In the eastern part of the county the Clarion soil, because of its high lime content, is better adapted to legumes than the surrounding Marshall silt loam.

A large percentage of this soil is under cultivation, although some of the areas occurring along drainage ways are more suitable for use as pasture or hay land and are generally so utilized.

The means given for improving Marshall silt loam apply equally well to Clarion silt loam.

Clarion silt loam does not comprise entire farms except in a few isolated cases and is sold in conjunction with adjoining types of soil. Cultivable areas range in value from \$150 to \$200 an acre.

## CLARION LOAM

The topsoil of Clarion loam is very dark grayish-brown friable loam from 11 to 13 inches deep. The upper part of the subsoil, to a depth varying from 20 to 24 inches, is medium-brown loam or heavy loam. The lower part of the subsoil is calcareous heavy yellow loam or silty clay material. The lower part of the subsoil and in some places the upper part, contains some rock fragments, sand, and gravel, and scattered bowlders. The subsoil also contains clay and silt in sufficiently large quantities to give the soil good water-holding capacity.

Clarion loam, like Clarion silt loam, is found chiefly on the lower slopes to drainage ways, and is surrounded, on the higher adjoining

land, by Marshall silt loam. It occurs in irregular discontinuous areas along Little Sioux River and its tributaries. A few isolated areas, rising up on a hill or ridge top and surrounded by Marshall silt loam, are in the eastern part of the county. A few open gravel pits occurring in connection with this soil, are indicated on the soil map by the proper symbols.

This soil is gently rolling or rolling. Natural drainage is good and, on some of the more rolling areas, is even somewhat excessive.

Cultivable areas of this soil are cropped to the general farm crops grown throughout the county. Yields are about the same as for Clarion silt loam. Some of the soil is better adapted for pasture or hay land than for cultivation.

That part of the soil devoted to cultivation is managed in the same way as the adjoining Marshall silt loam. The more desirable areas of Clarion loam are comparable to Marshall silt loam in value and producing power. Certain of the more rolling and ravine-dissected areas have a lower value.

The means given for improving and maintaining the fertility of Marshall silt loam apply to this soil. It has a value varying from \$75 to \$175 an acre, depending on its desirability for cultivation and the surrounding type of land, as this soil does not occur extensively enough to comprise entire farms in Cherokee County.

*Clarion loam, steep phase.*—The surface layer of steep Clarion loam is dark-brown friable loam about 6 inches deep. This is underlain by brown or yellowish-brown heavy loam which, at a depth varying from 18 to 24 inches, grades to yellowish or yellow heavy material varying from loam to silty clay. The subsoil is glacial-drift material and contains some admixture of sand, gravel, rock, and bowlders with the clay and silt. This layer is uniformly calcareous, containing lime flour, limestone pebbles, and fragments of lime rock. A few bowlders or small rocks occur on the surface.

The chief variation in this soil is in the presence of gravel pockets. Many of these are of appreciable size and have been opened; others are too small to be shown on the map. In most cases where these areas were too inextensive to be mapped as Lakeville sandy loam, they were shown on the map by the use of the gravel symbol.

This phase of Clarion loam occurs rather continuously along Little Sioux River and its tributaries on the upland slopes immediately bordering the stream course or its adjoining alluvial lands. The land, as the name implies, is strongly rolling or broken and is pre-vaillingly steep. Drainage is good or excessive. Practically none of the soil is under cultivation, as the steepness of the relief makes cultivation impractical.

The small acreage under cultivation is cropped mostly to corn or hay. Yields are not high. Every precaution should be exercised to prevent the destructive action of erosion which is so easily started on such steep land. Contour plowing and cultivation should always be followed.

The most suitable utilization of steep Clarion loam is for pasture and forest land. In unforested areas which have not washed, a good growth of pasture grasses is generally found. The soil is especially suited to use as pasture, because in many places it has some natural water supply, either an adjoining stream or hillside spring. It also

supports considerable forest growth, which consists chiefly of bur oak, soft maple, elm, basswood, red oak, ash, black walnut, hazel, willow, and cottonwood.

Some of the roughest areas of this soil are rather badly eroded and washed. This is the result of cultivation or the ultimate result of some other man-made or animal-made disturbance of the surface of the ground.

Probably no individual farms are composed wholly of this one soil, but its value may be placed at from \$40 to \$100 an acre. Gravel pits are sometimes a source of considerable income if they are desirably located and are accessible.

#### CARRINGTON SILT LOAM

The topsoil of Carrington silt loam is dark grayish-brown or very dark grayish-brown mellow silt loam, 12 or 13 inches thick. The subsoil below this is brown or yellowish-brown heavy silt loam, silty clay loam, or silty clay. The subsoil becomes heavier in texture and lighter in color to a depth of about 30 inches, below which it is lighter in texture and more friable. In many places iron stains and some faint mottles of yellow and brown are present in the lower part of the subsoil. Pebbles, bowlders, and glacial gravel occur in the subsoil and, very rarely, in the topsoil.

The areas of Carrington silt loam are rather widely scattered over the eastern half of the county, but the total acreage is small. A few areas of varying size in the eastern edge of the county are surrounded by Marshall silt loam. Elsewhere in the county Carrington silt loam borders bottom lands of Maple and Little Sioux Rivers and their immediate tributaries, occurring at a lower level than the Marshall soils.

Areas of this soil are gently rolling, and natural drainage is good but never excessive. This is a fertile soil suitable for cultivation and is devoted to the production of the common field crops of the county. It is practically all under cultivation, and crop yields are equal to those obtained on Marshall silt loam. This soil is managed in the same way as Marshall silt loam, and the means of improvement are the same for both soils.

In only a few instances does Carrington silt loam comprise entire farms. It is most frequently sold in conjunction with adjoining soils. Its value ranges from \$150 to \$225 an acre, depending on the usual influencing factors of location and improvements.

#### CARRINGTON LOAM

The topsoil of Carrington loam is dark-brown, friable, mellow loam. The upper part of the subsoil is brown loam which grades to yellowish-brown or yellow heavy material varying from loam to silty clay. The lower part of the subsoil, below a depth ranging from 20 to 24 inches, consists of little-altered glacial drift. It varies in composition but is commonly lighter in texture than the upper part of the subsoil and is more friable. Gritty particles, pebbles, and an occasional bowlder are found in this material.

Over a part of the area covered by this soil, however, the subsoil differs from typical in that it is loam or heavy loam, free from gravel or rocks.

Carrington loam in Cherokee County occurs chiefly in a few areas in the uplands bordering the east side of Little Sioux River in Pilot and Cherokee Townships.

From 50 to 60 per cent of this soil is under cultivation, and crop yields are good although they average a little less than on Carrington silt loam. This soil differs from Clarion loam only in that the subsoil is not calcareous. The two soils have the same value, yielding power, and desirability.

#### DICKINSON LOAM

To an average depth of 10 inches, the topsoil of Dickinson loam is dark-brown, mellow, friable loam. The upper part of the subsoil, to a depth of about 20 inches, is brown loam or sandy loam. Below this depth the subsoil is typically yellowish-brown or yellow loamy sand or sand, loose and incoherent. The material of the lower part of the subsoil is in places composed of a mixture of coarse sand and gravel. This is particularly true of the soil over most of its occurrence in section 34 of Cherokee Township and sections 3 and 10 of Pilot Township.

This soil occurs in the previously mentioned areas and elsewhere in small areas along Little Sioux River and Mill Creek. Areas are undulating or gently rolling, and natural drainage is good or excessive. The openness and porosity of the subsoil frequently permit the loss of soil water to such an extent that crops suffer during periods of dry weather.

From 50 to 65 per cent of this soil is under cultivation. It is devoted to general farming, and the crops common to the county are grown. Yields are less than on the heavier silts and loams but average fair and in favorable seasons are good. Corn yields average between 25 and 40 bushels to the acre, oats between 20 and 35 bushels, and hay between 1 and 1½ tons. Under careful management and in favorable seasons higher yields are obtained.

Dickinson loam is managed in much the same way as adjoining soils. More attention, perhaps, is given to the return of manure and crop residues than on the better-producing soils of the county. Commercial fertilizers are not in use.

Current values of Dickinson loam range from \$80 to \$150 an acre, depending on location, state of improvement, and condition of the soil.

Dickinson loam is a soil requiring more than average good management to produce good yields. The droughtiness of the soil and its lower fertility must be overcome.

The two outstanding problems in connection with the management of this soil are the improvement of its water-holding capacity and the maintenance of its supply of organic matter. Cultural practices should be improved. The soil should be plowed to a depth of 6 or 8 inches, the seed bed should be more thoroughly prepared, and crops should be well cultivated. The incorporation of organic matter with the soil will not only increase the organic-matter supply but will also help to increase the water-holding capacity. This increase can

be accomplished through the use of barnyard manure, through the plowing under of leguminous green-manure crops, or through the return of crop residues, such as cornstalks and small-grain straw, to the soil. The feeding of livestock is desirable in order to furnish a supply of manure. Leguminous hay crops, such as red or sweet clover, should be grown, and a part of these, preferably the entire second crop, should be plowed under as green manure. The use of a 3-year or 4-year rotation similar to one of the following would be desirable: Corn, 1 year, followed by oats, or other early small grain, 1 year, followed by clover, 1 year; or, corn, 2 years, oats, 1 year, clover, 1 year. Probably the 3-year rotation would be more desirable if it would fit into the system of farming employed.

#### DICKINSON FINE SANDY LOAM

The topsoil of Dickinson fine sandy loam is dark-brown friable sandy loam about 10 inches deep. The upper part of the subsoil is loose sandy brown loam, which grades, at a depth of 20 or 24 inches, to loose, porous, fine sand or sand varying from yellowish brown to yellow. A large percentage of this soil in sections 3 and 10 of Pilot Township has a subsoil consisting largely of coarse sand and gravel. In these sections both Dickinson loam and Dickinson fine sandy loam are sources of gravel for use in highway and railroad construction.

This soil is not important, either from the viewpoint of extent or productiveness. It occurs in Pilot Township and elsewhere along Little Sioux River and Mill Creek. Areas are undulating or rolling, and natural drainage is generally excessive.

The general field crops, including corn, oats, and hay, are grown. Yields average less than on Dickinson loam. The means of improvement given for that soil also apply to this. Its value varies from \$70 to \$125 an acre.

#### LAKEVILLE SANDY LOAM

Lakeville sandy loam consists of dark-brown or very dark grayish-brown sandy loam, 6 or 8 inches deep, underlain by brown sandy loam a few inches deep or underlain immediately by unassorted sand, gravel, and some larger rocks of varying size.

Lakeville sandy loam has its most extensive occurrence along the east side of Little Sioux River south of the city of Cherokee. Smaller areas occur elsewhere along the same stream and some of its larger tributaries.

Areas are rolling or steep and drainage is excessive. This soil is not suited to cultivation, and most of it is used for pasture land. Some wild hay is cut from a few areas. Its value lies in its use for pasture or, where the quality is good, in the sale of gravel.

#### WEBSTER SILTY CLAY LOAM

The topsoil of Webster silty clay loam is black or nearly black silty clay loam about 18 inches deep. The subsoil is gray or drab silty clay material which, with greater depth, contains some mottling of drab, gray, or brown. Iron stains and lime occur in the lower

part of the subsoil, where some weathered glacial rocks or small pebbles and gritty material are mixed with the clayey material.

This soil occurs in only a few small areas, aggregating 256 acres. The largest of these areas is in section 12 of Afton Township.

This land is flat or depressed, and natural drainage is fair or deficient. Webster silty clay loam is not important because of its small extent, but where adequate drainage exists naturally or has been established it is very productive. Probably 50 per cent of it is under cultivation. Corn is the chief crop. The remainder of this soil is in pasture or wild hay.

Because of the heavy texture of this soil, continuous cropping to corn impairs its physical condition and makes it more subject to puddling and clodding. For this reason the occasional plowing under of manure, straw, or part of a hay crop will improve the physical condition and make the soil more mellow and better aerated.

Webster silty clay loam is always sold in conjunction with adjoining soils. It has an approximate value varying from \$60 to \$150 an acre, depending on drainage, location, and improvements.

#### AFTON SILTY CLAY LOAM

The topsoil of Afton silty clay loam, to an average depth of about 15 inches, is black or nearly black smooth silty clay loam rich in organic matter. The upper part of the subsoil, to a depth varying from 24 to 28 inches, is gray or drab heavy silty clay loam. The lower part of the subsoil is lighter gray or drab or is gray, drab, and brown mottled heavy material ranging from clay loam to silty clay. Iron stains and concretions occur in many places in the lower part of the subsoil. There is some variation in the texture of the surface soil, in that a few areas are silt loam or heavy silt loam. These variations are few in number, however, and are not of great importance.

The most extensive areas of this soil are in the eastern part of the county near the headwaters of Maple River and its tributaries. Smaller areas occur elsewhere, chiefly in the northwestern four townships of the county.

Areas of this soil are flat, sloping, or depressed, and natural drainage varies from good to deficient. It is sometimes necessary to put in tile drains to establish adequate drainage for good crop production.

Afton silty clay loam has developed on loessial material which has weathered under conditions of poor drainage. It occurs as elliptical shaped or elongated areas at the heads of drainage ways or on flats or depressions in the upland. In a few places it occurs as slightly sloping border areas along stream bottoms.

Although this is not a particularly extensive soil and not all of it is productive, the better-located and better-drained areas make excellent farm land. Not more than 35 or 45 per cent of it is under cultivation. Corn is the principal crop, and in well-drained areas yields range from 50 to 70 bushels to the acre. Small grains have a tendency to lodge before full maturity but early short-strawed oats yield well. Tame hay yields from 1½ to 2½ tons to the acre but not much is grown. The poorly drained areas not suitable for cultivation are used for pasture, or wild hay is cut from them.

The suggestions for improvement of Webster silty clay loam are equally good for this soil. Drainage is the first essential, followed by good cultural practices and the growing of an occasional legume crop. On some of the less well-drained areas a fair yielding hay or pasture crop of alsike clover and timothy could be grown to advantage.

Values of Afton silty clay loam range from \$60 to \$175 an acre, depending on such factors as drainage, adjoining soils, and location.

#### WAUKESHA SILT LOAM

The topsoil of Waukesha silt loam is dark grayish-brown or very dark grayish-brown mellow silt loam 12 or 13 inches deep. The upper part of the subsoil is brown silt loam or silty clay loam. This is underlain by yellowish-brown, somewhat compact and slightly heavy, silt loam.

The only variation in this soil is in a few areas along Little Sioux River. In these the dark surface soil continues to a depth as great as 20 inches and is underlain by yellowish-brown silt loam or heavy silt loam. The most extensive variation of this kind is in the area of Waukesha silt loam in section 29 of Willow Township.

Waukesha silt loam occurs chiefly along Little Sioux River, particularly just south of the north county line, in southwestern Spring Township, north of the city of Cherokee, and along the east side of the river between Quimby and the south county line. A few smaller areas are along Maple River and Smith Creek.

Areas of this soil are level or slightly undulating. Natural drainage, however, is good and is comparable to that on Marshall silt loam.

Although Waukesha silt loam is not extensive in its occurrence, it is important because it is a productive and desirable type of farm land. The common field crops are grown, and yields are good. Corn yields from 40 to 60 bushels to the acre, oats from 40 to 55 bushels, and tame hay from 1½ to 2½ tons.

This soil is managed in much the same way as Marshall silt loam. In fact, the soils are very similar in many respects and have a similar crop-producing power. Waukesha silt loam does not, however, have a calcareous subsoil, and liming would be more essential in the growth of alfalfa than it is on the Marshall soils.

No commercial fertilizer is in use. Manure is the chief fertilizing material. The suggestions given for managing Marshall silt loam fit this soil equally well, but the growth of a legume crop at regular intervals, the application of manure, and good tillage practices should be particularly stressed.

Land values are influenced by the usual factors and range from \$150 to \$200 an acre.

#### SIoux SILT LOAM

The topsoil of Sioux silt loam is dark grayish-brown mellow silt loam 12 inches deep. The upper part of the subsoil is brown or yellowish-brown silt loam. The lower part of the subsoil, occurring below a depth of 24 or 26 inches, consists of brown, loose, incoherent gravel containing some sand. Limestone gravel is abundant in this material.

A few small areas of this soil, including the one about one-half mile northeast of the city of Cherokee, consist of silty loam in the

upper part of the subsoil. This continues to a depth varying from 28 to 32 inches below the surface before it is underlain by the gravelly substratum.

Sioux silt loam occurs in only a few areas scattered along Little Sioux River. The largest of these is in section 32 and adjoining sections in Pilot Township, where a large gravel pit is in operation.

Areas of this soil are level, sloping, or slightly undulating. Natural drainage is good or excessive but is less excessive in areas where the gravel substratum occurs at a greater depth.

This soil is not important agriculturally, because of its small extent, but most of it is under cultivation. General farm crops are raised, and yields are fair or good, depending somewhat on the amount and distribution of rainfall. Because of the gravel substratum, the soil has a tendency to dissipate its moisture, and crop yields are lowered in dry seasons. Suitable areas of this soil and of Sioux loam, however, have a high value on account of the underlying gravel deposits.

The current value of this land ranges from \$100 to \$150 an acre.

The management and means of improving Sioux silt loam are the same as for Dickinson loam. Special attention should be given to good tillage, the conservation of moisture, crop rotation, and the application of manure.

#### SIoux LOAM

The topsoil of Sioux loam is dark-brown friable loam about 12 inches deep. The upper part of the subsoil is brown or yellowish loamy material. The lower subsoil layer, which occurs below a depth of about 24 inches, consists of brown or yellowish-brown stratified calcareous gravel and sand. The substratum of gravel is loose and incoherent and has a low water-holding capacity.

This soil occurs in close association with Sioux silt loam and closely resembles Dickinson loam. It is found along Little Sioux River and in two small areas bordering Willow Creek. Like Sioux silt loam it is inextensive.

Drainage is good or excessive. Crop yields are similar to those obtained on Dickinson loam, and the same crops are grown. Management and means of improvement are also similar for these two soils.

Land values range from \$90 to \$140 an acre.

#### BREMER SILTY CLAY LOAM

Bremer silty clay loam consists of very dark grayish-brown or black silty clay loam rich in organic matter underlain, at a depth ranging from 15 to 18 inches, by dark-drab or gray clay loam which becomes lighter gray or drab in color and heavier in texture with increasing depth. The subsoil, in its lower depths, is generally of silty clay or clay texture. Gray, drab, and some brownish mottling and iron concretions commonly occur in the lower part of the subsoil.

The greatest variation in Bremer silty clay loam occurs in the area in section 31 of Pilot Township. Here the surface soil is mellow silt loam, about 15 inches deep, underlain by drab or gray silty clay or clay containing some coarse sand and fine gravel, but not in

sufficient quantity to make the soil droughty. This area is all under cultivation.

This soil is not extensive in Cherokee County. It occurs only in the above-mentioned area, in two smaller areas, one a mile and the other  $1\frac{3}{4}$  miles northeast of the larger area, and in an area about 80 acres in extent in section 9 of Willow Township. Areas are flat or depressed and occur on second bottoms above overflow. Natural drainage is fair or good. Tiling would be beneficial in some instances, provided a suitable outlet could easily be reached.

Bremer silty clay loam is not important, because of its small extent. It has high potential fertility, however, and where well drained is productive. Corn and small grains are the principal crops grown. Hay is a minor crop. Yields vary from fair to high.

The use of barnyard manure and the occasional growing of a leguminous crop will maintain the fertility of this soil for a number of years.

The value of this soil is variable, depending on drainage conditions, location, and adjoining soils, in conjunction with which it is sold. Its selling price ranges from \$60 to \$150 an acre.

#### JUDSON SILT LOAM

The topsoil of Judson silt loam is very dark grayish-brown or nearly black mellow, friable silt loam which continues practically unchanged to a depth varying from 24 to 36 inches. The subsoil generally differs little from the topsoil but is in places slightly lighter in color. In a few places the brown silt loam begins at a depth ranging from 26 to 30 inches.

This soil occurs most extensively along Little Sioux River and Mill Creek, although a few areas are found along some of the other streams in the county. It consists of colluvial material and lies at the base of upland slopes bordering stream courses or their immediate bottom lands.

The prevailing land surface has a gentle slope toward the stream course or bottom land it adjoins. Areas are flat or slightly undulating. Natural drainage is good.

Although not of great extent, this soil is comparatively important because of its high fertility and desirability for cultivation. It is all under cultivation, with the exception of a few small areas associated with uncultivable types of soil. Corn, oats, and hay are the leading crops. Yields are good, corn yielding from 50 to 65 bushels to the acre, oats from 40 to 60 bushels, and hay from 2 to 3 tons.

This soil, where cultivable, is managed in much the same manner as the adjoining upland soils. Corn is the leading grain crop and commonly succeeds itself for two or three years, when it is followed by oats with which is generally seeded a leguminous hay crop. Farm manure is the principal fertilizing material used, although cornstalks and clover stubble are plowed under to add to the supply of organic matter.

This soil ranges in value from \$100 to \$200 an acre, depending on the distance from town, size of the area, associated types of soil, and the other usual influencing factors.

The management of Judson silt loam should involve the use of a four-year or five-year rotation which includes a leguminous crop. A part of this crop should be utilized as green manure. The use of barnyard manure and good tillage practices are also essential.

#### JUDSON LOAM

Judson loam consists of dark grayish-brown or nearly black loam, underlain by lighter-brown loam. The transition from topsoil to subsoil is gradual and is not marked by any sharp line.

Judson loam occurs chiefly on bench lands above overflow along Mill Creek and the upper courses of the Little Sioux River. The total area of the soil is not large. Areas are level or nearly level and natural drainage is good.

Crop yields are good. This soil has a greater need for manure and the plowing under of a green-manure crop at regular intervals than has Judson silt loam. The common crops are corn, some oats, and hay.

The current value of Judson loam ranges from \$100 to \$175 an acre, depending on location, extent, and associated soils.

#### WABASH LOAM

The topsoil of Wabash loam is dark grayish-brown friable loam about 15 inches deep. The upper part of the subsoil is lighter-colored loam. It is underlain, at a depth ranging from 22 to 28 inches, by gray or mottled gray and yellow silty clay loam material. In places the lower part of the subsoil contains sufficient sand to make it gritty.

Wabash loam occurs principally along the upper two-thirds of the course of Little Sioux River. It generally lies on the bottom land immediately adjacent to the stream course.

Areas of this soil range from flat or level to billowy. The billowy character is imparted by the remnants of former stream channels. Only a small percentage of the Wabash loam is under cultivation. It is cropped chiefly to corn and small grain, and yields are fair or good. The land unsuited to cultivation is used largely for pasture. Much of it supports a forest growth, particularly those areas immediately bordering streams.

Natural drainage is generally good, except that the soil is subject to inundation at times of high water.

The successful management of cultivable areas of this soil involves good tillage practices, a crop rotation which includes a leguminous hay crop, and the application of barnyard manure.

Land values range from \$50 to \$125 an acre, depending on such factors as location and cultivability.

#### WABASH SILT LOAM

The topsoil of Wabash silt loam is very dark grayish-brown or nearly black silt loam about 15 inches deep. The upper part of the subsoil is grayish-brown heavy silt loam which grades, at a depth of about 24 inches, to gray or drab silty clay loam or silty clay, in places mottled with brown or yellow or stained with iron.

Wabash silt loam is the most extensive first-bottom soil in the county, and its occurrence is general. The largest areas are along Little Sioux River and, to a lesser extent, on the creek bottoms in the southwestern part of the county.

The surface of this soil is largely level. A few areas bordering Little Sioux River have more or less of an irregular surface resulting from former stream channels. Many such areas support a tree growth, but, in general, there is practically no timber on this soil.

Natural drainage varies from fair to good on some of the more desirably located areas and is deficient on others.

In some instances open ditches have been dug to augment natural drainage, and tile has been laid where suitable outlets are obtainable.

Wabash silt loam is the most important stream-bottom soil in the county, and a large percentage of it, especially along Little Sioux River, is under cultivation. The smaller ribbonlike areas along the small streams and creeks and the uncultivable areas along Little Sioux River are used as pasture land or for the production of wild hay. Corn is the principal crop and is grown more continuously on this soil than on the average upland soil of the county.

Some small grain, chiefly oats, is grown. Fewer leguminous and tame hay crops are grown and less fertilizer is used on the bottom lands than on the upland soils of the county. This is particularly true on individual farms which include cultivable areas of both kinds of soil.

Crop yields are somewhat variable because of the various uncertainties of bottom-land soils, but on the more desirably located areas they average good or excellent. Particularly on the less well drained areas, yields are dependent on seasonal conditions, and replanting is sometimes necessary. Corn yields from 40 to 70 bushels to the acre, oats from 30 to 60 bushels, and clover and timothy hay from 2 to 3 tons. Wild hay yields from one-half to 1½ tons to the acre. Higher yields than these are reported under very favorable conditions.

Land values range from \$50 to \$150 an acre, depending on the utilization that may be made, location, associated types of land, and other factors.

Any reasonable means of improving drainage conditions should be adopted. Continuous cropping to corn has a detrimental effect on the physical condition and resultant crop-yielding power of the soil. Some regular system of crop rotation which includes the growing of a leguminous hay crop is desirable. Part of this crop should be plowed under as green manure. The soil does not need to be seeded to a leguminous hay crop as frequently as some of the upland soils. The burning of cornstalks is an undesirable practice, as it wastes large quantities of beneficial organic matter.

Good management, combined with good cultural practices, will attain the greatest consistent high-yielding power of the soil.

#### WABASH SILTY CLAY LOAM

Wabash silty clay loam consists of black or nearly black silty clay loam, rich in organic matter, underlain at a depth of 16 or 18 inches by material ranging in texture from heavy clay loam to clay. This

material becomes heavier in texture with depth. The color of the subsoil is dark drab, which grades to lighter drab or gray, mottled in places with brown or iron stains.

Wabash silty clay loam occurs most extensively along Maple River in the eastern part of the county. A few areas are along Little Sioux River and elsewhere on the narrow bottoms along some of the creeks and smaller drainage ways.

This land is flat, and drainage is inclined to be deficient except on some of the larger areas where it is satisfactory for crop production a fair share of the time. Wet seasons, however, and excessive rainfall during a short period reduce the producing power of the soil.

This soil supports little or no tree growth. Only the more desirable extensive areas along Maple River and Little Sioux River are suitable for cultivation. The remainder is utilized as pasture or wild-hay land.

Corn is the principal crop grown. Yields are generally good and in seasons of favorable distribution and amount of rainfall exceed those obtained on any other soil in the county. Some tame hay and small grain are grown.

Wabash silty clay loam is a strong, fertile soil but because of its heaviness is difficult to manage. It will successfully stand more repeated cropping to corn than the upland soils, but it will be found very desirable to alternate with a crop such as clover and timothy, a part of which is plowed under as green manure. This will make the soil easier to plow and cultivate by improving its physical condition and hence its yielding power. Particular stress needs to be given cultural methods in order that plowing, preparation of the seed bed, and subsequent cultivation be done when the moisture content of the soil is most desirable, so that clodding or puddling and their resultant damage to the yielding power of the soil may be avoided. Manure is the only fertilizer in common use.

Current values of this land range from \$50 to \$140 an acre depending on the utilization that can be made of it. The greatest limiting factor in its productive value is drainage. In certain parts of the more desirably located areas, drainage may be augmented by the use of open ditches and tiles, but in many places a suitable outlet can not be obtained.

#### LAMOURE LOAM

The topsoil of Lamoure loam, to a depth of 14 or 16 inches, is friable dark grayish-brown or nearly black loam. The subsoil is drab or gray heavy material ranging in texture from loam to silty clay. It contains considerable sand, and the lower part is calcareous.

Lamoure loam differs from Wabash loam mainly in having a calcareous subsoil. It occurs on first bottoms subject to overflow, chiefly along Little Sioux River and Mill Creek, and has no great value agriculturally. Practically all of it is utilized as pasture or forest land. Some areas support a fair tree growth as well as bluegrass for pasture. Its current value ranges from \$40 to \$80 an acre, depending on the utilization which may be made of it. Cultivable areas, desirably located, may be worth more than \$100 an acre.

## LAMOURE SILT LOAM

Lamoure silt loam consists of very dark grayish-brown or black smooth silt loam about 15 inches deep, underlain by drab heavy silt loam or silty clay loam which, with increasing depth, grades to more gray or mottled gray, drab, and brown heavier-textured clay loam or silty clay. The subsoil contains sufficient lime to effervesce with acid, and in this way only differs from Wabash silt loam.

The largest area of this soil occurs in association with Wabash silt loam in sections 8, 9, and 10 of Spring Township. A large part of this area is under cultivation.

Lamoure silt loam is not of great importance agriculturally in Cherokee County because of its small extent. It is, however, potentially very fertile and where desirably located gives good yields. It has the same value as Wabash silt loam, and the means of managing and improving that soil apply equally well to this one.

## LAMOURE SILTY CLAY LOAM

The topsoil of Lamoure silty clay loam has a black color and ranges in texture from silty clay loam to tough silty clay. The depth ranges from 15 to 18 inches. The upper part of the subsoil is dark drab or gray silty clay. This is underlain by slightly mottled gray or drab clay which in many places contains iron stains and concretions and in some places shows some mixture of brown or yellow. The subsoil, and in places the subsurface layer, contain calcareous material, frequently in the form of concretions.

Lamoure silty clay loam occurs in several areas, one along Gray Creek north of Larrabee, one on the Little Sioux River bottom lands in section 9 of Spring Township, and others along tributaries of Maple River in Afton and Pitcher Townships. Areas of a heavier phase, from 80 to 120 acres in extent, are in section 34 of Spring Township, section 20 of Liberty Township, sections 20 and 21 of Marcus Township, and a smaller one is in sections 8 and 17 of Marcus Township.

Areas of this soil are flat or depressed. They occur, supposedly, in a former pond or lake area, and the soil is possibly of a semi-alluvial or lacustrine origin.

A part of the area in Liberty Township and a small area in Spring Township were under cultivation in 1924. The remainder is used for pasture or wild hay land. The soil is not naturally well drained, and unless good drainage can be established by artificial means the agricultural value is small. With the soil in its naturally drained state, fair yields might be obtained in favorable seasons but not consistently.

The establishment of good drainage is the first requisite to improvement. This must be followed by careful tillage operations to prevent puddling and clodding which impair the physical condition of the soil. It can not be worked under a wide range of moisture conditions. The use of manure and green manure plowed under would improve the physical condition and resultant yielding power of the soil by making it more mellow.

This soil has high potential fertility and if it could be reclaimed would be very productive under proper management.

The value, use, and management given for Wabash silty clay loam apply equally well to Lamoure silty clay loam.

#### SUMMARY

Cherokee County is in the northwestern part of Iowa. The total extent is 573 square miles, or 366,720 acres.

Cherokee County lies on a broad, gently rolling plain characterized by smooth, gentle slopes except on areas bordering Little Sioux River and a few of its tributaries where erosion has caused a rather steep surface. Little Sioux River and Maple River and their tributaries, Middle Fork Little Sioux River, and associated streams drain the county.

The mean annual precipitation is 28.73 inches and is favorably distributed for crop growth. The mean annual temperature is 46.1° F.

Agriculture in Cherokee County is typical of the Corn Belt and consists of raising the various field crops and of feeding a large number of hogs, beef cattle, and other animals.

Corn, oats, and forage crops are the principal crops grown. Forage crops include chiefly clover and timothy, sweet clover, and alfalfa. Other crops, such as small grains, coarse forage, truck crops, bush and tree fruits, pop corn, and sorghum, are grown to a small extent.

The raising of hogs is the principal livestock industry, followed in importance by the raising of beef cattle, dairy cattle, and sheep. The average size of the farms in Cherokee County is 190.9 acres. Forty and four-tenths per cent of the farms are operated by owners, 58.2 per cent by tenants, and 1.4 per cent by hired managers.

Land values range from \$50 to \$250 an acre, but most of the land is worth between \$150 and \$200.

Farming methods are very modern, and farms are generally well improved.

Twenty-three different soil types were mapped in Cherokee County. These represent 14 soil series.

The Marshall soils are dark-colored upland soils developed over loess. They are fertile and highly prized for general farming. Where Marcus silt loam occurs on more rolling areas, it has a little shallower surface soil than the Marshall soils. Where it occurs on level areas the surface soil is deeper. It sometimes requires artificial drainage.

Afton silty clay loam is a fertile soil, but lack of drainage is frequently a limiting factor in its producing power.

The Clarion and Carrington soils have developed over glacial drift. They are dark colored, well drained, and very productive.

The Dickinson soils are dark-colored soils underlain, at a depth ranging from 18 inches to 2 feet, by sand and gravel. Drainage is in many places excessive.

Lakeville sandy loam is a shallow dark soil lying immediately over sand and gravel. It has a lower value than the Dickinson soils.

Webster silty clay loam is a fertile dark-colored soil but is sometimes poorly drained.

The terrace soils of the county are included in the Waukesha, Judson, Sioux, and Bremer series. The first three series include

dark-colored fertile soils which are highly prized for farming. The Sioux soils resemble the Dickinson in having gravelly subsoils. In favorable seasons they yield fair crops, but they may be droughty. The Bremer soils are black and fertile but frequently require artificial drainage to be made productive.

The Lamoure and Wabash soils include the soils of the bottom lands in Cherokee County. The soils of both series are deep, dark-colored, fertile soils, very productive under favorable drainage conditions. Poor drainage is the limiting element in productivity, and artificial drainage can not everywhere be used because suitable outlets can not be obtained. These soils are subject to overflow at times of high water.



[PUBLIC RESOLUTION—No. 9]

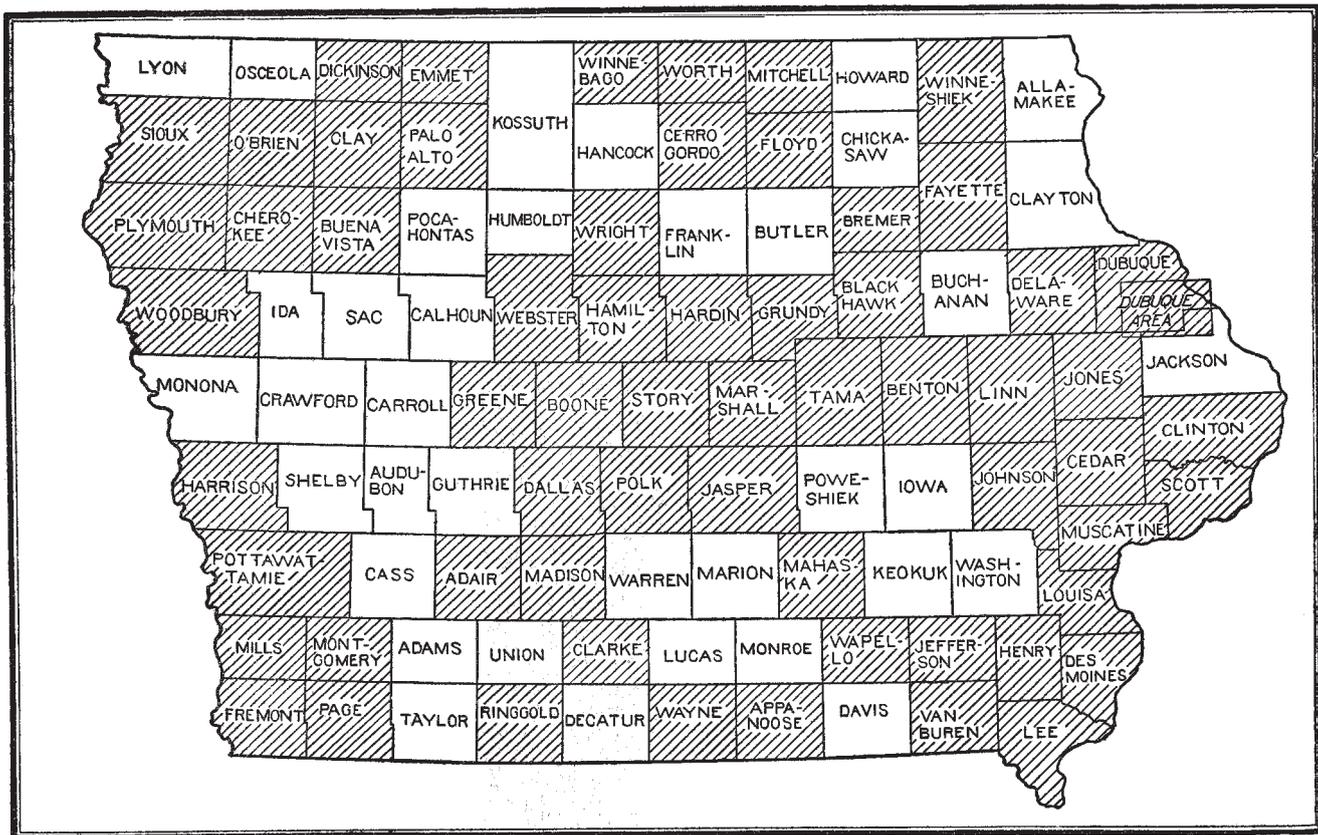
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

*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 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 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 Iowa, 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](mailto: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>.

## Nondiscrimination Statement

### Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

### To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at [http://www.ascr.usda.gov/complaint\\_filing\\_file.html](http://www.ascr.usda.gov/complaint_filing_file.html).

### To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed

complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to [program.intake@usda.gov](mailto:program.intake@usda.gov).

### **Persons with Disabilities**

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

### **Supplemental Nutrition Assistance Program**

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

### **All Other Inquiries**

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).