SOIL SURVEY OF FAYETTE COUNTY IOWA.

By A. H. MEYER, of the U. S. Department of Agriculture, In Charge, and H. J. HARPER and H. W. WARNER, of the Iowa Agricultural Experiment Station.—Area Inspected by THOMAS D. RICE.

DESCRIPTION OF THE AREA.

Fayette County is situated in the northeastern part of Iowa, in the second tier of counties west of the Iowa-Wisconsin line and in the second tier south of the Iowa-Minnesota line. It forms a rectangle 30 miles long and 24 miles wide, with the longer dimension north and south. The county contains 20 townships and comprises an area of 724 square miles, or 463,360 acres.

Fayette County presents two distinct topographical divisions. The first consists of an undulating prairie occupying the western and southern parts of the county. The materials here consist of glacial drift. Owing to the short geological time since the glacier withdrew, this region has not been deeply carved by its streams, and parts of it have been very little modified by erosion. Innumerable small areas are in a wet, marshy condition. The larger depressions with their fingerlike lobes separate the otherwise level prairie into a series of broad sinuous swells, which alternate with shallow grassy sloughs. At the heads the minor sloughs are concave depressions which mark the initial drainage courses of the larger streams. In the southwestern part of the county the landscape is relieved by a broad glacial valley through which the Little Wapsipinicon River flows and by another smaller parallel glacial valley about 6 miles east through which Otter Creek flows. In the eastern half of Harlan Township and the southern part of Center Township the generally level surface is broken by the erosion of the Volga River and its principal branches. The hills contiguous to these streams are low and the inclinations are gentle. Adjacent to Crane Creek and Little Turkey River in Eden Township the relief is stronger. South of Hawkeye low hills of gravel have retained their identity. A number of pahalike hills occur over the plain between Arlington and Fayette. A similar ridge extends along the northern side of section 14

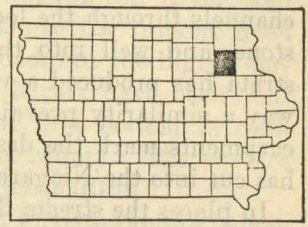

FIG. 33.—Sketch map showing location of the Fayette County area, Iowa.

in Windsor Township. Even though the surface changes are gradual and the slopes so gentle that there appears to be but little change in elevation, the region represents a maximum topographic relief of nearly 300 feet. Large bowlders 10 to 20 feet in diameter constitute a conspicuous topographic feature in parts of this region.

The second topographic division occupies the northeastern corner of the county and includes about one-fourth of the total area. In this region the drift is covered by a thick mantle of loess, and into this softer material the drainage channels have cut deeply and have extended their ramifications until the entire surface is dissected. Only the margin of the Kansan ice sheet extended over this region. It was too thin to be a very effective agent of erosion, and in many places the drift it left was entirely removed before the deposition of the loess. The broad features of the topography are therefore preglacial and are determined largely by the resistant layers of Niagara limestone. The surface dissection over the greater part of the area has been in the silty covering, the older formations being exposed only in the narrow, deeply cut stream channels. The broad plateau of which this region is a part has been eroded by Turkey River and its principal tributaries, Little Turkey River, and Otter Creek, and farther south by the Volga River. These streams have cut their channels through the loess, the Kansan drift, and the Niagara limestone, and well into the underlying shale. The erosion of these strata has produced a variety of surface features, but in a general way a similarity prevails along the larger streams. Prominent escarpments mark the descent toward the bottoms, where the stream has cut into the Niagara limestone.

In places the stream flows through gorges with walls of limestone. Where erosion has extended through the limestone into the softer shales the valleys tend to widen and the limestone escarpments on each side of the valleys recede. Gentle slopes occur along these exposures of shale between the alluvial lands and the limestone cliffs. In places the more rapid weathering of the shales has undermined the limestone and left it as overhanging shelves, or the limestone has fallen and lies scattered over the slopes and terraces as detached blocks.

With the exception of a small area in sections 2 and 3 of Auburn Township on the west and a strip about a mile in width bordering Clayton County, the region lying to the north of Turkey River is a thoroughly dissected plain. The streams have cut deeply into the Maquoketa bed, which immediately underlies the Pleistocene deposits over all of this area. The surface features are similar to those of the typical Loess-Kansan areas in other parts of the State, with the exception that here the superficial materials are underlain by nonresistant beds which have permitted even the smaller streams to cut

deeper channels than is usual where the materials are more indurated.

On the south side of Turkey River, for a distance of from one-half to 1½ miles, the surface rises with a rather gradual slope to a height of about 100 feet above the top of the terrace that bounds the flood plain. Over this region the streams have developed topographic features similar to those found north of the river. This strip is covered by the more or less interrupted escarpment of the Niagara limestone 30 to 60 feet in height. The resistant Niagara bed determines the sky lines over all that portion of the county lying to the east of St. Lucas, West Auburn, and West Union, and to the north of the town of Arlington and the Iowan drift border.

A double terrace, the upper formed by the Niagara and the lower by the indurated layer of the middle Maquoketa beds, is a characteristic feature of the landscape south of the Turkey River and also in the extreme eastern and extreme western parts of the area north of the river, where the outliers of Niagara limestone cap the highest points. The total relief in this topographical division is about 400 feet.

There are some flat alluvial terraces in the county, but they are of small extent and occur chiefly along the Turkey River, Little Turkey River, Crane Creek, Volga River, Little Wapsipinicon River, and Otter Creek. They lie from 5 to 25 feet above the present flood plains. The terraces are prevailingly uneroded, but the higher terraces along the Turkey and Little Turkey Rivers have been considerably modified by erosion. The area of first bottom is comparatively small, considering the area of the county. The surface of the bottomland is level, with only slight inequalities.

There are three distinct drainage systems in Fayette County, whose master streams are Turkey River, Maquoketa River, and Wapsipinicon River.

The Turkey River and its principal tributaries, Little Turkey River, Otter Creek, and the Volga River, drain about three-fourths of the surface of the county. Crane Creek is the most important affluent of the Little Turkey River in Fayette County. The Wapsipinicon River receives the run-off of about 120 square miles in the southwestern part of the county. The chief streams of this system in the county are Little Wapsipinicon River and Otter Creek. The Maquoketa River and small tributary streams drain about 50 square miles in the southeast. All the first bottoms are overflowed annually, and during high waters the low terraces are inundated.

The upland has an average elevation of about 1,150 feet above sea level. The highest determined point in the county, 1,285 feet, is in the northwest quarter of section 14, Windsor Township. The lowest point in the county is where the channel of the Turkey River crosses

the Fayette-Clayton County line, at an elevation of 775 feet above sea. The extreme difference in elevation is thus 510 feet.

Fayette County was established in 1837 and was named in honor of the French Marquis de La Fayette. It embraced the greater part of northern Iowa, nearly all of the present State of Minnesota, and all of the Dakotas east of the White Earth and Missouri Rivers, and covered approximately 140,000 square miles. In 1847 it was reduced to its present size, and finally organized in 1850 with West Union as the county seat. The first permanent white settlement in Fayette County was made in section 1, Smithfield Township. The early settlers were largely from eastern States. Later there was an influx of Germans, Scandinavians, and Irish, with a few Bohemians. In 1852 a colony of negroes settled in Westfield Township. At present there are only a few foreign-born persons in the county.

The total population of Fayette County in 1920 was 29,251, of which 74.5 per cent is classed as rural. The density of the rural population is 30.1 persons to the square mile, and the rural settlement is uniformly distributed throughout the county. There has been a slight decrease in the total population of the county since 1900.

Oelwein, with a population of 7,455, is the largest city in the county. It is an important junction point of the Chicago Great Western Railroad and has large railroad shops. A creamery and several elevators are also located here. West Union, the county seat, is second in size and has a population of 1,777. It has a creamery, cement factory, and grist mill. The Upper Iowa Wesleyan College is situated at Fayette, which is the third largest city in the county. Arlington is largely a distributing point for farm implements and supplies. Clermont, on the Turkey River, has a flouring mill, hydroelectric plant, creamery, brick and tile plant, cement factory, and grain elevator. A canning factory and creamery are located at Elgin. Hawkeye, Waucoma, Maynard, Wadena, Westgate, Eldorado, St. Lucas, Randalia, Alpha, Lima, Oran, Donnan and Brainard are towns of local importance. Dams for developing water power are located at Waucoma, Alpha, Eldorado, Clermont, and Fairbank.

Fayette County is well supplied with railroads, no point being more than 8 miles from a station. The Chicago Great Western Railroad crosses the southwestern part of the county and gives direct communication with Chicago and the Twin Cities. A main line of the same system extends west from Oelwein to Omaha, and another southwest to Kansas City, giving direct access to the markets of those cities. The Marion and Calmar line of the Chicago, Milwaukee & St. Paul Railroad traverses the county centrally from southeast to northwest and connects with the main line at Jackson Junction. The Decorah branch of the Chicago, Rock Island & Pacific Railroad crosses centrally from southwest to northeast. From West Union

the West Union line of the Chicago, Milwaukee & St. Paul extends southeast.

There are many excellent graded roads through the county, including a few automobile roads. The roads in the prairie region follow section lines or land lines, but in the loessial area they detour along gentler slopes. As there is an abundance of gravel, some of the main roads have been graveled, but the minor roads receive little attention. The more important highways are dragged as soon after each rain as the condition of the ground permits.

Chicago, the Twin Cities, and Kansas City constitute the principal markets for the farm products of Fayette County. Cattle, hogs, and sheep are generally shipped to Chicago, though some stock cattle are shipped to Kansas City. Most of the horses are shipped to northern Minnesota and Wisconsin and some to Chicago. The principal markets for poultry and poultry products are Chicago, Buffalo, and New York. In the local towns there is a small demand for dairy products, berries, and vegetables.

Rural mail delivery routes and telephones reach practically all parts of the county. Most of the public schools are well kept, and school facilities are accessible to all communities.

CLIMATE.

The mean annual rainfall as recorded at Fayette is 34.24 inches. From 60 to 70 per cent of the rainfall occurs during the growing season, from April to September, inclusive. About 40 per cent falls during the months of May, June, and July, with the maximum during May. November, December, and January are the driest months, with a total precipitation of 4.35 inches. Most of the summer rainfall occurs in the form of thunder showers, and precipitation is very heavy within short periods of time, ranging from 1 to 6 inches during single storms. The rainfall in May and June usually is well distributed, and droughts in these months are practically unknown. In July and August the rainfall is not so favorably distributed and periods of drought may occur. The average annual snowfall is about 30 inches. Little snow falls before December or after March.

The mean annual temperature is 44.8° F. January and February are the coldest months, with a mean temperature of about 15.5° F. July is the warmest month, with a mean of 72.1° F. The lowest temperature recorded at Fayette is —35° F. in February and the highest is 103° F. in July. The average date of the first killing frost in the fall is September 27 and that of the last in the spring May 11. The date of the earliest recorded killing frost in the fall is August 30 and that of the latest recorded in the spring June 12. There is an average growing season of about 140 days, which is sufficiently long to mature all the ordinary farm crops.

In the following table are shown the more important climatic data as compiled from the records of the Weather Bureau station at Fayette:

Normal monthly, seasonal, and annual temperature and precipitation at Fayette.

(Elevation, 1,003 feet.)

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1894).	Total amount for the wettest year (1902).
	°F.	°F.	°F.	Inches.	Inches.	Inches.
December	20.9	57	−27	1.53	1.45	2.76
January	13.5	51	−32	1.24	1.08	.82
February	17.4	59	−35	1.76	.35	1.48
Winter	17.2	59	−35	4.53	2.88	5.06
March	30.6	84	−15	2.04	3.28	2.27
April	46.4	93	5	3.09	3.78	1.13
May	58.0	91	25	5.06	1.91	15.59
Spring	45.0	93	−15	10.19	8.97	18.99
June	66.8	98	35	4.71	1.80	8.81
July	72.1	103	42	3.96	.21	9.07
August	69.6	101	33	3.42	1.44	4.92
Summer	69.5	103	33	12.09	3.45	22.80
September	61.3	100	27	3.39	2.08	3.86
October	48.7	85	10	2.46	3.37	1.47
November	32.7	75	− 3	1.58	1.26	2.13
Fall	47.5	100	− 3	7.43	6.71	7.46
Year	44.8	103	−35	34.24	22.01	54.31

AGRICULTURE.

Originally the smooth upland of Fayette County was covered with a luxuriant growth of prairie grasses, while the hilly Kansan drift plain was for the most part heavily forested with various species of oaks, maple, elm, hickory, walnut, cherry, basswood, cottonwood, ironwood, pine, cedar, and willow. Openings occurred throughout the forested region.

The early settlers established themselves on the timber-covered areas on account of the availability of building material and fuel, and because of the protection from the fires which swept the prairies annually. The pioneers depended for their subsistence largely on the killing of game, and the cultivation of land was attempted only in a small way. For many years progress was slow, wheat, a little

oats, and later some corn, being the main crops. The failure of the wheat crop in 1870 brought about a sudden change in the type of agriculture. More clover and timothy were grown, and the raising of cattle, hogs, and horses became a permanent feature of the agriculture. Creameries and cheese factories sprang up as the dairy herds increased. The building of railroads, beginning in 1872, developed the agricultural resources of Fayette County at a rapid pace. To-day most of the farmers are thrifty and prosperous. The dairy industry, the raising of hogs and cattle, and the feeding of beef cattle doubtless have been important factors in the progress, but the improved conditions are due chiefly to better methods of handling the soil.

In 1879 corn was the most important crop. It was grown on 66,663 acres, as compared with 50,485 acres in wheat. Oats were grown on 35,543 acres. Barley occupied 3,340 acres, buckwheat 686 acres, and rye 333 acres. Hay was cut from a total of 50,301 acres. The orchard products were valued at $12,295, the market-garden products at $754, and the forest products at $80,767.

Owing to the failure of wheat, the area devoted to corn increased to 77,181 acres by 1889, and the area devoted to oats increased to 57,530 acres, while the area in wheat decreased to 1,435 acres. Hay was grown on 85,431 acres, barley on 1,236 acres, buckwheat on 1,147 acres, and rye on 654 acres. Potatoes were reported on 2,083 acres, and flax on 1,060 acres. The market-garden products and small fruit had a total value of $5,061.

From 1889 to 1899 there was a material increase in the acreage of the major crops and in most of the minor crops. In 1899, 96,879 acres were devoted to corn, 75,562 acres to oats, and 3,938 acres to wheat. The acreage in barley had increased to 7,673 acres, of rye to 758, while the acreage of buckwheat was practically the same. Flax was reported on 2,399 acres, an increase over the previous census report. Nearly 2,367 acres were devoted to potatoes, 98 to sorghum, 33 acres to beans. There had been a material reduction in the hay crop. Tame grasses were reported on 54,014 and wild grasses on 15,569 acres. There were 52,984 apple trees in the county in 1899, 1,560 grape vines, and a total of 147 acres was reported in small fruit. The animals sold and slaughtered in that year were valued at $1,521,507; the dairy products excluding those used on the farms, at $517,890; and all poultry raised, at $125,765; eggs produced amounted to 1,315,690 dozens. From 1899 to 1909 there was a material reduction in the acreage of the chief crops, corn, oats, and hay, and the minor crops, buckwheat, rye, flaxseed, potatoes, and sorghum.

At present cereal production is the chief type of farming in Fayette County. Dairying and the raising of hogs and other live stock are important industries. Corn, oats, mixed timothy and

clover, timothy alone, and barley are the chief general farm crops. The tendency at present is to grow less corn and more hay.

Corn is the most extensively grown crop and the principal source of income. The census of 1920 shows corn grown on 84,924 acres, with a production of 3,279,519 bushels, giving an average yield of 38.6 bushels per acre. There are about 4.8 acres of corn to every 5 acres of all other cereals combined, and about one-fifth of the total acreage in farm land in Fayette County is devoted to the production of corn. The crop is grown on practically all the soil types of the county, but does best on the Tama silt loam. White and yellow dent varieties and some Bloody Butcher are the leading varieties. Practically all the corn is check-rowed. About 85 per cent of the corn is fed to hogs and cattle and the remainder is sold to local elevators. About 60 per cent of the corn is cut and shocked for feed, and the rest is pastured after the ears have been removed. About 7 per cent is cut for silage. There are now (1919) about 650 silos in the county and the number is gradually increasing. The report of the State board of agriculture for 1918 gives 599 silos, with 49,051 tons of silage put up.

The acreage in oats compares favorably with that in corn. The 1920 census reports 77,833 acres in oats, with an average yield of 33.3 bushels per acre. About 75 per cent of the crop is fed to horses and mules, and the remainder is sold to local elevators. Early and medium early varieties are grown. Smut is quite common in this county and causes an annual loss of many thousands of dollars. It can be easily controlled by the formalin treatment.

Barley is a fairly important crop, and in 1919 6,165 acres were devoted to it with an average yield of 23.5 bushels per acre. About 50 per cent is fed to poultry and other stock and the remainder is sold.

The other cereal crops are unimportant from a production standpoint. In 1919 there were 3,681 acres in wheat, 516 acres in rye, 35 acres in flax, and 464 acres in buckwheat. Obviously not nearly enough wheat is produced for home use.

Timothy and clover mixed constitute the most important hay crop, occupying 36,248 acres in 1919. The 1920 census reports the total area of cultivated grasses as 54,659 acres, with an average yield of 1.57 tons of hay per acre, and 11,537 acres in wild grasses cut for hay, with an average yield of a little more than 1 ton per acre. Clover and timothy do well, and as a rule little difficulty is experienced in getting a stand. In the 1920 census there are reported 14,106 acres in timothy alone, 23,813 acres in coarse forage (including corn cut for forage, kaffir, sorghum, and root crops), 2,688 acres in other tame grasses, 1,602 acres in clover alone, and 140 acres in grain cut green. Considerable timothy and some red-clover seed are produced. In 1918, according to the report of the State board of agriculture, 5,366

acres were devoted to the production of timothy seed, with an average yield of about 5.3 bushels per acre. This acreage was about 20 per cent greater in the season of 1919. Only 72 acres of red clover were reported harvested for seed, with a total yield of 47 bushels. About 80 per cent of the hay is fed to work stock and cattle, and the rest is shipped to market.

The report of the State board of agriculture for 1918 shows 138,953 acres in pasture, 527 acres in crops not enumerated, 1,780 acres in waste land not utilized for any purpose.

The growing of alfalfa is in an experimental stage. Some farmers report success with the crop and others failure, but on the whole it seems that with liming and inoculation the crop can be successfully grown. The 1920 census reports 15 acres in alfalfa in 1919, with a total yield of 25 tons.

In the vicinity of Elgin sweet corn is grown for canning. The State board of agriculture reported 574 acres in this crop in 1918, with an average yield of 3.24 tons per acre. The waste at the factories is taken home by the farmers and fed directly to live stock or stored in silos for winter feed. Sweet corn brought an average price of $12 a ton in 1919. Stowells Evergreen and Clark Early are among the main varieties planted.

The 1920 census reports 132 acres in sorghum, with a total production of 6,841 gallons of sirup. It is planted in small patches and the sirup is largely for home use.

A small acreage in the vicinity of West Union is devoted to cigar tobacco, similar to that grown in Wisconsin, and used chiefly for binder. It does well, the yields ranging from 1,200 to 1,600 pounds per acre. The land is heavily fertilized with cottonseed meal and sodium nitrate. According to the grower, the crop is very profitable on the loess soil. A few onions are grown on a commercial scale in various parts of the northeastern section of the county. Cantaloupes and watermelons do well on the sandy soils of the county.

Potatoes are reported on 1,665 acres in 1919, and the average acreage yield is given as 44 bushels. Normally enough potatoes are raised to supply the home demand and a few are shipped to outside markets. In the season of 1919 the crop was short, and about 50,000 bushels had to be shipped in.

Trucking receives little attention from a commercial standpoint, owing to the distance to markets. Some vegetables are grown near the cities and villages to meet the local demand. The 1920 census reports 605 acres in vegetables other than potatoes, and the aggregate value of the production including potatoes amounted to $419,712.

Most of the farmers have small orchards of apples, plums, and pears. These fruits do well when properly cared for, especially in the hilly section of the county. There are only a few commercial

orchards. The 1920 census reports 50,075 apple trees, with a total production of 9,082 bushels; 5,772 plum trees, with a total production of 445 bushels; 2,308 cherry trees, with a total production of 164 bushels; and 27 peach trees. Small fruits do well. In 1919 there were 105 acres in strawberries, 18 acres in blackberries, and 65 acres in raspberries. The value of fruits and nuts is given by the 1920 census as $69,016.

According to the same authority the county produced honey and wax to the value of $15,556 in 1919.

Dairying is receiving increased attention. Most of the farmers keep a few cows, chiefly Shorthorn grades. On the dairy farms the Holstein is the popular breed. There are a few herds of Brown Swiss and Guernseys. The number of cows kept per farm varies from 3 to 10, with 20 or more in the dairy herds on farms in the vicinity of cities. Most of the dairying is carried on in summer months, and in winter the supply of milk runs very low. The cream is separated on the farms and is delivered to creameries situated mostly in the towns and cities of the county. The 1920 census reports 24,858 cows and heifers kept for milk, and reported the total value of all dairy products, excluding home use of milk and cream, as $1,630,746.

There are some herds of beef cattle, mostly in the northeastern part of the county, where there are large areas of land suited only for pasture. The cattle are mainly of Shorthorn, Hereford, and Angus breeds or grades, though there are a few herds of Red Poll. Very few cattle are shipped in for feeding, but some are shipped out every year. On most farms a few head are fattened each year and sold when prices are most favorable. The 1920 census reports 25,311 beef cattle of a total value of $1,268,511.

Owing to the low price of horses, little attention has been paid in recent years to the breeding of farm and draft horses. Nevertheless many farmers raise one or two colts a year, and a few as many as four or more. In this way enough colts are raised to replace work stock and to give an occasional team for sale. The Percheron, Belgian, and Shire are the favorite breeds. About 5 per cent of the colts are mules. The 1920 census reports a total of 17,739 horses and 377 mules of all ages on the farms January 1.

There are only a few flocks of sheep in the county and they are largely confined to the rougher areas. The Shropshire and Cotswold are the principal breeds. According to the 1920 census there were 9,355 sheep on the farms valued at $117,934.

The raising of hogs is the most important live-stock industry. Nearly every farmer fattens from 30 to 40 hogs annually and some as many as 100. Pork production is profitable at present (1919)

prices, though the profits are somewhat reduced by cholera. Nearly every farmer butchers enough hogs to supply the home with meat the year round. Poland-China, Duroc-Jersey, and Chester White are the leading breeds, with a few herds of Hampshire and Berkshire. According to the 1920 census, 83,514 hogs were on the farms January 1.

The total value of poultry and eggs produced in 1919 was $1,199,450. The 1920 census reports 442,912 chickens January 1, 1920, and reports the egg production as 2,054,188 dozens for the season of 1919. The eggs and poultry are largely handled by the produce houses in the various towns and cities of the county.

The adaptation of soils to crops is not considered closely in the farming operations. It is generally recognized that corn is best adapted to the well-drained black upland soils, and hay and pasture grasses to the broken areas of Fayette silt loam, but there is little difference in the type of farming followed on the different soils.

Definite crop rotations are followed by only a few farmers. The general tendency is to keep the same field in corn for 2 years, in oats 1 year, and in clover and timothy 1 year and occasionally 2 or 3 years. A large number of farmers still plant the same crop on one field for a series of years.

As a whole, the tillage operations in Fayette County are thorough, as the high price of land makes efficiency necessary. About 60 per cent of the farm land is plowed in the fall and 40 per cent in the spring. Oat stubble and other stubble land commonly is plowed in the fall. Corn land is plowed in the fall if time permits, otherwise it is not broken until just before planting. Where oats follows corn only 50 per cent of the land is plowed, the rest being disked. It is necessary to exercise greater care in the preparation of the seed bed on the heavier soils than on those of lighter texture. Considerable barnyard manure is used, usually being applied on sod ground, but the use of commercial fertilizers is not common. According to the census, the total expenditure for fertilizers in the county in 1919 was $14,065, 209 farmers reporting their use. A few farmers are using lime to correct the acidity of the land, and the State officials are advocating its more extensive application where the conditions indicate acid conditions.

The farm buildings, especially the houses, are for the most part well painted and kept in good repair. There are many large, modern houses, but the barns are usually small. Most of the boundary fences and cross fences are of barbed wire, though woven wire is coming into more general use.

The work stock consists mainly of heavy draft horses. There are quite a number of gasoline tractors in the county, and their use is apparently being rapidly extended. On most farms the 4-horse

hitch is used. The farm equipment consists of gang or sulky plows, walking plows, disk harrows, straight-tooth harrows, drills, corn planters, mowing machines, cultivators, rakes, hay loaders, tedders, and binders. Thrashing machines are available in all sections of the county.

Owing to a shortage of labor it is very difficult to obtain efficient help. The usual wage paid is $60 to $75 a month with board and washing. Most of the laborers are hired from March to October or December, but a few farmers employ by the year, as it is easier in this way to get efficient hands. Where they are hired only to October 1 the laborers are paid additional rates of 7 to 9 cents a bushel for husking corn. The daily wage for transient labor during corn cultivating and harvest time ranges from $4 to $6 a day with board. Under these conditions most of the farm work is performed by the farmers and their families.

Approximately 94.4 per cent of the total area of Fayette County is in farms and 76.9 per cent of the farm land is improved. The average size of the farm is 138.6 acres. Since 1880 the average size has increased 12.6 acres. The 1920 census reports 62.1 per cent of the farms were operated by owners, 36.9 per cent by tenants, and 1 per cent by managers.

Both the cash and share systems of renting, as well as a combination of the two, are followed. Cash rents for general farming land range from $7 to $10 an acre, depending on the soil. Where land is leased on shares the tenant furnishes one-half of the implements and stock and receives one-half the product. In the case of combined cash and share renting, the permanent pasture and woodlots are rented for cash and the grain and hay lands on shares. In any case the tenant is required to deliver the landowner's grain to the elevator. In 1900 the average assessed value of all farm land was $34.17 an acre, and by 1910 it had risen to $60.43, and the 1920 census reports the value of land per acre as $140.92. Of the total value of all farm property 70.7 per cent is represented by the land, 16.2 per cent by the buildings, 4.4 per cent by implements, and 8.7 per cent by domestic animals. At present (1919) the selling price of farm land ranges from $50 to $300 an acre, depending on the soil, improvements, and location.

SOILS.[1]

The soils of Fayette County belong to two of the broad soil groups of the world: (1) Those developed under excess of moisture, (2) those

[1] Fayette County adjoins Bremer County on the west. In certain cases the soil maps of these counties do not agree along the boundaries. This is due to changes in correlation resulting from a fuller understanding of the soils of the State. The Fargo loam in Bremer County has been changed to Clyde silty clay loam in this county. The Bremer sandy loam in Bremer County is divided into the O'Neill loam and the Plainfield loam. Meadow, in Bremer County, has in this area been mapped with the Wabash loam or the Cass fine sandy loam.

developed under optimum humid conditions. They are humid soils, therefore, and consequently are free from accumulations of soluble salts. Their carbonates have been leached out, even in cases where the parent material was highly calcareous. The soil profile is a relatively simple one. In the first group it consists of a surface horizon of dark-colored, usually black, material ranging from 6 to 24 inches in thickness, underlain by a slightly heavier horizon of unequally oxidized and aerated material grayish or bluish gray in color, with spots of brown or yellow. This group of soils, not an important one in Fayette County, comprises the various members of the Clyde and Bremer and the heavier members of the Wabash and Cass series.

The second group is composed of two subgroups, one including dark-colored soils, the other light-colored soils.

The soils of the former subgroup consist of a dark-colored, usually dark-brown or black, surface horizon ranging ordinarily from 6 to 18 inches in the virgin soil, with a rather well marked granular structure. Beneath the surface horizon is a brown to yellowish-brown, uniformly oxidized horizon, somewhat heavier than the surface. The natural surface and subsoil drainage is good. This subgroup includes the various members of the Carrington, Tama, O'Neill, Thurston, Jackson, Waukesha, and the lighter textured or well-drained members of the Wabash series. These soils cover by far the larger part of the area of the county and comprise the predominant producing soil units of the county.

The second subgroup of the well-drained soils consist of light-colored soils with profiles essentially like those of the first subgroup, a light-colored, usually brown or grayish-brown surface horizon replacing the dark-colored surface horizon in the first subgroup. In some cases, however, a thin grayish horizon, an inch or two in thickness, may overlie the principal surface horizon. This subgroup of soils includes the various members of the Lindley, Fayette, and Plainfield soils. They were developed under forest cover, while the soils of the first subgroup, or what we might call the Carrington group, were developed under grass cover.

In the definition and classification of the soils of the United States by the Bureau of Soils they are first grouped according to their soil characteristics, these consisting of the number and character of the horizons in the soil profile. From this point of view, therefore, there are three groups of soils in Fayette County, which may be designated as the Clyde group, the Carrington group, and the Lindley group.

The soils of each of these groups are further differentiated according to the source, character, and processes of accumulation of the material from which the several soils were developed.

In the following pages a description of these factors is given, with a listing of the soils derived from each of the groups or classes of

soil material, followed by a short description of each of the soil series.

The soil materials from which the upland soils of Fayette County have been developed fall into three divisions based upon the processes by which these materials were accumulated in the several parts of the county. These processes coincide with, viz, the loessial, the glacial, and the residual deposits.

The loess forms a mantle over the surface of the Kansan drift in the northeastern part of the area, except where it has been removed by erosion near the channels of streams. In its original unweathered condition it consists of a yellow, unconsolidated, homogeneous fine-grained material. Geologically, it is a very recent deposit, apparently contemporaneous with the Iowan drift sheet. It is largely unleached of its lime constituents, except in the soil section, and seldom shows more signs of oxidation in one place than another. Two types of soils are derived from this material, one a dark-colored prairie soil, called the Tama silt loam, and the other a light-brown soil developed in the timbered areas, known as the Fayette silt loam. The glacial drift consists of three sheets known as the pre-Kansan, Kansan, and Iowan sheets. The loess sheet was deposited later. The maximum thickness of the glacial deposits is more than 130 feet. The deposits vary greatly in thickness from place to place.

The pre-Kansan drift is greenish blue when wet or gray blue with a greenish cast when dry. Greenstone and vein-quartz pebbles predominate in the clay matrix. It is exposed in a railroad cut near Oelwein and, as far as known, does not give rise to any soil material. It is overlain by a layer of carbonaceous matter which has accumulated from plant decay through a long series of years. The Aftonian surface shows a distinct soil line which supported a luxuriant growth of mosses and coniferous trees. This soil horizon is buried by more recent glacial débris and has given rise to no present soil material as far as known.

The Kansan drift rests on the Aftonian and forms a large proportion of the area of Pleistocene deposits in Fayette County. Over all but the northeastern part of the area the Kansan material is deep, reaching a maximum known thickness of 130 feet. The material where exposed in thick beds is a bluish clay containing numerous bowlders varying in diameter from 1 or 2 to 10 or 12 inches, with a few larger. The larger ones are usually of reddish-gray granite and quartz. Many of the smaller ones are of a dark-colored, fine-grained trap known as greenstone. Fragments of limestone also are common. Where exposed the upper part of this drift has been leached of its lime content and the material has been oxidized to a reddish-brown color to a depth of 2 or 3 feet. This red zone grades downward to a less perfectly oxidized, yellow-colored bowlder clay,

which in turn merges gradually into the unchanged blue drift material. The uppermost layer of the Kansan drift shows evidence of having been very long exposed to erosion and to the leaching and oxidizing action of the atmosphere before it was covered by later deposits.

Beds of Buchanan gravel are exposed at a number of points in Fayette County. The deposits of Buchanan gravel present two phases. All of the beds known in Fayette County belong to the valley phase. The beds vary from 3 to 4 feet to more than 20 feet in thickness. They occur along old valleys, lowlands, and over upland areas. The deposit, consisting of red sand and small pebbles, is much weathered and strongly stained with iron.

The Iowan drift covers nearly two-thirds of the area of Fayette County. The northeastern part was not covered by this sheet, the eastern boundary, following a sinuous line of loess-covered hills, is easily traced. The drift left by the Iowan ice sheet is very thin, and in many places very slight erosion has exposed the oxidized zone of the Kansan deposits. The Iowan drift consists of a yellow clay which carried numerous bowlders of coarse gravel composed of gray or pink granite. The Iowan surface is practically uneroded, unbleached, and unoxidized, and its bowlders show but slight decay. A characteristic feature of this drift is the number of large bowlders strewn over the surface. Dimensions of 10 to 20 feet are common.

The glacial drift has weathered into three dark-colored series, the Carrington, the Thurston, and the Clyde, and one light-colored series, the Lindley.

The Iowan gravels are deposits of unweathered gravels of Iowan age, appearing in the upper part of a gravel terrace exposed at various points along the Turkey and Little Turkey Rivers. The gravels have a fresh unoxidized appearance.

The drift sheets were laid down unconformably over the broad surface of the rocks of the Maquoketa, Magna, and Delaware stages, burying them to a depth which in places reached 130 feet. The preglacial erosion had developed deep valleys over the entire county, which are still undisturbed in the northeastern part of the county.

The bedrock of Fayette County is represented by the Devonian, Silurian, and Ordovician systems.[2] The rocks of the Devonian belong to the Meso-Devonian series and are subdivided into the Cedar Valley and Wapsipinicon stages. The Wapsipinicon is represented by the Upper Davenport and Lower Davenport substage. The Silurian rocks belong to the Niagara series and to the Delaware stage. The Ordovician rocks belong to the Trenton series and are subdivided into the Maquoketa and Trenton stages. The bedrock consists largely of limestone and shales. The Niagara limestone outcrops

[2] Iowa Geol. Survey, Vol. XV. Geology of Fayette County, by T. E. Savage.

in narrow ledges in the southeastern part of the county, but the small areas of soil derived from the decay of this limestone are not of sufficient size to be indicated on the soil map. They consist of two phases, one of which consists of incoherent grains of yellowish dolomite sand and the other of angular chert fragments imbedded with a small proportion of tough reddish-colored clay. The only residual soil of any agricultural importance is the Sogn clay loam in the northeastern part of the area. It is derived wholly or in part by weathering from the Maquoketa shale.

The terraces of Fayette County are not extensive. They consist largely of glacial terraces, known as Buchanan and Iowa gravels. The low terraces are more recent and are largely derived from silt and coarser material from the adjacent uplands. The O'Neill, Plainfield, Bremer, and Jackson series of soils are developed on the terraces.

The principal areas of alluvial soils occur along Turkey, Little Turkey, and Wapsipinicon Rivers and Crane and Otter Creeks. The soils are of recent origin and are constantly receiving additional sediments from the overflow waters of the streams. They largely represent reworked and redeposited loessial and glacial material. The alluvial soils are classed in the Wabash and Cass series.

The types of the Carrington series are characterized by dark-brown soils, with an average depth of 12 inches, underlain by a brownish-yellow friable clay loam. They are derived from glacial débris and have an undulating to gently rolling topography. Except in the smoother positions the drainage is good.

The Lindley series includes types derived through weathering from glacial till, with little or no modification by admixture of loess. The series is developed largely in the Central States, and consists mainly of timbered soils. The surface soil is generally brown. The subsoil is lighter colored, generally being brownish yellow. The topography is rolling to hilly.

The surface soils of the types of the Thurston series are dark brown. The subsoil is yellowish brown to brownish yellow or, occasionally, reddish brown. The subsoil is characterized by beds of sand or gravel. The types are excessively drained and droughty, and usually occupy a rolling to bumpy topography. In Fayette County they are derived from cross-bedded sand and gravel belonging to the Buchanan gravels.

The Clyde series includes types with dark-brown to black surface soil and a light-gray subsoil mottled with yellow and rusty brown. These soils have been developed from glacial drift under conditions of poor drainage and require artificial drainage before they can be farmed. They are noncalcareous, and show a strong acid reaction to litmus paper.

The surface soils of the types included in the Sogn series are black. The subsoil is light gray, mottled yellow, and rusty brown, and below 24 inches includes blue-green mottlings. The series is calcareous in the lower subsoil. On account of the flat topography the drainage in this area is poor. The Sogn soils appear to be derived from the underlying bedrock, with some admixture of glacial material.

The Fayette series includes types with prevailingly light-brown soils and a yellow to brownish-yellow subsoil. They are derived from loess beds always thick enough to form the subsoil as well as the surface soil, the underlying glacial till lying deep enough to have no marked influence on the general character of the soil. The topography is steeply rolling to hilly, and the surface drainage thorough. The soil material is noncalcareous.

The Tama series includes types with dark-brown to black surface soils and a lighter brownish yellow subsoil. In this series are placed the noncalcareous, dark-colored, upland loess soils, occurring in the eastern part of the prairie region of the Central West. The soils are distinguished from the Fayette soils by the large quantity of organic matter in the surface layer. The topography is undulating to rolling.

The types included in the O'Neill series are characterized by dark-brown to black soils and a lighter colored sandy to gravelly subsoil. They occupy glacial terraces and second bottoms along stream courses. The surface is level, but drainage is thorough owing to the porous subsoil. They normally lie above ordinary overflows.

The types in the Plainfield series are characterized by a brown soil and a light-textured sandy or gravelly subsoil. They differ from the O'Neill series in the color of the surface soil. The Plainfield occupies glacial and stream terraces. Both soil and subsoil have a low lime content.

The surface soil of the types in the Waukesha series is dark brown to black, and the subsoil yellow. These soils occur in areas of deep glacial drift. They are derived from water-assorted glacial débris deposited on broad filled-in valleys or as outwash plains and terraces. The topography is mainly flat to undulating. Drainage is good.

The Jackson soils are prevailingly light brown to brown and lower in organic matter than the Waukesha soils. The subsoil is yellowish brown and moderately friable. These soils are derived from water-assorted loess and glacial débris deposited in broad filled-in valleys or as outwash plains and terraces. The topography is mainly flat to undulating and drainage is good.

The surface soils of the Bremer series are dark brown to black, and the subsoil is bluish gray or light gray, mottled with yellow and rusty

brown. These soils occur on poorly drained second bottoms. The topography is flat to depressed.

The Wabash series includes soils prevailingly black, though in some places dark brown, and contain a high percentage of organic matter. The subsoil is brown or brownish gray. These soils occur in the first bottoms of streams in the Central Prairie States. The material is derived principally from the loess and associated soils of the region.

The surface soils of the types correlated in the Cass series are dark brown to black. The subsoil is lighter in color and in texture. These soils are alluvial and are most extensively developed in the bottoms of the Mississippi and Missouri Rivers and their tributaries. They occur in association with the Sarpy soils, occupying, however, areas which are somewhat less well drained, being subject to overflow. Between the high stages of the streams the drainage is good.

In the following pages of this report the soils of Fayette County are described in detail and their relation to agriculture discussed. The accompanying map shows their distribution in the area. The following table gives the name and the actual and relative extent of each type mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Carrington loam	195,264	42.1	Carrington sandy loam	2,688	0.6
Fayette silt loam	94,208	20.3	Thurston sandy loam	2,176	.5
Clyde silty clay loam	71,360	15.4	Sogn clay loam	1,856	.4
Tama silt loam	32,320	7.0	Bremer loam	1,792	.4
O'Neill loam	14,976	3.2	O'Neill sandy loam	1,664	.4
Lindley loam	8,000	1.7	Plainfield sandy loam	1,344	.3
Wabash silt loam	6,208	1.3	Jackson silt loam	1,024	.2
Wabash loam	5,376	1.1	Carrington fine sandy loam	1,024	.2
Lindley sandy loam	4,608	1.0	Waukesha silt loam	1,024	.2
Plainfield loam	4,544	1.0	Muck	192	.1
Cass fine sandy loam	4,032	.9			
Cass sandy loam	3,968	.9	Total	463,360	
Lindley fine sandy loam	3,712	.8			

CARRINGTON SANDY LOAM.

The surface soil of the Carrington sandy loam is a dark-brown to black loam, with an average depth of 12 inches. The typical subsoil is a brown clay loam which passes at 18 inches or deeper into a yellowish-brown clay loam, but over a larger proportion of the type as mapped in Fayette County the subsoil is a brownish-yellow to yellow, somewhat coherent sand. The typical soil is developed only in the area south of Fayette. A few bowlders occur in this type.

The Carrington sandy loam is best developed in the vicinity of Wadena, south of Fayette, and north of Elgin, but numerous small areas occur throughout the Iowan drift plain. In the latter position the type forms low hills and ridges, while in the Kansan drift area it occupies lower lying gently sloping positions adjacent to stream courses. The drainage is thorough and, where the type is underlain by sand, excessive.

The native vegetation consisted of prairie grasses common to the region, except in the areas derived from the Kansan drift, where it originally was forested. About 90 per cent of the Carrington sandy loam is under cultivation, and the remainder is largely in permanent pasture. No farms are confined entirely to this type. The yields of crops are lower than on the Carrington loam. Corn yields 25 to 35 bushels, oats 20 to 25 bushels, and clover and timothy 1 to 2 tons per acre. Only light farm equipment is required in cultivating this type. Liberal amounts of manure but no commercial fertilizers are used. Land values range from $100 to $150 an acre.

Owing to the open structure of the soil and in many places of the subsoil material, farm practice should include the liberal use of farm manure, the turning under of green crops, and the growing of leguminous crops to maintain the supply of organic matter.

CARRINGTON FINE SANDY LOAM.

The surface soil of the Carrington fine sandy loam is a dark-brown to black fine sandy loam, 10 to 12 inches deep, underlain by a brown fine sandy loam which passes abruptly into a grayish-yellow loamy fine sand. The soil is fairly high in organic matter, as is indicated by its dark color.

The type occurs in areas throughout the Iowan drift plain, but its total extent is small. The best developed area lies 1½ miles south of St. Lucas. Numerous patches were not mapped on account of their small extent. The areas occupy gentle slopes, low hills, and ridges.

Most of the Carrington fine sandy loam is under cultivation and devoted to the same crops as the Carrington loam. In seasons of favorable rainfall these crops do well, though ordinarily the yields are lower than on the Carrington loam.

The Carrington fine sandy loam works up into a very mellow seed bed under almost any moisture conditions. Liberal amounts of manure are added, but no commercial fertilizers are used. Land values range from $125 to $175 an acre.

For the improvement of the Carrington fine sandy loam it is recommended that green crops be turned under to increase the organic-matter content.

CARRINGTON LOAM.

The soil of the Carrington loam consists of a dark-brown loam, 10 to 15 inches deep. Beneath this there is a layer of light-brown heavy loam to clay loam and ranging in thickness from 4 to 6 inches, representing a zone of transition between soil and subsoil. The subsoil is a brownish-yellow gritty clay loam, which frequently becomes sandy in the lower part. The upper layer is not as compact as the lower subsoil. The change in texture and color from soil to subsoil is very gradual. The subsoil is slightly plastic when wet and open and moderately friable when dry. The soil is comparatively high in organic matter. From this typical description there is some variation both in color and in texture. On the flatter and depressed positions the color is darker, approaching black, and the texture ranges from a silty loam in some places to a light-textured loam in others, and there are several areas in the southwest corner of the county where the texture approximates a silty clay loam or clay loam. Here the topography is nearly level and the drainage is not as good as in the typical soil.

The Carrington loam covers nearly one-half the area of the county. It is the predominating soil in the western and southern parts, but its continuity is interrupted by numerous branching areas of Clyde silty clay loam.

The Carrington loam is undulating to gently rolling and is fairly well drained. In the areas along the larger streams the slopes are steeper and the type is subject to erosion. Elsewhere there is little danger of injuring this soil, owing to its relatively large supply of organic matter and to the fact that it is very retentive of moisture.

Originally the Carrington loam was prairie. About 90 per cent of it is now in cultivation, the rest being in permanent pastures and farmsteads. Corn is the most important cash crop, though about 80 per cent of all the corn produced is fed on the farm. Nearly one-half of the type is in this crop. The yield averages about 40 bushels per acre. A much higher yield is obtained where the cultural methods are best. Oats rank second to corn in acreage. The yield of this cereal ranges from 35 to 40 bushels per acre. About 70 per cent of the production is fed to work stock and the remainder is sold, chiefly to the local elevators. Barley is now a crop of secondary importance, Its acreage could well be extended. Ordinarily a yield of 30 to 35 bushels per acre is obtained. Wheat is not an important crop. Clover and timothy mixed yield 1½ to 2 tons of hay per acre. Considerable timothy is grown for seed, with very profitable returns. This type is not well adapted to potatoes.

The general practice on this type is to keep the land two years in corn, one year in oats, and one year in clover. The four-horse hitch

is used almost exclusively in the preparation of the seed bed. Under favorable moisture conditions a mellow seed bed can be easily obtained, and the soil will remain in good physical condition all summer, if it is not puddled by being stirred when too wet. Liberal amounts of barnyard manure are applied to the fields on this type.

The price of land of the Carrington loam type ranges from $150 to $250 an acre.

Over a large part of this type artificial drainage is essential to maximum crops. In general the land is not only productive but high in potential fertility. Only where a field has been devoted to the same crop for a series of years has the soil materially declined in productiveness. Deeper plowing is needed on most of the farms, and although the type is fairly high in organic matter, it is advisable to rotate cereal crops with legumes every four or five years in order to maintain the content of organic matter.

LINDLEY SANDY LOAM.

The Lindley sandy loam consists of 6 to 8 inches of light-brown sandy loam, low in organic matter and containing a noticeable amount of coarse sand, passing gradually into a subsoil consisting of a friable loamy sand or sand of brownish-yellow color.

This is a soil of small extent occurring as small, isolated areas along the slopes of drainage ways. The largest area lies 4 miles northwest of Clermont, and has a gently rolling topography; and in general those areas in the Iowan drift plain occupy moderately gentle slopes. On the contrary, areas in the Kansan drift are for the most part relatively steep and interrupted by rocky bluffs. Drainage is excessive and the land inclined to be droughty. In most cases the surface has been more or less modified by wind erosion.

Originally the Lindley sandy loam was forested; now about 75 per cent of the type is under cultivation, with the remainder largely in permanent pasture. Corn, oats, clover, and timothy are the staple crops. Corn yields 20 to 40 bushels, oats 20 to 35 bushels, and timothy and clover 1 to 2 tons of hay per acre. Watermelons and truck crops do well and potatoes of excellent quality are produced.

Land of the Lindley sandy loam is valued at $80 to $125 an acre. The steep slopes of this type should be kept in cover crops as much as possible to prevent loss of fertility through washing and gullying. In general, the soil is in need of organic matter. Apparently the type offers opportunities for the development of trucking and the growing of special crops.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lindley sandy loam:

Mechanical analyses of Lindley sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333326	Soil	0.2	15.3	22.5	48.3	3.2	8.0	2.4
333327	Subsoil	.6	18.1	22.3	45.6	2.2	1.1	10.0

LINDLEY FINE SANDY LOAM.

The surface soil of the Lindley fine sandy loam is composed of about 8 inches of light-brown fine sandy loam. This passes gradually into the subsoil which is in the upper part a brownish-yellow fine sandy loam to loamy sand, and below 30 inches a yellow fine sandy loam to loamy fine sand. Both soil and subsoil are open and friable. The type is influenced more or less by the adjacent loess areas, and frequently the surface soil carries a relatively high percentage of silt. As the color indicates, the soil is low in organic matter.

The total extent of the Lindley fine sandy loam is less than 6 square miles, the largest areas lie in the vicinity of St. Lucas and Lima. The type is developed in lower positions adjoining the loess-covered area and also on slopes along the streams. The topography ranges from rolling to steeply rolling and in places the surface is interrupted by rock bluffs. The drainage is excessive.

Most of the type was originally forested. About 75 per cent is now under cultivation, corn, oats, and hay being the most important crops. The yields are apparently a little larger than those obtained on the Lindley sandy loam.

Owing to its sandy texture, this soil is very easy to handle where the slopes are not too steep or rocky. Liberal amounts of barnyard manure are added, but nevertheless the type is in need of organic matter. It should be kept in cover crops on the steep slopes to prevent loss by erosion.

The selling price of this land ranges from $80 to $125 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lindley fine sandy loam:

Mechanical analyses of Lindley fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333317	Soil	0.6	12.8	26.6	49.0	1.5	6.9	2.6
333318	Subsoil	.3	12.5	25.4	47.5	2.0	9.8	2.6

LINDLEY LOAM.

The Lindley loam consists of a light-brown or brownish-gray loam, extending to a depth of 6 inches underlain by a brownish-yellow gritty clay loam subsoil, mottled with light gray below 30 inches. The surface soil is relatively high in sand and fine sand and includes some areas of soil of these textures. Bowlders are common on the surface. The content of organic matter is low. The Lindley loam is derived from both the Iowan and Kansan drift sheets.

A silty variation of this type is developed in the area 2 miles southeast of St. Lucas. It apparently has been more or less modified by material from the adjacent loess type.

On the Iowan drift plain the Lindley loam occurs in small, widely scattered areas, the more important lying north of Waucoma and along the Little Wapsipinicon River. It has developed in the timbered parts of the drift and occurs along stream courses or adjacent to forested areas of loess soils. On the Kansan drift plain it occupies a lower position adjacent to the larger streams. For the most part the slopes are gentle. The soil withstands drought well and is only locally subject to severe erosion.

Most of the type has been cleared and used for the production of the staple crops. Where the organic matter supply is maintained, corn, oats, barley, and clover and timothy do well, though the yields on this type are lower than on the better areas of the Carrington loam.

Land values on the Lindley loam range from $125 to $175 an acre.

For the improvement of this type the organic matter content should be increased by turning under green crops, growing legumes, and applying barnyard manure.

THURSTON SANDY LOAM.

The Thurston sandy loam in Fayette County includes a dark and a light colored soil. The areas occurring in the prairie regions have a black sandy loam surface soil 6 to 8 inches deep, and those in the timbered regions a light-brown sandy loam surface soil 4 to 6 inches deep. The subsoil in both regions consists of fine cross-bedded gravel of the Kansan beds. The color ranges from yellowish brown to rusty brown.

The Thurston sandy loam is inextensive, having a total area of less than 4 square miles. The forested soil is best developed southwest of Waucoma and occurs chiefly north of the Little Turkey River. The prairie soil is found south of the river, where it occurs in small areas.

The surface, which consists of alternating depressions and knobs can be described as bumpy.

Owing to the gravelly subsoil the type is extremely droughty, and only a small part of it is under cultivation. The yields of farm crops are low except in wet seasons. The uncultivated areas are used for pasture.

As agricultural land the type is valued at from $60 to $90 an acre. In many places the subsoil of the Thurston sandy loam furnishes excellent road-building material.

CLYDE SILTY CLAY LOAM.

The surface soil of the Clyde silty clay loam is a black silty clay loam, 15 to 18 inches deep, containing a noticeable quantity of fine sand. This passes gradually into a dark-gray plastic clay loam subsoil, mottled with yellow and rusty brown. Below 20 to 24 inches the dominant color changes to light gray and the mottlings appear somewhat brighter. Frequently at 30 inches a yellow gravelly sandy loam is encountered, which is the contact line between the Iowan and Kansan drift. The soil is very high in organic matter, is noncalcareous, and checks and cracks considerably during periods of dry weather. Bowlders of all sizes and cobblestones are abundant on the surface as well as within the soil mass.

The edges of the larger areas of the Clyde silty clay loam and numerous small narrow areas of the type are of a loam texture and represent the Clyde loam, but on account of their irregular occurrence and small extent were not mapped separately.

The Clyde silty clay loam is an extensive upland type. It occurs in the larger depressions and their fingerlike lobes, which reach practically every 40 acres in the Iowan drift plain. The topography is flat to depressed, and the drainage is very poor, owing largely to the closeness of the contact line of the Iowan and Kansan drift.

The original growth on this type consisted of slough grasses and other water-loving plants. Most of the type is in grass for hay and pasture, only about 5 per cent being under cultivation. On tile-drained land corn yields 40 to 60 bushels per acre and hay 2 to 3 tons. The grain crops make a rank growth and are apt to lodge. The unreclaimed land furnishes a low grade of wild hay and poor pasture.

The Clyde silty clay loam is considerably harder to handle than the Carrington loam, with which it is closely associated. Under favorable moisture conditions it works up into a mellow seed bed, but when worked too wet it bakes and forms intractable clods. The type receives little or no fertilization, though manure has a very beneficial effect.

The Clyde silty clay loam is valued at $100 to $175 an acre.

The establishing of efficient drainage, preferably tile drainage, is necessary to bring the Clyde silty clay loam under cultivation.

SOGN CLAY LOAM.

The Sogn clay loam is a jet-black, plastic clay loam, 15 to 18 inches deep, underlain by a rusty-brown plastic silty clay mottled with gray and yellow. Below 24 inches the subsoil becomes hard, which seems to be due to some cementing material, and bluish-green mot-

tlings appear. Bluish or bluish-green bodies are very common in the Maquoketa shale, and this soil is undoubtedly derived from it. There are no glacial bowlders on this type, and as far as could be ascertained the surface material contains practically no foreign material. Frequently seams of white sand are encountered in the second foot of the soil section. The soil as well as the subsoil has a granular structure, a characteristic of soils high in clay. The soil is very high in organic matter. The lower part of the subsoil effervesces with hydrochloric acid.

This type has an area of only 1,856 acres and is thus one of the least extensive soils of the county. It is confined almost entirely to the region northeast of Elgin, where a single area covers several sections. It occurs on three upland levels, the lower bench being about 150 to 200 feet above the flood plain, the second 20 feet higher, and the third 40 feet above the second. The topography is flat to gently sloping. The drainage is somewhat deficient.

The Sogn clay loam is used for the production of the staple crops common to the region. Corn and small grains do well in seasons of favorably distributed rainfall, but in wet seasons the returns are low. Corn yields from 30 to 50 bushels and oats from 20 to 40 bushels per acre. Clover and timothy thrive on the better drained parts of the type.

This is the most difficult soil in the county to handle and a heavy farm equipment is required to farm it properly. When cultivated too wet it clods, though under favorable moisture conditions the soil works into a mellow seed bed. Liberal amounts of barnyard manure are applied.

The value of this land ranges from $155 to $200 an acre, the price depending mainly on drainage conditions.

The land requires careful drainage to remove the excess seepage and surface water. This can best be accomplished by properly planned and constructed systems of tile drains.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Sogn clay loam:

Mechanical analyses of Sogn clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333305	Soil	0.3	4.8	10.3	24.6	6.1	37.7	16.4
333306	Subsoil	2.7	4.2	2.9	15.2	31.4	20.9	22.9

FAYETTE SILT LOAM.

The Fayette silt loam consists of a light grayish brown, friable, smooth silt loam, 6 to 8 inches deep, underlain by a brownish-yellow silt loam to silty clay loam subsoil, mottled with light gray in the

lower part. The subsoil is moderately friable and open, but in the second and third foot of the soil section the material is slightly heavier and more compact than the underlying silt, which is rather loose and open. Neither soil nor subsoil is highly calcareous. The soil varies considerably in depth and color with difference in topographic position. On the sharp divides and upper steep slopes a light yellowish gray variation occurs. On the tops of divides or on the lower slopes of hills and in forested areas the soil is brown, in places dark brown. In timbered areas the darker color is due largely to leaf mold, and soon disappears with cultivation. The typical soil contains very little black organic matter.

The Fayette silt loam is the most extensive loess soil in Fayette County. It is confined to the northern and eastern parts of the county.

The country occupied by this type has a thoroughly dissected topography and is excellently drained. The valleys are 300 to 400 feet deep and have rather steep slopes. Precipitous bluffs of limestone are common throughout this type and the topography is largely determined by the irregularities of the underlying rock. In general, it may be described as steeply rolling to hilly or broken. The type is subject to severe erosion, though the washing away of the surface material does not greatly change the character of the type nor render it useless for agriculture, as the subsoil is of practically the same character as the surface soil. The underlying rocks prevent destructive erosion on a large scale.

Practically all this type originally was forested with various species of oak, maple, elm, hickory, walnut, cherry, basswood, cottonwood, ironwood, scraggy pine, cedar, and willow. About 80 per cent of it is now devoted to the production of the staple crops. Corn does well, yielding from 35 to 45 bushels per acre. Oats yield from 35 to 40 bushels per acre and barley 25 to 35 bushels. Clover and timothy thrive, the yield of hay ranging from 1½ to 2½ tons per acre. In the vicinity of Elgin a very fine quality of sweet corn is grown on the Fayette silt loam. It yields from 3 to 5 tons per acre. Apples and small fruits do well.

Owing to the steep topography, the type is hard to manage notwithstanding its loose structure and favorable texture. There is a large acreage of pasture on this type, and the numbers of horses and cattle on the farms are correspondingly large. Liberal amounts of barnyard manure are applied to the fields.

Land of this type is valued at $60 to $200 an acre, depending largely on the proportion of land suitable for cultivation.

It is necessary to handle the Fayette silt loam with considerable care in order to prevent erosion and gullying, and it should be kept in grass as much of the time as possible. The cultivated areas should

be plowed deeper and more organic matter should be incorporated with the soil. As the steep land furnishes excellent bluegrass pasture, the forested areas should be cleared as far as feasible, and dairying and stock raising extended. The commercial production of apples should be successful where transportation and market conditions are favorable.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Fayette silt loam:

Mechanical analyses of Fayette silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333313	Soil	0.0	0.0	0.7	2.4	24.7	55.1	17.0
333314	Subsoil	.0	.9	.3	1.6	25.9	57.6	13.8

TAMA SILT LOAM.

The surface soil of the Tama silt loam is a dark-brown, moderately heavy, smooth textured silt loam with an average depth of 10 to 15 inches. This layer grades through a thin brown layer of silt loam, about 4 inches thick, into a brownish-yellow subsoil material, changing to yellow with increasing depth. As a rule the color of the subsoil is uniform, though occasionally the lower part is slightly mottled with light gray. In structure and texture the subsoil is an open and friable heavy silt loam to light silty clay loam. The soil is high in organic matter. The soil and subsoil are noncalcareous.

The depth of the soil is variable and depends upon the topographic position. On the gently arched divides it is 15 to 18 inches deep, while on the shoulders of hills and along gullies the depth is only 6 to 8 inches, and often the yellowish-brown subsoil is exposed. On the lower parts of slopes the soil is darker in color and deeper, often being 24 inches or more in depth at the foot of the slopes, where there has been an accumulation of colluvial material, and there have been included with this type small, narrow strips of strictly colluvial material occurring along intermittent streams.

The boundary line between the Tama silt loam and the Fayette silt loam is arbitrary, as the change in color of the surface soil from one type to the other is very gradual. The Tama silt loam differs from the Fayette silt loam in having a higher content of organic matter. In texture and structure the two soils are similar, except that the subsoil of the Fayette silt loam may be a little more compact and heavier. Both have the sectional structure and extremely smooth feel characteristic of loess soil.

The Tama silt loam occurs in areas of smoother topography within the loess region. The most typical areas are developed north of

West Union, northeast of Arlington, and on the divide between Otter Creek and the Volga River.

In general the topography is rolling. The drainage is good and the physical condition of the soil is such that it withstands protracted droughts. Where the slopes are steep there is considerable erosion. Most of the type lies at an approximate elevation of 900 to 1,200 feet above sea level.

The Tama silt loam originally supported a growth of prairie grasses and a scattered growth of forest trees. Part of the type was true prairie. Approximately 95 per cent of the land is now under cultivation. It is considered by farmers the best upland corn land in the county. About one-third of it is devoted to the production of this crop and the rest is largely in oats, barley, and clover and timothy. In average seasons corn yields 30 to 50 bushels per acre, and occasionally as much as 60 bushels. Oats, ranking second in acreage, ordinarily yield 35 to 45 bushels per acre. About one-fourth the corn and oats is sold, the remainder being fed to hogs, beef cattle, and work stock. Clover and timothy are the principal hay crops, though some millet and sorghum are grown. In wet seasons clover does well, but in dry seasons some difficulty is experienced in getting a stand. Ordinarily clover yields 1½ to 2½ tons per acre, while clover and timothy mixed yield 1 to 2 tons. Most of the hay is fed on the farms. Small fields of rye and wheat also are grown.

There are several large farm orchards on this type, apples doing especially well.

This soil is friable, silty, free from stones, and very easy to handle. It can be cultivated under a wide range of moisture conditions without clodding or baking badly on drying. Though the natural productiveness of the type is high, it responds readily to good methods of cultivation, fertilization, and the growing of leguminous crops. Only small quantities of barnyard manure are applied, and no commercial fertilizer is used.

The value of the Tama silt loam ranges from $250 to $300 an acre, depending on location, improvements, and the condition of the land.

For the improvement of this soil deeper plowing is needed on most farms, and though the soil is high in organic matter, it is advisable to rotate the cereal crops with leguminous crops every four or five years in order to maintain the supply of organic matter. On steep slopes, where erosion is a serious factor, the type should be kept in cover crops as much as possible.

O'NEILL SANDY LOAM.

The O'Neill sandy loam, to a depth of 18 to 24 inches, is a dark-brown to black sandy loam, carrying a high percentage of organic

matter. The surface soil passes gradually into a sticky, sandy clay, which at about 30 inches rests on a stratified bed of sand or gravel. In places the gravel comes within 10 to 12 inches of the surface.

This type is very inextensive. It occurs as low, medium, and high terraces along the Little Turkey, Turkey, and Volga Rivers. The topography of the low and medium terraces is flat, while that of the high terraces has been more or less modified by water and wind erosion. This latter condition exists in the terrace north of Eldorado and the one southeast of Clermont. The low terraces are inundated during very high floods.

Practically all of the O'Neill sandy loam is under cultivation. Corn and oats are the important crops. They do well except on the high terraces, where the soil is very droughty and leachy. Ordinarily corn yields 35 to 50 bushels per acre and oats 30 to 45 bushels.

The type ranges in value from $150 to $200 an acre, the price depending upon the location, soil, and improvements.

Small areas of fine sandy loam have been included with this type, as they were not of sufficient extent to warrant separate mapping. These areas consist of a dark-brown to medium-brown fine sandy loam, high in organic matter, underlain at 18 to 20 inches by a brownish-gray, open, loose, fine sandy loam. The soil is of very small extent. It is developed along Little Wapsipinicon River and Little Turkey River. The surface is flat and the drainage thorough. It occurs on low terraces and is subject to overflow during exceptionally high floods.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the O'Neill sandy loam:

Mechanical analyses of O'Neill sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333324, 333336.	Soil	1.2	13.3	16.4	41.1	6.8	12.3	8.8
333325, 333337.	Subsoil	1.6	17.5	17.7	41.9	5.0	9.3	6.7

O'NEILL LOAM.

The surface soil of the O'Neill loam is a dark-brown to black loam with an average depth of 12 to 15 inches. It is high in organic matter and contains in places a relatively high percentage of sand. The subsoil is a brown, heavy loam, becoming brownish yellow and lighter in texture at 20 inches. Below 24 to 30 inches a coarse sand or fine gravel of a brownish color is encountered. In many places the cross-bedded gravel is encountered at 8 to 12 inches, and in other places it is not found above a depth of 3 or 4 feet.

The O'Neill loam—the most extensive terrace soil in the county—covers approximately 23 square miles. It is developed in narrow, disconnected belts along all the important streams of the county. This type occupies distinctly benchlike areas, modified to only a small extent by stream erosion. The terraces lie 5 to 20 feet above the present flood plain. The soil is thoroughly drained and droughty.

Practically 95 per cent of the O'Neill loam is under cultivation. Corn is the principal crop and does well in wet seasons, but in seasons of low or unfavorably distributed rainfall the crops suffer seriously from lack of moisture. Corn yields from 25 to 40 bushels, oats 20 to 40 bushels, and clover and timothy 1 to 1½ tons of hay per acre. The methods of cultivation and fertilization of crops are similar to those practiced on the Carrington loam.

The value of farms on the O'Neill loam ranges from $125 to $200 an acre, depending on the condition of the soil.

The important steps to be taken in improving this soil are the increasing of the organic matter and the conservation of moisture.

PLAINFIELD SANDY LOAM.

The Plainfield sandy loam, to a depth of 8 inches, is a grayish-brown sandy loam, containing considerable proportions of coarse sand and sand, and low in organic matter. The subsoil is a yellowish-brown sandy loam, with a slightly reddish cast, grading into a bed of grayish-yellow sand or gravel at 18 to 30 inches.

Areas of this type are developed principally on the terraces of Otter Creek, largely within the vicinity of Oelwein. A few small areas lie along the larger streams of the county.

Like the Plainfield loam, this type is derived from water-worked material belonging to the Buchanan and Iowan gravel, as well as more recent terrace deposits. The topography is for the most part almost level, but some low ridges occur. Drainage is excessive and crops suffer from drought in dry seasons.

Most of the type is used for crop production. In the vicinity of Oelwein it is devoted to truck crops, watermelons, and potatoes, which do well. Corn and oats yields are extremely variable from season to season, because of the droughty nature of the soil. The type requires the same treatment as the Plainfield loam.

PLAINFIELD LOAM.

The soil of the Plainfield loam is a grayish-brown friable loam, 6 to 10 inches deep, containing a relatively high percentage of fine sand and silt. This passes gradually into a brownish or light-yellow loam, which at 18 to 30 inches rests on a bed of stratified sand or gravel.

The Plainfield loam differs from the O'Neill loam in having a lower content of organic matter. It is similar to the latter type in

texture and structure, and in the presence of an underlying noncalcareous bed of sand and gravel.

This soil, which covers about 7 square miles, is the second most extensive terrace soil in the county. It is developed along all the important stream courses of the county. It lies usually 10 to 15 feet above the normal flow of the streams. The surface is generally flat and the drainage is excessive, owing to the shallow depth of soil over the sand and gravel subsoil.

This type was originally forested with white oak, red oak, hickory, basswood, ash, and elm. About 90 per cent of the type is devoted to the production of staple crops, corn, oats, and clover and timothy. Corn yields 30 to 50 bushels per acre, and oats 25 to 35 bushels.

The soil is in need of organic matter both to improve its capacity for retaining moisture and to add nitrogen.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Plainfield loam:

Mechanical analyses of Plainfield loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333311	Soil	0.9	6.8	10.1	29.0	11.1	35.5	6.6
333312	Subsoil	1.6	7.7	13.3	33.1	7.1	28.3	8.9

WAUKESHA SILT LOAM.

The Waukesha silt loam consists of a dark-brown to black, smooth, friable silt loam, with an average depth of 18 inches, passing through a brown heavy silt loam into a brownish-yellow, open friable silt loam subsoil which becomes lighter in color with depth, being yellowish in the lower part. In general, the soil section is similar to that of the Tama silt loam. As the color indicates, the soil is high in organic matter.

In extent the Waukesha silt loam is very unimportant, having a total area of a little more than 1½ square miles. It occurs in isolated areas along the Turkey and Volga Rivers, where it lies on terraces 10 to 20 feet above the present flood plains. It is well drained and withstands drought over long periods.

Nearly all of the type is now under cultivation. Corn yields 40 to 50 bushels, oats 40 to 45 bushels, and barley 30 bushels per acre.

The methods of cultivation and fertilization are similar to those on the Tama silt loam.

The value of farm lands on the Waukesha silt loam varies from $250 to $300 an acre.

For the improvement of this soil there is a general need for more thorough cultivation and the growing of leguminous crops to maintain the supply of organic matter.

JACKSON SILT LOAM.

The Jackson silt loam consists of a brownish-gray, smooth silt loam, 8 to 10 inches deep, passing gradually into a yellowish-brown, open, friable silt loam subsoil. Light-gray mottlings are common in the lower subsoil. Where the type adjoins the upland soils, the type is more or less colluvial in origin.

This soil covers but 1.6 square miles. It occurs as small isolated areas on the terraces of the Turkey and Volga Rivers. The areas lie 10 to 20 feet above the flood plain. Drainage is adequate.

Nearly all the Jackson silt loam is under cultivation. Corn yields 35 to 40 bushels per acre, and oats 30 to 40 bushels. Hay crops do well.

The value of farm land on the Jackson silt loam varies from $200 to $250 an acre, but no farms consist entirely of this type.

To improve this soil there is a general need for more thorough cultivation and the growing of leguminous crops to increase the organic matter content.

BREMER LOAM.

The soil of the Bremer loam is a black friable loam, 14 to 18 inches deep, containing a relatively high percentage of silt. The subsoil is a plastic, somewhat tenacious bluish-gray clay loam, mottled with rusty brown and yellow. It is probable that the type is everywhere underlain at some depth by stratified sand or gravel, and in some places this bed is encountered in the third foot.

The Bremer loam is largely developed southeast and northwest of Maynard, along the Little Volga River and its affluents. Small areas lie on the other streams of the area. It occupies terraces lying about 10 feet above the normal level of the streams. The topography is level and the type is very poorly drained. The Bremer loam is not subject to ordinary overflow, but during high floods a large part of the type may be flooded.

Practically none of the Bremer loam is devoted to crop production. It is largely used as pasture and to some extent for the production of hay. The soil requires a heavy equipment. Land of this type is valued at $100 to $125 an acre.

Drainage is required for the improvement of this type. The installation of tile drains is practicable, so far as outlet is concerned.

Some areas of silt loam were mapped with this type on account of their small size. The profile is composed of a surface layer of black, friable, smooth silt loam, 18 to 20 inches deep, passing gradually into a light-gray heavy silt loam subsoil, mottled with yellow and rusty brown. The subsoil is friable and not compact. As the color indicates, the soil is high in organic matter.

This soil occurs in four small areas adjacent to the bluffs on the terraces of the Turkey River, two west of Dover Mill and two in the vicinity of Elgin.

The areas are flat and very poorly drained. They lie about 10 feet above the normal level of the river.

All of the areas of silt loam texture are in native pasture except the one southwest of Elgin, which produces excellent yields of corn. Tile drainage should be installed in most of the areas.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Bremer loam:

Mechanical analyses of Bremer loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
333341	Soil	0.8	6.4	6.1	26.0	7.3	30.4	23.1
333342	Subsoil	2.5	6.7	5.8	32.3	8.5	23.7	20.4

WABASH LOAM.

The soil of the Wabash loam is a black, friable loam 18 to 20 inches deep, containing as a rule a relatively large percentage of sand, fine sand, and silt. This layer changes gradually into a jet-black silty clay loam or clay loam subsoil, friable and open in structure, though more compact than the surface soil. Seams of gray sand are encountered in the subsoil. In the loess region lime fragments are common throughout the soil section and on the surface. Small areas of Cass loam occur throughout the extent of the Wabash loam.

The Wabash loam lies mainly along the smaller streams in the Iowan drift, though it is also found along the streams in the loess region. It has a flat surface, but owing to its open structure it is fairly well drained between stages of high water.

The greater part of this type is used for pasture; the larger areas are devoted to the production of corn and oats. Corn yields 40 to 60 bushels per acre, and oats 30 to 40 bushels.

Over most of the type the drainage should be improved.

WABASH SILT LOAM.

The Wabash silt loam, to an average depth of 24 inches, consists of a black, heavy, smooth silt loam. This surface soil typically passes gradually into a dark-brown silty clay loam subsoil, slightly more compact than the surface soil, but there may be little difference in color or texture in the material from the surface to a depth of 3 feet or more. A high content of organic matter is characteristic of the surface soil. Fragments of limestone may occur in any part of the soil section, and in places they are strewn on the surface. The deeper subsoil, except in those areas in the Iowan drift plain, always contains more or less lime fragments.

Although this type is inextensive, it is an important bottom-land soil in the county. It occupies the first bottoms of the smaller streams

flowing through the loess region in the northeastern part of the county. One area is developed in the Iowan drift plain along Gundlach Creek, and small areas occur on the edge of the first bottoms of Turkey River.

The surface is generally flat, relieved only by old cut-offs. Originally the drainage was poor, but by clearing and straightening the channels of the streams the drainage conditions have been very much improved.

Practically all the type originally was forested with cottonwood, elm, black walnut, and ash. Most of it has been cleared of timber and is largely used for pasture. About 20 per cent of it is tilled. This part is largely devoted to the production of corn. Ordinarily corn yields 50 to 60 bushels per acre, and with good cultivation in favorable seasons as much as 80 bushels has been obtained. Oats are likely to lodge. No crop rotation is practiced, because of the high natural productiveness of the soil. No barnyard manure or commercial fertilizers are used on this type. In many cases the fields are kept in corn continuously for a series of years without apparent decline in yields.

The flat topography, silty texture, and mellow structure of this soil make it very easy to handle.

Land of the Wabash silt loam ranges in selling price from $200 to $300 an acre, depending on location and drainage conditions.

The most important problem confronting farmers on this type is that of improving the drainage. In the better drained situations ditches may serve the purpose, but in low, poorly drained areas tile drains should be laid.

CASS SANDY LOAM.

The Cass sandy loam, to a depth of 15 to 20 inches, is a black sandy loam high in organic matter. This surface layer grades into a subsoil of yellowish-brown or grayish-brown loamy sand or sandy loam.

The total extent of this type is about 6 square miles. It is chiefly developed in the valleys of the Little Turkey, Turkey, and Volga Rivers. It occurs for the most part in narrow strips along the river banks, but occasionally widens out to one-half mile or more. The topography is nearly flat and drainage is poor between periods of high water. There is usually sufficient subirrigation to prevent crops on this type from suffering from drought.

This soil is alluvial in origin and, like the Cass fine sandy loam, is comprised of glacial material washed down and deposited in the stream valleys by running water. The type is usually overflowed early in the spring. The original vegetation consisted of forest trees, mainly oak, ash, willow, elm, black walnut, and cottonwood.

Sixty per cent or more of the type is used for general farming. Corn yields from 40 to 60 bushels per acre, and oats about 40 bushels. The type seems well adapted to the latter crop. Barley and rye do well. The Cass sandy loam, as well as the Cass fine sandy loam, is

well suited to the production of early vegetables, tomatoes, and potatoes.

Land of the Cass sandy loam is valued at $125 to $200 an acre.

CASS FINE SANDY LOAM.

The Cass fine sandy loam consists of a black, fine sandy loam underlain at 20 to 24 inches by a brownish-gray fine sandy loam subsoil. Both soil and subsoil have a loose, open structure. As the color indicates, the soil is high in organic matter.

The type occurs mainly as first bottoms along Little Wapsipinicon and Little Turkey Rivers, the headwaters of the Volga River, and on Crane and Otter Creeks. Its total area is small. The surface is flat and subject to frequent overflows, but as a result of the sandy subsoil the drainage is adequate between stages of high water. Only a small part of the type is under cultivation. This is devoted to the production of corn. The soil works up into a very mellow seed bed and can be tilled under any moisture condition as long as there is no water standing on the surface. Ordinarily the Cass fine sandy loam furnishes good pasturage for cattle and horses.

MUCK.

Muck is a cumulose soil derived from the decomposition of accumulated organic materials. It consists of black, partially decomposed vegetal matter. The beds in this county have a depth of 36 inches or more. Small patches of peaty material—that is, showing less advanced decay than Muck—are included. Muck occurs in seepy or depressed positions and is very poorly drained. None of the type has been reclaimed, and it is used solely for pasture. The total extent of Muck is less than 200 acres. It is confined to small areas scattered over the Iowan drift plain. The largest and best developed area lies 3 miles northwest of Hawkeye.

SUMMARY.

Fayette County is situated near the northeastern corner of Iowa. It is composed of almost flat to steeply rolling country.

The regional drainage is good. The greater part of the area is tributary to the Turkey, Maquoketa, and Wapsipinicon Rivers.

According to the census of 1920, Fayette County has a population of 29,251, of which 74.5 per cent is classed as rural. The principal town is Oelwein. Railroad facilities are good, and in general the county is provided with excellent graded dirt and gravel roads. All parts of the county have rural mail delivery routes, telephone service, and good schools.

The average growing season is about 139 days in length. The mean annual precipitation is about 34 inches and the mean annual temperature about 45° F.

Grain farming is the main type of agriculture. Corn, oats, and mixed clover and timothy are the principal crops, ranking in acreage in the order named. The raising of hogs and beef cattle and dairying are important industries. The farm improvements are substantial and indicate a condition of thrift and prosperity.

Systematic crop rotations are followed to some extent. Liberal quantities of barnyard manure are applied to the soils, but scarcely any commercial fertilizer is used. Efficient farm labor is very scarce and often impossible to obtain.

About 95 per cent of the total area of the county is in farms, and of the land in farms over 76 per cent is improved. The average size of the farms is 138.6 acres. The value of farm land ranges from $60 to $300 an acre. About 62 per cent of the farms are operated by owners.

The soils of Fayette County are derived from glacial drift, loess, and, to a small extent, from consolidated rock formation. The drift material has given rise to the Carrington, Lindley, Thurston, and Clyde soils; the loess to the Fayette and Tama soils; and residual rock to the Sogn clay loam. The second bottoms along the streams are occupied by the O'Neill, Plainfield, Waukesha, Jackson, and Bremer soils, and recent alluvial deposits are classed with the Wabash and Cass series.

The Carrington loam is the most extensive soil type in Fayette County. It is well suited to the production of corn, oats, barley, and clover and timothy.

The Carrington sandy loam and fine sandy loam are used in the same way as the loam.

The Lindley soils are used less extensively for the growing of corn and more extensively for oats and hay crops.

The Thurston soils are largely in pasture.

In its natural condition the Clyde silty clay loam is best suited for pasture and hay, and when reclaimed it is exceptionally well suited to the growing of corn.

The Sogn clay loam is largely utilized for growing corn, oats, and hay crops. The O'Neill loam and sandy loam are largely devoted to the production of corn, oats, and hay. The Plainfield loam and Plainfield sandy loam are more extensively used for grain and less for corn than the O'Neill soils.

The Waukesha silt loam and Jackson silt loam are soils of small extent. They are adapted to the production of grain and hay crops.

The Bremer soils and the first bottom soils, except the Cass sandy loam, are largely in pastures. The last named is devoted to the production of general farm crops.

The small areas of Muck have not as yet been reclaimed. The land in its undrained state has some value for grazing.