U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS.
IN COOPERATION WITH THE IOWA AGRICULTURAL EXPERIMENT STATION.

SOIL SURVEY OF JASPER COUNTY, IOWA.

BY

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U. S. DEPARTMENT OF AGRICULTURE.

[Advance Sheets—Field Operations of the Bureau of Soils, 1921.]

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[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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SOIL SURVEY OF JASPER COUNTY, IOWA.

By D. S. GRAY, in Charge, and A. M. O'NEAL, Jr., of the Iowa Agricultural Experiment Station, and R. E. DEVEREUX and S. B. COLE, of the U. S. Department of Agriculture.

DESCRIPTION OF THE AREA.

Jasper County, Iowa, is situated in the central part of the State. Newton, the county seat, is 36 miles east and a little north of Des Moines. The county is rectangular in shape, comprising 20 land-survey townships, running 5 east and west and 4 north and south. The land area is 730 square miles, or 467,200 acres.

Jasper County may be considered as a broad rolling plateau, into which several streams flowing toward the southeast have cut their valleys and extended their ramifying drainage ways over the greater part of the surface. It is believed that the surface of the older glacial deposit, known as the Kansan drift sheet, which is exposed over nine-tenths of the area of the county, was, after the retreat of the ice, a smooth, nearly level plain, and that the minor details of the topography which have been developed are the result of destructive erosive action of streams and of constructive modification by deposition of a covering of loess over the drift. Remains of the original plain surface, only slightly modified by erosion, may be seen in the long, irregular, comparatively flat divides between the main stream systems. These flats are nearly coextensive on the soil map with the areas of Muscatine silt loam. The remainder of the Kansan drift surface is for the most part gently rolling, with narrow strips of more broken land along the deeper stream valleys. The topography of the eroded drift area has been modified in places by the loess covering. In general, the influence of the loess mantle has been to smooth and moderate the surface of the eroded drift. At several points along the Skunk River Valley, sand hills and ridges are prominent features of the landscape.

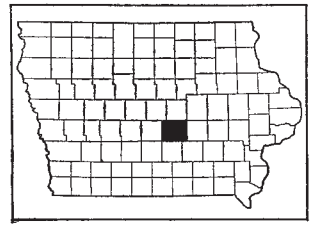

FIG. 38.—Sketch map showing location of the Jasper County area, Iowa.

The topography of the northwestern corner of the county, which is covered by the more recent Wisconsin drift, has not reached so mature a stage of development as that generally prevailing over the rest of the county. The youthful topography is indicated by more general smoothness of the surface and by the presence of marshy areas and occasional ponds.

The alluvial land of the county includes terraces 5 to 20 feet above overflow, and more extensive first bottoms which are subject to inundation at certain times. The terraces are flat to sloping and

uneroded. The first-bottom lands occur along the larger streams and the lower courses of their tributaries. They are flat or sloping, or in some places are undulating to billowy, owing to the presence of old meanders of former stream courses. The most extensive first bottoms are along Skunk River and Indian Creek; in places they attain a width of 3 miles.

Although Newburg, in the northeastern part of the county, with an elevation of 1,029 feet, is the highest point, the drainage courses run in a southeasterly direction. The upland has a general elevation of 900 to 1,000 feet above sea level. The lowest recorded elevation is that of the Skunk River where it is crossed by the Chicago, Rock Island & Pacific Railway at a height of 753 feet above sea level. Other elevations in the county are, Colfax 791 feet, Valeria 855, Skunk River at the Polk County line 831, the divide between Skunk River and Indian Creek 971, Baxter 1,000, Prairie City 930, Monroe 922, Kellogg 844, Murphy 812, Sully 909, and Lynnville Junction 904 feet above sea level.

The Skunk River is the principal stream in Jasper County, and with its tributaries drains about two-thirds of the county. Indian Creek, the largest tributary, and Cherry, Sugar, Prairie, and Carson Creeks enter from the north and east. Squaw and Buck Creeks are the principal streams entering from the south and west. The Skunk River has been dredged and straightened throughout its course in Jasper County. This improvement has greatly increased its gradient and carrying capacity, so that overflowing is less frequent than before the project was completed. Formerly the river's course was extremely tortuous, the adjoining bottoms were frequently under water, and travelers in the early days were often mired and unable to continue their journey.

Elk Creek drains the east-central part of the southern half of the county, and joins the Skunk River in Mahaska County. North Skunk River, the second largest stream of the county, drains nearly all of the area north and east of Elk Creek and joins the Skunk River in Keokuk County.

Small tributaries of the Iowa River drain the northeast corner of the county. The southwest corner is drained by streams that reach the Des Moines River.

There is a complete drainage system throughout the county, except in a few isolated areas in the Wisconsin drift country in the northwestern part. Overflows along the Skunk River are less frequent than formerly, although in occasional years the flood plain of this stream is largely under water, and parts of it are under water once or more each year. Overflowing is more common on the smaller streams of the area than on the larger ones.

There are a number of springs over the county, but most of the water for farm use is obtained from wells. The source of water for these wells is in gravelly deposits at the base of the loess mantle, pre-Kansan sands and gravels, or sandy alluvium in the bottom lands. In the town of Colfax a considerable industry has been developed from mineral springs, which have their source in water-bearing strata of the St. Louis age. Numerous health resorts and sanitariums are supported by persons afflicted with various ailments which are believed to be benefited by these mineral waters. The

city of Newton obtains its water supply from three deep wells located in the northwest quarter of section 13, Mound Prairie Township.

The mining of coal is an important industry in Jasper County, which ranks eighth in the State in the quantity mined. The quality of coal compares favorably with that found elsewhere in the State. The largest mine now in operation is at Seevers. Another large one is being operated southeast of Colfax at the end of the south spur of the Colfax Northern Railway. A number of smaller privately owned mines are being operated over the county. Many others of varying size have been abandoned, particularly in the vicinity of Oswalt, where rather extensive operations were in progress at one time, and a few miles south of Newton. Most of the coal produced is consumed locally, but the quantity is not sufficient to supply the demand.

There is a clay works at Lynnville, in which the yellowish loessial subsoil is being used for manufacturing tile and brick. Several other clay works have been in operation over the county, but are now abandoned. A heavy blue clay is being excavated about 2 miles west of Newton, on the east bank of Cherry Creek, and hauled to Newton.

The first white settlers in Jasper County settled near the present site of Monroe in about 1841. From there the settlement gradually spread to the north toward where Newton now stands. Most of the early settlers were from Illinois, Indiana, and States east as far as New England. The county was established with its present boundaries by an act of Congress in 1846, the first election was held the same year, and Newton was selected as the county seat. Later other parts of the county were settled by foreigners, largely from Germany and Holland. Although relatively few of the present population are of foreign birth, many are of foreign descent, about 85 or 90 per cent of the population in the northern tier of townships being of German and about 75 per cent in the southern part being of Dutch descent.

The total population, as given by the 1920 census, is 27,855. Of this, 67.2 per cent is classed as rural and includes all inhabitants outside of Newton and Colfax. The rural population is quite evenly distributed over the county and averages 25.6 persons per square mile. The population is somewhat more concentrated near towns, particularly Newton and Colfax. Except from 1880 to 1890, there has been a gradual increase in the population each decade for the last 50 years.

Newton, the county seat, had a population of 6,627 in 1920. It is an active business center, located in the center of the county, 36 miles from Des Moines on the Chicago-Omaha line of the Chicago, Rock Island & Pacific Railway. Newton is a flourishing business and manufacturing city. Its industries include factories devoted to the production of four makes of washing machines, and one concern which produces ditch-digging machinery.

Other incorporated towns in the county are Colfax, with 2,504 inhabitants; Monroe, 936; Prairie City, 780; Kellogg, 603; Baxter, 571; Sully, 393; and Lynnville, 461. In addition there are a number of small railroad towns and stations, ranging in population from 27 to over 300, including Newburg, Murphy, Reasnor, Lynnville Junction, Fairmount, Metz, Valeria, Mingo, Ira, Killduff, and Turner. Vandalia and Galesburg are inland towns which support stores.

Other inland settlements are Oswalt, Clyde, Green Castle, Goddard, and Rushville. Newton was formerly connected by a branch line with Goddard, Valeria, and points northwest to Rockwell City, but the line was abandoned a number of years ago. Another abandoned railway formerly connected Colfax with Goddard and Valeria.

Jasper County is well supplied with railroads, no point being over 6 or 8 miles from a shipping point. The Chicago-Omaha branch of the Chicago, Rock Island & Pacific Railway runs east and west through the center of the county, giving direct connections with Chicago, Des Moines, and Omaha. The Keokuk branch of the same road runs through the southwestern part of the county, serving Prairie City and Monroe. The Monroe branch of the Rock Island connects Monroe with Newton, passing through Franklin, Reasnor, and Wilson. The Chicago Great Western Railroad crosses the northwestern part of the county through Valeria, Mingo, Ira, and Baxter, affording direct service to Kansas City, Des Moines, and the Twin Cities. A branch of the Minneapolis & St. Louis Railroad from the northwest meets the main line at Newburg. The Newton branch of the same road runs southeastward through Murphy, Killduff, Lynnville Junction, and Lynnville. These branches afford connections for St. Louis. The Inter Urban Railroad (electric) connects Colfax with Des Moines.

The public roads generally follow land lines, except where topographic features make irregularities necessary. All the roads are of earth construction except the River to River Highway from Kellogg through Newton to Colfax, which was being graveled in the fall of 1921. The main roads are kept well graded and dragged, but many of the byroads, particularly those in rough country, are not kept in good shape, some being impassable and abandoned. A number of main automobile trails cross the county east and west and others cross it north and south. Culverts and bridges are largely of steel or concrete construction, although some wooden structures are still in use.

Rural mail routes serve all parts of the county, and most farms have telephone service. Rural schools are maintained at about 2-mile intervals, except in districts served by consolidated schools, of which there are several in the county. The larger towns offer high-school instruction. Rural churches are scattered throughout the county.

Chicago, Omaha, and Des Moines constitute the principal markets for farm products. Dairy products, vegetables, and melons are sold locally.

CLIMATE.

Jasper County has a healthful climate typical of the Corn Belt. It is characterized by rather severe winters and comparatively hot summer seasons, with pleasant spring and fall months. The precipitation is generally abundant and well distributed. The mean annual temperature, as recorded by the Weather Bureau station at Baxter, is 47.7° F. The highest temperature recorded is 110° F. in July, and the lowest is −33° F. in January. The climate is well adapted to the production of the general field crops of the Corn Belt and to the breeding and feeding of livestock.

The mean annual precipitation, as recorded at Baxter, is 32.81 inches, about 72 per cent of which comes, on an average, within the growing season from April to September, inclusive. The greater part of this comes in the spring and early summer, while the fall season is pleasant and favorable for the harvesting of crops. The total precipitation for the driest year (1910) was 20.49 inches, and for the wettest year (1902) it was 47.87 inches. Crop failures are unknown, although crop yields are sometimes reduced by hail or prolonged periods of dry weather accompanied by hot dry winds. Tornadoes are uncommon.

The average date of the last killing frost in the spring is April 28, and the average date for the first in the fall is October 7. The latest killing frost on record for spring occurred on May 20, and the earliest in fall on September 20. The average growing season is long enough to mature the crops being grown. The grazing season extends over a longer period of time.

The following table gives the normal monthly, seasonal, and annual temperature and precipitation, as recorded at the Weather Bureau station at Baxter:

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

[Elevation, 998 feet.]

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1910).	Total amount for the wettest year (1902).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	24.3	61	−26	1.00	0.27	1.95
January	18.0	61	−33	.91	1.41	.70
February	21.1	63	−23	.92	.19	.75
Winter	21.1	63	−33	2.83	1.87	3.40
March	33.9	87	−15	1.96	.24	.90
April	49.3	92	17	3.06	2.25	3.21
May	60.6	95	26	5.30	3.38	4.95
Spring	47.9	95	−15	10.32	5.87	9.06
June	69.0	105	36	4.17	2.52	10.76
July	73.6	110	42	4.06	2.07	6.60
August	72.0	106	40	3.62	3.13	6.57
Summer	71.5	110	36	11.85	7.72	23.93
September	63.5	106	27	3.62	3.89	4.85
October	51.5	90	14	2.79	.46	4.33
November	35.8	76	−1	1.40	.68	2.30
Fall	50.3	106	−1	7.81	5.03	11.48
Year	47.7	110	−33	32.81	20.49	47.87

AGRICULTURE.

The agriculture of Jasper County dates back to the time of the first settlers in the forties of the nineteenth century, when settlement was first made along what is now known as Buck Creek in Fairview Township. The early pioneers grew mainly subsistence crops, as there was no market at which they could be disposed of if grown on

a large scale. Hunting, fishing, and the clearing of timber furnished much activity for these people. The hostility of the Indians somewhat retarded agricultural development, but not to the extent that it did in some other parts of the State.

Jasper County originally supported a luxuriant growth of prairie grasses in the open country, with marginal strips of forest along the rivers and larger creeks. As settlement became thicker and conditions more stable, more encroachment was made on the rich prairie lands back from the streams. The slow development of the early agriculture was due to economic factors rather than to a lack of inclination on the part of the early settlers, who were an agricultural people. Interest was maintained and gradual progress made as time passed. The Jasper County Agricultural Society was organized in 1855. The main activity of the society was an annual fair, which provided a stimulus for attainment in agricultural lines. Another agricultural society was organized at Prairie City in 1870. The second grange of the State was organized at Buena Vista Grange. At present there are nine granges in the county. In 1865 the railroad from Keokuk reached Monroe and was extended to Prairie City the following year. In 1867 the Chicago, Rock Island & Pacific Railway extended its line from the east through Newton to Des Moines. These means of transportation gave a great impetus to agricultural development and marked the beginning of a new era, the growth from that time on being rapid.

Prior to 1880 corn was the chief crop grown. Other crops of importance were wheat, oats, hay, and some barley and rye. Flax, potatoes, vegetables, and buckwheat were grown on a small scale. Corn has since maintained its lead. Wheat became less important after 1880, although it occupied a considerable acreage in the last few years. Oats and hay have always been important field crops.

The table below gives the acreage and production of the leading crops in Jasper County, as reported by the last five censuses, and indicates the general trend of agriculture in the last 40 years:

Acreage and production of leading crops in 1879, 1889, 1899, 1909, and 1919.

Crop.	1879		1889		1899		1909		1919	
	Area.	Production.	Area.	Production.	Area.	Production.	Area.	Production.	Area.	Production.
	Acres.	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*	*Acres.*	*Bushels.*
Corn	136,333	5,917,671	118,391	5,773,116	153,897	6,810,330	134,199	5,597,806	130,141	5,590,179
Oats	26,824	979,559	61,298	2,622,799	56,090	2,250,110	49,906	1,395,974	60,694	1,909,314
Wheat	48,966	554,927	5,573	66,723	19,981	324,780	9,291	127,744	20,662	305,933
Barley	2,559	48,801	517	16,426	1,135	32,270	2,157	38,204	397	9,258
Rye	2,003	34,176	1,136	21,877	383	4,940	371	4,263	669	7,738
Potatoes		303,046	7,438	908,412	6,212	552,861	2,207	143,554	644	25,385
		Tons.		*Tons.*		*Tons.*		*Tons.*		*Tons.*
Hay	38,121	54,388	56,892	87,422	42,683	54,963	56,974	81,930	41,717	44,012

Agriculture in Jasper County at the present time consists largely of grain farming and stock raising combined. Such a system, in which most or all of the crops raised are fed to stock on the farm, has proved to be the most profitable from the standpoint of returns from crops raised and the maintenance of soil fertility. Although this is the

prevailing system, there are many farms from which all or nearly all of the crop is sold. Corn and wheat comprise the leading cash crops. The general type of farming, consisting of grain raising and stock feeding, is quite uniform over the entire county. Truck and fruit raising are not important, although practically all farms produce fruits and vegetables for home use. The feeding of steers and sheep, shipped in from western markets or raised locally, is an important industry.

Corn is the main crop grown. It occupied about 38 per cent of the improved land of the county in 1919 and produced an average yield of 43 bushels per acre. Reid Yellow Dent is the principal variety grown. Yellow corn of no distinct variety, white corn, and some calico and red corn, are grown to a small extent. Very little seed is used from sources outside of the county. Over half of the corn produced is fed on the farms, some is sold to other farmers in the county for feeding, and probably less than one-fourth is sold to local elevators to be shipped to terminal markets, usually Chicago. A greater proportion of the crop is marketed from tenant farms than from those operated by owners. Corn is usually harvested from the standing stalks during the fall and winter months, after which the land is often pastured, the stalks affording considerable roughage for cattle, hogs, and sheep.

Some farmers "hog down" their corn, turning hogs and cattle into the field without picking the ears. When this is to be done soybeans or cowpeas are usually seeded with the corn, furnishing some concentrated feed along with the fattening corn. If enough hogs are used, they will root out all feed tramped down and none will be wasted. This plan saves labor and enriches the land by means of the manure left on the field. Some corn is grown for silage, in which case it is usually drilled; soybeans are often seeded with it. The crop is cut in a green stage and affords a succulent and palatable feed for stock during the winter months. Silage crops in 1919 yielded 33,846 tons on 4,416 acres. The State census of 1920 reports 406 silos in the county. The best corn yields are produced on the dark-colored upland soils, such as the Tama, Grundy, and Muscatine silt loams, and the Carrington and Clarion loams, the Bremer, Waukesha, and Buckner terrace soils, and the better drained bottom lands.

Oats occupy the second largest acreage. The average yield in 1919 was about 32 bushels and in 1920 it was 42 bushels per acre. The crop is grown mainly as feed for work stock on the farm, although a part of it is sold. The oat crop is important in the cropping system of the more progressive farmers, as it serves best among the small grains as a nurse crop for clover. The early varieties meet with most favor; they include Kherson, Early Champion, Albion (Iowa No. 103), and Richland (Iowa No. 105).

According to the 1920 census, the tame hay crop in 1919 was 42,688 tons on 40,681 acres. Wild hay was cut on 1,036 acres in the same year, producing 1,324 tons. This is harvested from rough or depressed areas in the upland and areas of bottom land not suitable for cultivated crops. Of the cultivated or tame hay crops, timothy and clover mixed is the most extensive; it was grown on 20,159 acres; clover alone in the same year occupied 15,333 acres, and timothy alone 4,757 acres. Clover alone and clover and timothy mixed yield 1½ to 2½ tons of hay on the better soils of the county, and from 1 to 2 bushels of seed. Practically all the hay grown is consumed locally, either on the farm where it was produced or on neighboring farms.

Timothy and clover mixed or clover alone are always seeded with oats as a nurse crop, which prevents the encroachment of weeds during the early stage of its growth and permits the hay crop to make sufficient growth, after the removal of the oats, to withstand the following winter season. The first growth of the following year is usually cut for hay, and the second growth for seed in favorable years. Sometimes it is pastured and the remaining growth plowed under that fall as a green-manure crop. This plan is more desirable than cutting the second growth for hay, as the manure left by the stock and some green top growth are turned under and are beneficial to the soil. The plowing under of the entire second growth would also be good practice, but the need for late summer and fall pasture does not always permit of doing this.

Permanent pastures support a luxuriant growth of volunteer bluegrass, which affords good pasture if not grazed too heavily.

Alfalfa was grown on 223 acres in 1919, and yielded a total of 650 tons, or over 2.9 tons per acre. Although not extensively grown, it has proved to be a profitable crop where a stand has been successfully established. There should be no difficulty in obtaining a stand if the soil is made sweet with ground limestone and either the soil or the seed is inoculated with the proper bacteria.

The acreage of wheat has varied greatly in the last 40 years. The relatively large acreage in recent years is due to the stimulus provided for increased wheat production during war times, and it is probable that the acreage will decrease considerably during the next few years. Wheat is a cash crop and is sold to local elevators, from which it is shipped largely to Chicago. Winter wheat is more important than spring wheat. Turkey is the principal winter variety, while Marquis and Java are the chief spring varieties grown. The darker upland soils and the better drained terrace types are considered best for the growing of wheat. On some farms it is grown successfully on first-bottom soils.

Rye, barley, buckwheat, potatoes, sorgo, and vegetables are crops of minor importance in Jasper County. The census for 1920 gives the extent and total yield for these crops in 1919 as follows: Rye, 669 acres, 7,738 bushels; barley, 397 acres, 9,258 bushels; buckwheat, 65 acres, 423 bushels; sorgo occupied 72 acres, yielding 417 tons of fodder and 6,231 gallons of sirup. An area of 229 acres was devoted to various vegetables. Small quantities of garden truck are grown near Newton. Some watermelons and cantaloupes are produced on the sandy soils, particularly in the vicinity of Colfax. They are disposed of at local markets or in Newton and Des Moines.

Fruit growing is not a commercial industry in Jasper County. The fruits are mainly apples, with cherries, plums, peaches, and pears following in importance in the order named. Most farms have a few fruit trees or enough to call a small orchard, but most of these are pruned and sprayed very little or not at all, and the quality of fruit is not particularly good. The fruit produced is consumed on the farm or in the immediate vicinity. Strawberries, raspberries, blackberries, and grapes are generally grown on each farm on a small scale to supply the family needs.

The values of crops by classes for 1919 are reported in the 1920 census as follows: Cereals, $9,635,168; other grains and seeds,

$176,614; hay and forage, $1,540,959; vegetables, $202,411; fruits and nuts, $71,278; and all other crops, $9,174.

The feeding and breeding of hogs, cattle, horses, and sheep are important industries of Jasper County, closely associated with the growing of the various crops. The census of 1920 reports that on January 1, 1920, there were on farms in the county 19,455 horses, 1,353 mules, 60,247 beef cattle, 9,719 dairy cattle, 18,916 sheep, 124,066 hogs, and 404,582 chickens.

The raising of hogs is the most important livestock industry. The number of hogs on farms is generally considerably smaller in January than in July. The Poland-China breed is the most popular, followed closely by the Duroc-Jersey. Herds of purebred hogs are enrolled by the county farm bureau as follows: Poland-China 23, Duroc-Jersey 22, Hampshire 9, Chester White 7, Spotted Poland-China 7. This list, however, does not include all the herds of purebred hogs. Although there are many purebred hogs in the county, many grade hogs are also raised. Some farmers make a business of raising purebred hogs for sale as breeding stock. The feeding out of barrows and gilts for market is the chief activity in the hog industry. The hogs are marketed in the spring and fall, largely in Chicago, although some are disposed of locally.

The breeding and feeding of beef cattle is equally as important as hog raising. The Iowa Yearbook of Agriculture gives the number of cattle in the county not kept for milk as 41,097 on January 1, 1922. The purebred herds, as listed by the farm bureau, are Shorthorn 40, Aberdeen Angus 18, Hereford 8, Polled Hereford 7. Although a large proportion of the steers and heifers fattened for market are raised locally, a good many are shipped in from western markets to be fed for periods of three to six months. The greater part of the feeder stock consists of western range cattle bought on the Omaha and Kansas City markets; they are generally sold in Chicago. Farmers feeding out less than a carload usually sell to local buyers, who ship in large quantities. Most cattle, as well as hogs, are shipped to markets through cooperative livestock associations, of which there are 14 in the county, one at every shipping point. Feeder cattle are usually carried through the summer months on pasture and finished out in the feed lot during the fall and winter months on corn, silage, and some concentrates. Some farmers specialize in the production of breeding stock.

Dairy cattle are not as important in the county as beef cattle. The Iowa Yearbook gives the number of cattle in the county kept for milk in January, 1922, as 10,787. Whole milk is sold to some extent in Newton and other towns in the county. In most parts of the area the milk is separated and the cream sold in nearby towns. Dairy products in 1919, excluding milk and cream for home use, were valued at $510,098. Practically all farms maintain enough milk cows to supply the home needs. These are generally grade cows of the milking breeds or milking Shorthorns. The farm bureau has listed 6 purebred Holstein herds and 1 Jersey, but there are more purebred dairy herds than these in the county.

The Percheron is the most popular breed of horses, followed closely by Clydesdale and Shire, according to the farm bureau record of breeders, but there are also a large number of Belgian horses in the county. Most farmers raise a colt or two each season, while those

making horse breeding a specialty raise a good deal of breeding stock for sale. Mules are less important but are becoming more popular, and some mules are raised locally.

The 1920 census reports the value of poultry and eggs produced in 1919 as $1,038,729. All farms keep a few fowls and some farms maintain rather large flocks. A number of good flocks of turkeys and ducks were noted over the county in the year of the survey (1921). Eggs and poultry are sold to local buyers, who supply the local demand and ship the surplus to larger markets.

The feeding and raising of sheep is a fairly important industry in Jasper County. Some of the sheep are raised locally and some are shipped in from other markets, largely Kansas City and Omaha, for feeding. In 1919 the wool clip amounted to 85,918 pounds, with a value of $44,544. The wool is marketed largely through the Iowa Fleece Wool Growers Association. Chicago is the chief market for the wool. Sheep are usually quite profitable, since they utilize rough feed not suitable for other stock and afford a revenue from the wool produced as well as from their sale on the market. There are several flocks of purebred sheep in the county.

The more rolling areas along the rivers and larger creeks of the county are used mainly as pasture and timber lands. The less productive areas of first-bottom lands, which are subject to frequent overflow, are used for pasture and hay. The Tama, Muscatine, and Grundy silt loams, the Webster soils, the Carrington and Clarion loams, the well-drained dark-colored terrace soils, and the well-drained first-bottom types have the greatest value for general cropping. While some of the more sandy soils are used for general crops, they are best suited for pasture or for truck crops, such as melons.

Systems of crop rotation are in more common practice at the present time than formerly. Decreased crop yields resulting from continuous cropping with corn and oats have led farmers to grow a leguminous crop once in 4, 5, or 6 years. It is estimated that from 50 to 65 per cent of the farmers of the county are following such a practice. On the better managed farms corn is seldom grown for more than two years on the average upland soil. It is sometimes grown for a longer period on the heavier first-bottom soils with no apparent decrease in yield. The rotation in most common use consists of corn 2 years, clover seeded with oats 1 year, and 1 year of the mature clover crop. Some variations are introduced by the addition of wheat. Alfalfa has not yet found a very definite place in the rotations.

The dark-colored upland and terrace soils and the well-drained first-bottom soils are recognized as the best for raising corn. The crop is check planted, so that it may be cultivated in two directions. Some corn is drilled in rows for silage or for fodder. Soybeans are sometimes planted with the corn. It is cultivated from three to five times during the season, depending on the progress it has made, and is usually laid by about July 4. Corn is ordinarily followed by oats. The ground is seldom plowed for oats, but is thoroughly disked. The ground is usually plowed for wheat, and seeding is done early in the fall with a drill.

The fertilizers in common use include barnyard manure and some crop residues, such as straw, cornstalks, and hulled clover stalks. Commercial fertilizers are used in small quantities mainly in the form

of ground limestone and rock phosphate. In 1920, 35 farms reported the use of commercial fertilizers, with an average expenditure of $129.43 per farm.

More attention is now being given to plowing to a depth of 6 to 8 inches or more, thorough preparation of the seed bed, and selection of seed than formerly. Seed corn should be selected from the stalk, preferably by the first frost and not later than the time of picking. The small-grain seed should be fanned, and when necessary it should be treated for smut or rust. These precautions, combined with the growing of a leguminous crop once in four or five years, the use of liberal amounts of farm manure and crop residues, and the application of crushed limestone when necessary, will insure satisfactory yields and maintain the productiveness of the soil.

Manure is generally applied to clover sod in the fall before plowing. Cornstalks are burned by many farmers, but this practice results in loss of much soil fertility. While the stalks are sometimes a nuisance in plowing the ground and cultivating the subsequent crop, they are a great benefit in maintaining the content of organic matter of the soil. Disking the stalks will make plowing much easier.

There are grain elevators at practieally all shipping points in the county. Five elevators, located at Newburg, Lynnville, Sully, Fairmount, and Prairie City, are farmer-owned and cooperative. The elevator at Kellogg is owned by a stock company of farmers.

Improved farm machinery is in common use. Medium to heavy horses are used in operating most machinery. The Iowa Yearbook reports that there were 217 tractors, 90 automobile trucks, and 2,047 pleasure cars on farms in 1920. Most farm buildings are of good construction and kept in good repair, presenting a prosperous appearance. This is not true, however, of a good many farms located on the poorer soils of the county and some tenant farms on the more productive soils. Fences are of barbed wire or a combination of barbed wire and woven wire, making the fields suitable for pasturing hogs.

Ordinarily there is a sufficient supply of farm labor. Some of the transient laborers are not always dependable. Wages range from $30 to $45 or as high as $50 per month, with keep.

The census reports that 94 per cent of the area of the county was included in 2,946 farms in 1920, with an average size of 149.1 acres. Of the land in farms, 87.9 per cent, or an average of 131 acres per farm, is improved land. Forty per cent of the farms in the county are rented, 58.7 per cent operated by owners, and 1.3 per cent operated by hired managers. Since about 1880 the proportion of tenancy has nearly doubled. Renting may be on either a share or cash basis. Under the share plan the owner receives one-half or two-fifths of the crops. Cash rents range from $5 to $10 or $15 an acre, depending largely on the type of soil.

The average assessed value of farm land in Jasper County in 1920, as reported by the census, was $224.37. Land values at the present time (1921) range from $50 to $350 or as high as $400 or more an acre.[1]

[1] The land values given throughout this report are as of the year in which the survey was made. There has been a considerable decrease since that time.

SOILS.

The soils of Jasper County have been differentiated in this report into a number of series and types on the basis of their most obvious physical characteristics and their chemical constituents as far as these could be readily determined in the field. The characteristics of the soils of any region are the result of two factors — (1) the character of the parent rock upon which the soils are formed, and (2) the processes of soil formation, including weathering, leaching, aeration, and oxidation, to which the soils have been subjected during their development. The soil-forming processes, which are controlled to a large extent by climatic conditions, are believed to have been of greater influence in fixing the present character of the soils of this area than the composition of the parent rocks.

The county lies in the Prairie Region of the United States, where the topography and rather high moisture supply favored a grass vegetation over the greater part of the upland. This treeless condition is not produced by climate alone, as we find that wherever the smooth surface had been broken by erosion and better surface and subsoil drainage established, a timber growth had rapidly invaded the slopes.

The native vegetation, therefore, under which the soils of this county were developed was grass over the relatively smooth uplands and timber along the deeper stream valleys. The soils of the area may be differentiated on the basis of their most widely distributed and broadest characteristic, color, into dark-colored and light-colored soils, and this color is closely related to and determined by the character of the native vegetation.

The area of the dark-colored soils is nearly coextensive with the areas of prairie on the upland, and includes also areas of dark-colored alluvial soils. The dark-colored soils fall into two subclasses or groups whose differentiation is based on drainage conditions of soil or subsoil, or both, during their development.

The soils of one of these groups, of which the Carrington series is representative, were developed under conditions of good soil and subsoil drainage. The typical profile has a surface layer of dark-brown ior dark grayish brown color and a friable granular structure. This ts underlain by a brown granular layer slightly heavier in texture than ohe surface. At a depth of about 24 inches this passes into a brown or yellowish-brown material usually heavier in texture than the upper layers. At about 30 inches the parent material is encountered, which is yellowish brown and usually more friable. The carbonates as a rule have been removed by leaching to depths of more than 3 feet. In this group belong the Carrington and Tama series on the more gently rolling upland, and the Shelby series on the slopes. With this group may be placed also the Waukesha, Buckner, and O'Neill series on the high terraces. The latter two, however, have layers of sand and gravel below 2 feet. The Clarion series is similar in the appearance of its profile to the soils of this group, but leaching is not so far advanced and effervescence with acid will take place in the lower part of the 3-foot section.

The other group of dark-colored soils mentioned above includes those developed under conditions of poor drainage. These have surface soils of black color and usually well-defined granular structure;

underlain by gray or mottled gray, yellow, and brown subsoils heavier than the surface. The details of the profiles of these soils vary considerably, depending on the depth to which good drainage and oxidation have extended. In some cases both surface soil and subsoil have developed under a cover of water or at least a predominantly wet condition. In other cases the soil has been rather well drained but the subsoil frequently water-logged, while in still others only the deeper part of the subsoil has been subjected to such conditions. This group includes the Grundy series on the flat uplands, the Bremer on the terraces, and the Lamoure and the heavier types of the Wabash series on the first bottoms. The Muscatine series may be regarded as being in an intermediate stage of development between the Grundy and the Tama soils. It has a well-oxidized brown upper subsoil, but a slight mottling has been developed in the lower subsoil. Peat and Muck represent extreme conditions with respect to poor drainage and the accumulation of organic matter.

The area of light-colored soils is coextensive with the part of the upland which was well covered by forests when the white man first settled the region, and the soils are those which would be developed under a tree vegetation in this climatic zone. The usual soil profile has a surface layer, ranging in depth from 3 to 8 inches, of grayish-brown or grayish-yellow color and silty floury structure. This is underlain by material of coarsely granular structure and brown to yellowish-brown color to a depth ranging from 2 to 3 feet. Below this the texture is lighter and the structure less compact. The soils which belong to this light-colored group are the Clinton, Lindley, and Marion series. The two former differ from each other mainly with respect to topography and parent material. The Marion series occurs on small flat or nearly flat areas and has developed a light-gray layer immediately below the surface soil.

The principal characteristics mentioned above have been those imparted to the soil by the greater soil-forming processes, such as leaching, oxidation, and accumulation of organic matter. However, in the classification of soils into soil series, account is also taken of the characteristics due to the composition and the processes of accumulation of the parent material from which the soils have been developed.

This entire area was at one time covered with glacial drift or till, consisting of a mixture of gravel, rocks, rock fragments, sand, and rock flour brought down from the north by the Kansan glacier. Since the retreat of this glacier there have been other depositions and modifications, resulting in the present surface material. A more recent deposit of glacial material, which now occupies a surface position in the northwestern corner of the county, was brought down by the Wisconsin glacier. The dark-colored soils which have glacial drift as a parent material are those of the Carrington, Clarion, Webster, and Shelby series. The Lindley series comprises light-colored soils developed upon drift.

The remainder of the county contains soils derived from loess, which is silty material supposedly deposited by wind action, contains no coarse material, and is generally silty in character for a depth of 3 feet or more. This overlies the Kansan drift sheet. Where erosion has been so active as to cut through the loessial covering, this drift

is exposed and gives rise to soils. These drift soils occupy lower slope positions below the upland loess soils in this part of the county and occur in ribbonlike areas bordering the streams. In places, however, the loessial soils extend from the upland to the stream course or its flood plain, usually where there was a depression in the original drift surface, which permitted a deposit of the loess to a greater depth. The series which have been developed wholly or largely from loess are the Muscatine, Grundy, and Tama on the upland prairies and the Clinton, Marion, and Knox on the forested slopes.

Where erosion has been active enough to cut through both the loess and drift layers, it has exposed the underlying bedrock, which in those parts of the county is red sandstone, but no important types of residual soil have developed.

The alluvial soils are developed more or less throughout the entire county, but chiefly along the Skunk River and Indian Creek. In other parts of the county the alluvial soils are confined to rather inextensive ribbonlike areas along the various stream courses.

The soils of this area are differentiated into soil series on the basis of differences in color, structure, and other details of the soil profile and on the basis of the source, character, and the processes of accumulation of the material from which the soils have been developed. Each soil series consists of soil types, which differ from each other in texture or the relative proportions of fine and coarse particles of the surface soil. The type is the unit of soil mapping.

The Muscatine series comprises very dark brown or nearly black surface soils of good depth, relatively high in organic matter, overlying a compact silty clay loam subsoil mottled yellow, brown, and some gray, and containing iron stains and iron concretions. The surface is flat to gently undulating. The Muscatine silt loam is mapped in this county.

The surface soils of the Grundy series are very dark grayish brown to nearly black and of good depth. The subsoil is mottled largely with gray and some brown and yellow, is usually heavier textured and somewhat less well drained than the subsoil of the Muscatine series, and contains iron stains and concretions. The surface varies from flat to undulating. The silt loam is mapped in this survey.

The Tama series has dark-brown to very dark brown or nearly black, mellow surface soils. The subsoil is a yellowish-brown to yellow silty clay loam. Natural drainage is good, and the subsoils have been well aerated and oxidized. Typically the soils do not contain enough lime carbonate to effervesce with acid. The series is represented by the silt loam, which is the most extensive soil in the county.

The types of the Clinton series are characterized by brown to yellowish-brown or grayish-brown surface soils, relatively shallow, overlying a compact, but not heavy, silt loam to silty clay subsoil of yellow color, sometimes faintly mottled with gray. The topography is rolling to broken, and natural drainage is good to excessive. The silt loam occurs in this area.

The Knox series comprises light-colored surface soils, underlain by a yellowish-brown to yellow subsoil. The surface is generally broken and drainage is good to excessive. The Knox fine sand is mapped.

The Marion series is characterized by light grayish brown surface soils, with a subsurface of light ashy gray. The subsoil ranges from

yellow to yellowish brown or brown, is mottled in places, and is a clay loam to clay or silty clay in texture. The silt loam is mapped and generally covers rough timbered areas.

The Webster soils are derived from glacial drift under conditions of poor drainage. The surface soils are generally black or very dark brown and rich in organic matter. The subsoil is a gray or drab clay loam to clay, mottled yellow and brown, and containing sufficient lime to effervesce with acid. Three types are mapped, the loam, clay loam, and silty clay loam.

The surface soils of the Clarion series are dark to very dark brown. Natural drainage is good, and the subsoil is oxidized to a yellowish-brown or yellow color but still contains sufficient lime to effervesce with acid. In texture the subsoil is a silt loam to clay loam, containing some admixture of sand and gravel in the lower subsoil. The loam and fine sandy loam are mapped.

The Carrington series differs from the Clarion series in the absence of lime in the subsoil. The members of this series in the county are the loam, with a steep phase, fine sandy loam, and fine sand.

The surface soils of the Shelby series are brown to dark brown. The subsoil is encountered at shallow depths and grades down through a heavy yellowish-brown loam to a yellow or reddish, sandy, gritty clay, containing appreciable proportions of rock fragments and gravel, sometimes in sufficient quantities to make the soil droughty. Weathered fragments of limestone are not uncommon in the lower subsoil. The Shelby loam is mapped.

The Lindley soils are yellowish brown to yellow, overlying a sandy, gravelly, clay subsoil. The topography is typically rough, often eroded, and excessively drained. The loam and silt loam are mapped.

The surface soils of the Waukesha series are very dark brown and generally high in organic matter. The subsoil is a brown to yellowish-brown or yellow silty clay. The series occupies second bottoms above overflow. The topography is flat to sloping and natural drainage is good. The Waukesha loam and silt loam are mapped.

The Bremer series comprises types with black or dark-brown surface soils high in organic matter, overlying a heavy drab or gray subsoil, which contains iron concretions and stains and is mottled locally with yellow and brown. The topography in places is depressed, but is usually flat to sloping, and drainage ranges from good to poor. It is a terrace series only recently brought above overflow by the lowering of the stream level. The Bremer silt loam is mapped.

The surface soils of the Chariton series are dark-brown to dark grayish brown, underlain by a subsurface layer of an ash-gray, flourlike silt loam. This grades into the subsoil of heavy, impervious, gray or drab clay, mottled with lighter gray and containing iron concretions. The series occurs on terraces. The surface is flat and the drainage in places is poor. The silt loam is mapped.

The Buckner series has dark-brown to very dark brown surface soils, overlying subsoils of about the same texture and slightly lighter color. The series occupies a terrace position, and the loam, fine sandy loam, and fine sand are mapped.

The surface soils of the O'Neill series are dark brown. The subsoil is yellowish brown, and contains much sand and some gravel. The series is developed on terraces and is represented here by the fine sand and the loam.

The types of the Wabash series resemble the Bremer soils, but occupy first bottoms subject to overflow. The surface soils are generally black or very dark brown and rich in organic matter. The subsoil is a drab, gray, or mottled gray, brown, and yellow clay loam to clay. Iron stains and concretions are commonly present. On colluvial slopes the soil may be practically the same for the entire 36-inch depth. The surface is flat or depressed to sloping, and natural drainage is usually not very good. The fine sandy loam, loam, silt loam, silty clay loam, and clay are mapped.

The Lamoure series differs from the Wabash mainly in the presence of lime in the subsoil. The surface soils are dark brown to black over a gray or drab subsoil. The series occupies first bottoms and is represented in this area by the silty clay loam.

Peat and Muck occupy depressions in the upland and are accumulations of organic matter. Peat has a fibrous structure and is brown in color. Muck is a black smooth mass of organic matter, more thoroughly decayed than Peat. The two materials are mapped together.

The distribution of the soils of Jasper County is shown on the accompanying soil map. The following table gives the extent, actual and relative, of all the soils in the county:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Tama silt loam	200,817	42.3	Clarion loam	1,408	0.3
Clinton silt loam	59,840	12.8	Marion silt loam	1,152	.2
Carrington loam	39,040	10.1	Clarion fine sandy loam	1,152	.2
Steep phase	7,872		Webster loam	1,024	.2
Wabash silt loam	35,328	7.6	Buckner loam	896	.2
Shelby loam	32,192	7.0	Buckner fine sandy loam	320	.1
Muscatine silt loam	26,112	5.6	Lindley silt loam	256	.1
Wabash silty clay loam	23,232	5.0	Webster clay loam	256	.1
Lindley loam	9,088	1.9	O'Neill loam	192	.1
Carrington fine sandy loam	5,696	1.2	Buckner fine sand	192	.1
Grundy silt loam	4,288	.9	O'Neill fine sand	128	.1
Carrington fine sand	3,264	.7	Wabash fine sandy loam	128	.1
Knox fine sand	3,136	.7	Chariton silt loam	128	.1
Wabash loam	2,816	.6	Webster silty clay loam	128	.1
Bremer silt loam	1,856	.4	Peat and Muck	64	.1
Waukesha loam	1,856	.4	Lamoure silty clay loam	15	.0
Waukesha silt loam	1,792	.4			
Wabash clay	1,536	.3	Total	467,200	

MUSCATINE SILT LOAM.

The Muscatine silt loam is a very dark brown or nearly black silt loam to a depth of about 17 inches. The upper subsoil from 17 to 24 inches is a dark-brown heavy silt loam to silty clay loam, faintly mottled with yellowish brown and stained with iron. At 24 inches the subsoil is a silty clay loam, becoming heavier in texture and lighter in color with increasing depth. The lower subsoil is distinctly mottled, largely with yellow and brown, but also gray, and contains iron stains and true and incipient iron concretions.

In some of the areas of Muscatine silt loam which lie in rougher country, surrounded largely by Clinton silt loam, the surface soil is a little lighter in color and shallower than in more smoothly rolling country, where the surrounding soil is the Tama silt loam.

Another slight variation in the soil is found where it approaches the Grundy silt loam, in which the color is more gray, and the subsoil is heavier and more tenacious. As both types have the same topography and position in the upland, and the transition from one soil into the other is very gradual, it was necessary to draw an arbitrary boundary between the two, which was established about 1½ miles southeast of Killduff. Since both types have about the same value and productivity, the exact location of the boundary between them is not especially important from an agricultural standpoint.

The Muscatine silt loam in Jasper County covers an area of about 41 square miles. It occupies flat tablelike or undulating divides in the upland and probably represents the original constructional surface of the silty plain. The type is usually surrounded by the gently rolling Tama silt loam, but in a few areas the adjoining soil is the Clinton silt loam, which has a more strongly rolling topography. The most extensive areas of the Muscatine silt loam are in the vicinity of Newburg, north and east of Baxter, from Prairie City to Monroe, north and east of Newton, about 2 miles southwest and south of Kellogg, near Killduff, and in Rock Creek Township. Many isolated areas of 10 to 100 acres are scattered through the upland, except in the northwestern and southeastern parts of the county.

The Muscatine silt loam is used for general and livestock farming. Corn, small grains, and forage crops are grown and generally fed to livestock, although some farmers keep very little stock and sell the crops. A corn-corn-oats-clover rotation is generally followed, but on some farms a legume is not included in the rotation. Corn generally yields 50 to 65 bushels per acre, although lower yields are not uncommon and yields of 70 to 80 bushels are obtained on some farms. Oats yield 50 to 55 bushels per acre, and clover yields 2 to 3 tons of hay and 1 to 1½ bushels of seed. The type when properly cared for is capable of heavy production, and is probably the most consistently high-producing soil in the county.

Although the soil in its natural state is very fertile, it can not continue to produce high yields under continuous cropping with corn and oats. The system should include a leguminous crop, such as clover, which may be utilized as a forage and hay crop and to some extent as green manure. This should be supplemented by applications of barnyard manure. Where possible, the second-growth clover should be plowed under rather than cut for hay. Another method is to pasture the second growth lightly, so that some green top growth will remain to be plowed under with the manure left by the pasture stock. Such additions of organic matter improve the physical condition of the soil and also increase productiveness. Drainage is not a problem on this type, except in periods of excessive rainfall, when the flat areas may retain too much water. The laying of tile would easily prevent such a condition.

Sale values for the Muscatine silt loam range from $275 to as high as $400 or more an acre, depending on location and improvements.

GRUNDY SILT LOAM.

The Grundy silt loam to a depth of about 17 inches is a dark grayish brown to nearly black, smooth silt loam, slightly heavier in texture in the lower part. The upper subsoil to a depth of 24 inches is a

heavy silt loam to silty clay loam of dark-drab color. The lower subsoil from 24 to 36 inches is a heavy and tenacious clay loam to clay, mottled gray, brown, and yellow and containing iron stains and concretions. The entire subsoil has a more grayish cast than that of the Muscatine silt loam.

Where the Grundy silt loam approaches the Muscatine silt loam southeast of Killduff, it becomes less typical and more like that soil. Within areas of the Grundy silt loam there are shallow depressions, too small to be shown on the map, in which the surface soil is a black silty clay loam and the subsoil is a heavy, drab-colored, tenacious clay, quite impervious to water. Drainage on these areas is naturally poor.

The Grundy silt loam as mapped in Jasper County differs slightly from the type as developed in extensive areas in the southern part of the State, where the subsoil generally is heavier and more impervious and has more of a drab color than in this county.

The type covers a total area of about 7 square miles. The most extensive area extends from the southeast corner of the county northwest through Lynnville Junction toward Killduff. Smaller isolated bodies are mapped in the surrounding upland. The Grundy silt loam generally occupies flat upland divides, but usually it extends farther into the adjoining undulating to slightly rolling upland than does the Muscatine silt loam.

Agriculture on the Grundy silt loam is practically identical with that on the Muscatine silt loam. Corn yields 55 to 65 bushels per acre, with occasional higher yields. Oats yield 45 to 60 bushels per acre, and clover hay 2 to 3 tons.

The Grundy silt loam ranges in value from $225 to $350 an acre, according to improvements and location.

TAMA SILT LOAM.

The surface soil of the Tama silt loam is a very dark brown, smooth silt loam to an average depth of 14 inches. The subsoil is a brown to yellowish-brown or yellow, compact, heavy silt loam to silty clay loam. The transition in color and texture from 14 to 36 inches is gradual, the subsoil becoming heavier in texture and lighter in color with increasing depth. The soil, being of loessial origin, is entirely free from coarse material.

Although this type in general is uniform in color and texture of both soil and subsoil, it includes some minor variations. The soil is most uniform in the large areas, in which the only variation is a thinning of the surface soil on the crests of hills or narrow ridges, where the depth may not exceed 8 to 10 inches. In places at the base of slopes approaching small intermittent drainage ways the surface soil is darker in color and 16 to 18 inches deep, owing to an accumulation of colluvial material from the soil of higher elevation. In such places the subsoil is also darker in color and may be mottled brown and yellow. None of these variations extend over areas large enough to be shown on the map. Where the Tama silt loam lies adjacent to the Muscatine silt loam, the type may have a slightly deeper surface soil than typical and show some mottling in the lower subsoil. As the transition from one soil to the other is rather gradual, neither would be exactly typical at the boundary line. In

places near the boundaries between the Tama and Clinton silt loams there is a gradual change from the dark color of one to the lighter color of the other, and the boundary is established arbitrarily.

A marked variation from the typical Tama silt loam consists of the presence of lime nodules or concretions within the 3-foot section. The largest such area comprises all of the Tama silt loam in Washington Township except that in sections 25, 29, 31 to 36, inclusive, and the southern parts of sections 26 and 30. The next largest area lies in the southeastern part of Palo Alto Township. Several small areas are located on the line between sections 21 and 22, Palo Alto Township, in section 14, Poweshiek Township, and in section 30, Independence Township. The lime concretions, which are plainly visible in road cuts, are chalky gray in color and range in size from that of a pea to 1½ or 2 inches across, the larger ones being hollow. Although generally found in the subsoil, they sometimes occur within the plow depth. They effervesce freely with acid, but in many cases the soil immediately surrounding them does not contain sufficient lime to effervesce. The presence of lime in the substratum has been noted in areas of the Tama silt loam in Polk County on the west and Marshall County on the north, but not within 36 inches of the surface.

The Tama silt loam is the most extensive type in this county and is developed in all parts, except in western Clear Creek and Poweshiek Townships and northern Washington Township, where the upland soils are glacial rather than loessial. The largest continuous area lies in Des Moines and western Fairview Townships. The type is interlaced with other upland soils, such as the Muscatine, Grundy, and Clinton silt loams, and the Carrington, Shelby, and Lindley loams. In many parts of the county it extends in fingerlike areas along divides between drainage ways, or surrounds irregular-shaped bodies of the Muscatine or Grundy silt loams.

The topography of the Tama silt loam is undulating to gently rolling or rolling and occupies an upland position intermediate between the flat Muscatine or Grundy silt loam and the lower lying drift soils or the alluvial soils of the terraces or bottoms. Where it borders the Clinton silt loam, the topography is often a little more strongly rolling. Natural drainage over the type is good, except in some small areas bordering intermittent swales or draws. A line of tile has been run through many such places to take care of excessive amounts of water. While the character of the soil permits of good natural drainage, it is also retentive of moisture and capable of withstanding rather extended periods of dry weather.

Practically all of the Tama silt loam is under cultivation. There is little natural forest on this type, although most farmsteads have a few shade trees and some kind of a windbreak or small timber lot. This type originally supported a luxuriant growth of prairie grasses, which resulted in large accumulations of organic matter in the soil, giving it the rich dark brown to nearly black color. A small proportion of this type is used for permanent pasture, part of which would be suitable for cultivation.

The Tama silt loam is a very productive soil when properly managed, is workable under a rather wide range of moisture conditions, and is highly prized for general farming. Crop yields as a rule are slightly lower than on the Muscatine silt loam, although on some of

the better managed farms they are nearly the same. Corn, oats, hay, and wheat are the principal crops, named in the order of their acreage. Livestock feeding goes hand in hand with the crops mentioned and is the prevailing industry on the type. Some dairying is practiced with good success. The tree fruits, largely apples, are confined to small orchards. Bush fruits and garden vegetables are grown for home use. The production of potatoes is not sufficient to supply the local demand.

In an average season corn yields 45 to 60 bushels per acre. In good seasons yields as high as 70 to 80 bushels are obtained by some farmers, showing the possibilities of the type. Yellow corn predominates, Reid Yellow Dent being the most popular variety, but much of the yellow corn grown has lost its identity as a variety. Oats, ranking second in acreage, yield 40 to 50 bushels per acre, In 1921 the season was bad for oats and the yield on this type ran from 30 to 35 or 40 bushels. Since oats are very commonly used as a nurse crop for clover, an early variety is desired. The most popular varieties appear to be Early Champion and Albion (Iowa No. 103). Other varieties include Green Russian, Richland (Iowa No. 105), oats of no distinct variety, and Iowar, a new oat developed by the Iowa Agricultural Experiment Station. The winter varieties of wheat are grown chiefly, yielding from 18 to 26 bushels per acre; the spring varieties usually yield from 10 to 16 bushels. Clover yields 1½ to 2 tons of hay per acre, not including the second growth, which is utilized in various ways. The suggestions for the use of clover, as given for the Muscatine silt loam, apply here also. In years when seed is well formed, the second growth is often hulled, yielding a bushel or more of seed. Timothy is generally seeded with the clover, giving a mixed hay. Usually the timothy is not left on the land after the second year following the seeding with the oats and clover.

Probably three-fourths of the farmers on this type follow a general 4-year rotation of corn-corn-oats-clover. This is to be highly recommended as a cropping system. The Tama silt loam, having a rolling topography, is more subject to loss of plant food through leaching and wash than are the more flat soils. Therefore it is a little more difficult to maintain the content of organic matter and nitrogen, but this can be maintained by using manure and following a rotation. Manure is best applied to the clover stubble and plowed under in the fall. The depth of plowing on this type ranges from 3 to 8 inches, with 4 or 5 inches as an average. A plow depth of 6 or 7 inches would be advisable. Commercial fertilizers are not in common use, although ground limestone has been used with good success and is particularly valuable where alfalfa is grown.

Land values of the Tama silt loam are somewhat variable, owing to such factors as interlacing of soils of lower value, condition of the soil, location, and improvements. Farms composed solely of this type range in value from $250 to $350 or more an acre. The type usually brings the highest prices when sold in conjunction with the Muscatine silt loam. Many farms lying within areas of this type are made up in part of the Shelby, Carrington, and Lindley loams, the Clinton silt loam, and other soils. The value of such farms ranges from $150 to $300 an acre, or even higher. While these figures are representative, the type has brought as high as $400 or more an acre.

CLINTON SILT LOAM.

The surface soil of the Clinton silt loam is a brown to yellowish-brown or grayish-brown, mellow silt loam, 7 to 10 inches deep. The subsoil to a depth of 36 inches is a brownish-yellow to yellow, heavy, compact, but not impervious silt loam to silty clay, which becomes lighter in color and relatively heavier in texture with increasing depth and is flecked locally with light-gray and faint mottlings of brown in the lower subsoil.

In areas greatly dissected with draws and swales, the ridges and hills are commonly topped with a very light colored surface soil, while at the base of hills the surface soil in places is darker and of greater depth. When dry the soil has a grayish cast and in places approaches the Marion silt loam in appearance. In forested areas the upper layer of 2 or 3 inches of the surface soil usually has a darker brown color, owing to the accumulation of organic matter from fallen leaves, but this dark color disappears after the land is put under cultivation. In places it was difficult to establish the exact boundary between this soil and the Tama silt loam, where the two soils grade into each other.

The Clinton silt loam covers an area of about 93 square miles in Jasper County, and is rather generally distributed, except in western Poweshiek and Clear Creek Townships. The most extensive bodies are along Rock and Sugar Creeks, the Skunk River, Elk Creek, and in Independence and Sherman Townships along the numerous tributaries to Indian Creek and Skunk River. In addition, numerous isolated areas occur along intermittent drainage ways in various parts of the county.

The topography of the Clinton silt loam is prevailingly strongly rolling to rough or broken. In some areas along the larger streams the surface is a succession of sharp hills and steep-sided valleys, 75 to 150 feet above the bottom lands. Where the topography is more rolling and less broken, the type has been put under cultivation to the best advantage and the surface soil has a darker color and greater depth.

The drainage is good to excessive. Although the subsoil is fairly retentive of moisture, crops suffer for lack of water during dry periods. Erosion is active on the land under cultivation in rough areas.

The Clinton silt loam originally supported a forest growth, and much of it is still in forest, being unsuited for cultivation because of the rough surface. A good deal of the cleared land is now in pasture. The original forest growth consisted largely of oak, hickory, hazel brush, elm, maple, willow, elder, and butternut.

Corn, oats, and hay are the chief cultivated crops. Corn yields range all the way from less than 20 to more than 50 bushels per acre. Some of the better lying areas, under good management, give excellent yields. Oats yield 20 to 45 bushels per acre, and hay 1 to 2 tons per acre.

This type, which is not considered as valuable as the Tama silt loam, is managed about the same but requires greater care. The better areas can be made quite productive. Generally speaking, the soil is low in humus and responds well to the use of farm manure, green-manure crops, and other forms of organic matter. Plowing should

be to good depth, preparation of the seed bed should be thorough and organic matter should be added as frequently as conditions demand. Where the surface is rough, the land should not be cropped but kept in pasture or forest.

Land values on the Clinton silt loam range from $100 to $250 an acre. The price is influenced by topography, state of cultivation, location, and the proximity of better or poorer types of soil.

A calcareous variation of this soil occurs in the western part of the county, which, if it had covered a sufficient area, would have been mapped as Knox silt loam. The surface soil consists of 6 or 8 inches of brown to yellowish-brown silt loam, mellow and friable. The subsoil is a yellowish-brown, friable, heavy silt loam to silty clay to a depth of 24 inches, where it passes into a yellow, friable, heavy silt loam containing considerable very fine sand. Concretions of lime occur throughout the subsoil and are sometimes found within the plow depth. The occurrence of this soil is confined to the western two-fifths of the county, with the exception of a few areas in the upland bordering the bottoms of the Skunk River. The most eastern area lies 1½ miles south of Galesburg on hills adjacent to the bottom lands.

The topography is strongly rolling to broken. Very little of this land is in forest, most of it being in pasture or under cultivation. Some of the rougher areas are not suitable for cultivation and should be kept in grass or timber. Alfalfa might do well on this soil, since the subsoil is rich in lime. A light application of ground limestone may be found necessary to correct the surface acidity.

KNOX FINE SAND.

The surface soil of the Knox fine sand is a yellowish-brown to yellow fine sand, 6 inches deep. The subsoil to 36 inches is an incoherent yellow fine sand, locally containing lime concretions of variable size. In a few fields under cultivation, sufficient organic matter has been incorporated with the surface soil to give it more of a brown than a yellowish-brown color. In areas where the soil is subject to shifting by wind, the surface has a clean yellow, light yellow, or cream color.

The Knox fine sand covers an area of about 5 square miles in Jasper County. It occurs principally on the bluffs bordering the east side of the Skunk River bottom lands, from about 2 miles south and a little west of Ira to the Marion County line. Its areas are elongated in a general northwesterly and southeasterly direction and extend into the upland for distances varying from one-fourth to 1 mile.

The topography of the Knox fine sand ranges from gently rolling to strongly rolling or broken. The type is not heavily forested, but supports a few trees in some areas. This soil, being very light textured and porous, loses its moisture rapidly. Surface wash is not great, as the topography is not very steep, but drainage is thorough to excessive.

Crops are uncertain on the Knox fine sand, owing to lack of moisture during dry periods, and yields of the field crops are rather low. Corn yields from 15 to 30 bushels per acre, oats and rye 15 to 25 bushels, hay one-half ton to 1½ tons. Much of the type is in pasture and supports a rather indifferent growth of grasses. This soil has

been utilized to good advantage in some localities for the production of watermelons and cantaloupes, particularly in the vicinity of Colfax.

The best means of improving this soil, without the use of commercial fertilizers, is through the incorporation of farm manure, green manures, and crop residues. The soil is very low in organic matter and should receive large quantities of manure where available, which will add to the fertility of the soil and increase its water-holding capacity. Green manures should be of leguminous crops, of which red clover is probably as good as any. This should be sown with a nurse crop, and for this purpose rye is preferred by many farmers. The Knox fine sand is usually sold in conjunction with adjoining types of soil.

MARION SILT LOAM.

The typical surface soil of the Marion silt loam in Jasper County is a light grayish brown silt loam, 6 inches deep, underlain by a light-gray floury or ashy silt loam extending to a depth of 8 to 15 inches. The subsoil is a brown to yellowish-brown or yellow silty clay loam to clay loam, which becomes heavier with increasing depth. The lower subsoil in places is mottled with yellow and brown and stained with iron.

In some areas of this type, such as in section 25, Clear Creek Township, the surface soil is dark gray to brownish gray when wet, but ashy gray when dry, and the subsoil is a grayish-brown to light-brown, heavy silt loam to silty clay. In forest areas there is often a slight accumulation of organic matter in the surface soil, giving it a darker color for a depth of 2 or 3 inches. Areas of this soil are very noticeable because of the whitish appearance of the surface soil. Where the type adjoins the Tama or Clinton silt loam, the change from one soil to the other is very gradual, and the boundary has been placed rather arbitrarily within the transition belt.

The Marion silt loam was originally covered with timber growth, and much of it is still in forest, although some areas have been cleared and are under cultivation. The topography is strongly rolling to broken, except on the area mapped in section 25, Clear Creek Township, where the surface is gently rolling. The drainage is good to excessive. The type has a total area of less than 2 square miles and is developed principally in the northwestern part of the county.

Corn, small grains, and hay are the cultivated crops grown, and the yields are lower than on the Clinton silt loam. The type can best be utilized for forestry, or, where cleared, for pasture. A few areas are suitable for cultivation, but special attention is required to produce satisfactory yields. The chief need of this soil, as indicated by its color, is organic matter. This can be supplied by liberal applications of farm manure. If manure is not available in sufficient quantities, leguminous green manures should be used to build up the content of organic matter and nitrogen and increase the water-holding capacity. Ground limestone would undoubtedly prove beneficial.

Land values of the Marion silt loam are low, but the type usually comprises only a small part of a farm and is sold in conjunction with other types of soil.

CARRINGTON FINE SAND.

To a depth of 10 or 12 inches the Carrington fine sand is an incoherent brown fine sand. The subsoil to a depth of 24 inches is a lighter brown fine sand, and from 24 to 36 inches it is a yellow incoherent fine sand. In many places a small amount of fine gravel is distributed through the 3-foot section. The type is particularly low in organic matter. In some variations from the typical soil the surface soil is more of a loamy fine sand than pure sand, or the surface is more of a yellowish-brown or gray color. The Carrington fine sand differs from the Knox fine sand in that it contains some gravel and is not subject to drifting.

The Carrington fine sand is confined to the western part of the county. The largest continuous area lies at and south of the town of Colfax. The topography ranges from strongly undulating to broken. Most of the type is in pasture or under cultivation; some parts of it support a forest growth.

The yields of field crops on this type are uncertain and not high at their best. While corn, oats, and hay are the leading crops, some winter wheat is grown, and in places, particularly in the vicinity of Colfax, the type is used successfully for the production of melons. It is probable that in the growth of truck crops lies its most profitable use, where markets are favorable.

The soil yields about the same as the Knox fine sand, and the means of improving that type apply equally well to the Carrington fine sand. This type is usually sold in conjunction with the adjoining soil type.

CARRINGTON FINE SANDY LOAM.

The Carrington fine sandy loam to a depth of 12 to 15 inches is a dark-brown or dark grayish brown, very friable fine sandy loam. The subsoil is somewhat variable, but usually grades through a brown fine sandy loam to the lower subsoil of yellowish-brown to yellow loam, heavy loam, or sandy clay. Locally the subsoil is a sandy loam to loamy fine sand or sand, which is incoherent, porous, and friable. It is not uncommon to find gravel and bowlders in the 3-foot section or an occasional bowlder on the surface.

The type is rolling to strongly rolling or even broken in the rougher areas. It is largely a prairie soil, although in some areas along streams it supports a growth of timber. In a few fields the organic matter has become depleted and the soil has a brown or grayish-brown color. Some of the areas, particularly near Oswalt and northwest through Poweshiek Township, include small bodies of loamy fine sand, fine sand, or a very light textured fine sandy loam, which are not large enough to warrant being shown on the map. The largest continuous areas of this type are in the vicinity of Oswalt and north and northwest of Valeria. Some areas occupy crests of ridges and hills within areas of the Carrington loam.

This type is confined to the western part of the county north of the Skunk River, with the exception of about 100 acres in the northern part of section 5 in Mound Prairie Township and two small areas just south of Colfax.

The Carrington fine sandy loam is largely under cultivation, although an appreciable proportion is in forest and permanent pasture. Its light texture makes it an early soil and permits of cultivation when rather wet without danger of harming the physical condition of the soil. Lighter draft is required to work this soil than the heavier ones. Areas of the type in which the subsoil is open and porous do not stand dry weather as well as those having a subsoil more retentive of moisture. Crop yields on this soil are lower than on the loam of the same series. Corn and oats are the leading field crops. Corn yields 25 to 35 bushels and oats 25 to 30 bushels per acre in favorable years. While not a particularly fertile soil, it returns profitable yields over most of the type when properly managed.

The Carrington fine sandy loam is generally rather low in organic matter. For this reason it is desirable to apply a good deal of manure, in addition to plowing under some green legume growth, cornstalks, and small-grain straw. This practice will improve the physical condition of the soil and increase its water-holding capacity and productiveness.

Land values on the Carrington fine sandy loam are variable, ranging from $90 to $200 or more an acre.

CARRINGTON LOAM.

The surface soil of the Carrington loam is a dark-brown mellow loam, underlain at 12 to 14 inches by a brown to yellowish-brown heavy loam. The subsoil from 16 or 20 inches to 3 feet is a silty clay to clay loam, yellowish brown to yellow in color, containing some sand, pebbles, and fragments of rock of varying size. Occasional bowlders are found on the surface or within the 3-foot section, but they are not numerous enough to interfere with cultivation. The soil is relatively high in organic matter. On the crests of hills and ridges the soil may have a lighter color and a higher content of sand. In lower positions it is often darker in color and somewhat more silty in texture.

The topography of the Carrington loam is strongly undulating to rolling, but largely gently rolling. It is one of the more extensive soils of Jasper County, comprising a large part of Clear Creek, western Poweshiek, and northwestern Washington Townships. It also occurs in other parts of the county in an intermediate position between silty loess soils and bottom soils or the drainage ways themselves. In this position it occurs in ribbonlike bodies along the larger stream courses and many of their tributaries. In such areas the type is not as valuable for farming as the surrounding upland or the more extensive areas of the same soil in the northwestern part of the county, owing to such factors as the presence of draws or swales and the shallowness and light color of the surface soil on points and ridges.

The Carrington loam has good natural drainage but is not excessively drained. When properly cared for crops do not suffer through the dry months of the year. Some of the smoother or lower lying areas have been improved by tiling. Erosion is not serious over most of the type, although some of the rougher areas are subject to gullying. If the content of organic matter of the soil is maintained,

there is little danger of erosion, except in the rough areas which are better kept in grass.

This type was originally a prairie soil supporting a rich growth of grasses and some forest along the stream courses. Only a small part of it is not under cultivation; this comprises land not suitable for cropping, small wood lots, and permanent pastures.

All of the field crops common to the county are grown on the Carrington loam and are used largely for feeding livestock on the farm. Corn yields 35 to 50 bushels per acre, oats 35 to 45 bushels, and clover and timothy hay mixed, 1 to 2 tons per acre. Larger yields are obtained by some farmers by the generous use of farm manures, a leguminous crop in the rotation, and the plowing under of crop residues. The average plow depth should be increased to 7 or 8 inches. Because of its content of sand, this soil is workable under a wider range of moisture conditions than the more silty soils of the county, and it warms up earlier in the spring. Good tilth is easily maintained through the season.

Bodies of the Carrington loam within loess areas, being inextensive, are farmed as are the adjoining soils, usually the Tama silt loam. Many such areas are in pasture. Where cultivated, special attention should be given to the use of manures and the plowing under of some green leguminous growth.

The rotation of crops is followed to some extent on this type. The most popular and successful plan is the common 4-year rotation of corn two years, oats, and clover. Continuous cropping with corn and oats has cut down the productiveness of some areas. Alfalfa is not grown to any extent but does well after a stand is established. Bluegrass usually comprises the growth of permanent pastures.

Farms on the Carrington loam sell for $175 to $300 an acre, depending on the usual factors of location, soil condition, and improvements.

Carrington loam, steep phase.—The steep phase of the Carrington loam includes the more strongly rolling to broken areas of the type, where the surface soil is shallow, usually not over 6 to 8 inches deep, and is often lighter colored than the typical soil. Particularly on the points of hills the surface soil is likely to be thin and light colored. The subsoil contains some sand, gravel, and bowlders, and surface bowlders are more numerous than on the typical development. Some areas of the phase contain patches of the typical soil not large enough to show on the map.

This phase occurs almost entirely on lower slopes to drainage ways, within areas of loessial soils. One area was mapped in the east-central part of Clear Creek Township, where the surrounding upland soil is the typical Carrington loam. A few small areas of the steep phase occur along the Polk County line north of the Skunk River. The surface is steep and cut up with numerous swales and draws.

The steep phase is of relatively small extent and is not important agriculturally. Most of it supports some forest growth and is used mainly for pasture, very little being under cultivation. Cropping is not to be recommended, as the soil is not very productive and is subject to severe erosion which is hard to control if the land is plowed. If placed under cultivation, manure should be applied generously and the soil carefully watched to check erosion. The Carrington loam, steep phase, is usually sold in conjunction with adjoining types.

CLARION FINE SANDY LOAM.

The Clarion fine sandy loam is a brown to dark-brown fine sandy loam to a depth of 10 to 14 inches, where it grades into a yellowish-brown to yellow sandy loam to sandy clay. The subsoil is rarely lighter than a sandy loam, and is usually a heavy loam to sandy clay loam. At depths varying from 24 to 30 inches the subsoil is calcareous, effervescing with acid. Rock fragments and gravel are numerous within the 3-foot section, and occasional bowlders are found on the surface. Areas of this type sometimes include spots of sandy soil not large enough to map.

The Clarion fine sandy loam has a total area in this county of a little less than 2 square miles. The largest area of this type lies mainly in section 21 in Poweshiek Township, 2 miles north of Oswalt. A small area lies northwest of Oswalt along the Skunk River bottom lands.

The surface of the type is gently rolling to rolling or in places broken. Natural drainage is good, but usually not excessive. The type is largely under cultivation or in pasture. A small part is in forest, particularly that north of Oswalt.

The Clarion fine sandy loam differs from the Carrington fine sandy loam in that it is calcareous in the subsoil while the Carrington is not. Another difference lies in the fact that the Clarion fine sandy loam generally has a less porous subsoil than the corresponding type in the Carrington series. Crop yields, land values, and suggestions for the improvement of the two types are the same.

CLARION LOAM.

The surface soil of the Clarion loam is a dark-brown friable loam, 12 inches deep. The subsoil is a brown to yellowish-brown or yellow heavy loam, which passes into a yellowish silty clay at about 24 inches, and contains some fine sand and gravel in the lower subsoil. Below depths of 24 to 30 inches the subsoil is calcareous, containing lime flour and fragments of limestone rock. Bowlders of various sizes are found on the surface; these are not numerous enough to interfere with cultivation and have been largely removed from cultivated fields. The soil is relatively high in organic matter but may become depleted if not properly cared for.

The topography of the type is gently rolling to rolling. Slight variations may be found within areas of this soil in that it is lighter colored and shallower on ridges and tops of hills. Usually a darker and deeper surface soil is encountered on the lower slopes of hills.

The Clarion loam in this county covers about 1,400 acres. With the exception of small areas in sections 18 and 19 of Poweshiek Township and section 9 of Washington Township, the type is confined to Clear Creek Township, where the largest continuous body comprises parts of sections 2, 3, 4, 9, and 10.

The Clarion loam resembles very closely the Carrington loam, the only material difference being the presence of lime in the subsoil of the Clarion. The soils are equally desirable, producing the same yields under like management. It is possible that the Clarion loam will support a little better growth of leguminous crops because of the

lime in its subsoil. The surface soil generally is acid. Methods of improvement and management suggested for the Carrington loam also apply to this soil.

WEBSTER LOAM.

The surface soil of the Webster loam is a very dark brown to black mellow loam, passing at a depth of 10 to 12 inches into a subsurface layer of black silty clay to clay loam, which is heavier in texture and approaches a dark-drab color at a depth of 18 inches. The subsoil to 36 inches is a drab to yellowish-drab clay loam to clay, becoming lighter colored in the lower subsoil and mottled gray, brown, and yellow. The lower subsoil may contain some sand, fragments of limestone rock, and rock flour. The subsoil is uniformly calcareous, effervescing with acid.

The type is confined to the northern part of Clear Creek Township and the northwestern part of Poweshiek Township. It is not extensive, covering about 1½ square miles. It has a flat to undulating surface and occupies flat divides or smooth areas at the heads of drainage ways. In places the natural drainage is insufficient and the installation of tile drains is necessary.

Agriculture on the Webster loam consists of raising of corn, oats, and hay, and feeding livestock. Crop yields are very good under proper management. Where manure is applied, crops are rotated, and good methods of plowing, seeding, and tilling are employed, corn yields 50 to 65 bushels per acre, oats 45 to 60 bushels, and clover and timothy hay 2 tons per acre. These yields are above the average for the county and are themselves frequently surpassed on this soil.

For the improvement of the Webster loam thorough underdrainage should be provided, the crop rotation should include a legume, and the naturally high content of organic matter should be maintained by plowing under manures and crop residues. Land of this type is valued at $200 to $300 or more an acre.

WEBSTER CLAY LOAM.

The surface soil of the Webster clay loam is a black or nearly black clay loam, about 15 inches deep, and rich in organic matter. The subsoil to 36 inches is a heavy clay loam to clay of dark-drab color, which becomes lighter in color and heavier in texture with increasing depth. The lower subsoil is calcareous, effervescing with acid.

The type occupies flat divides or slight depressions in the upland usually surrounded by Carrington loam. It is of little importance in this county, covering only about 250 acres, in small areas on or near the Polk County line in Washington and Clear Creek Townships.

The chief problem on this type is the establishment of thorough drainage. Owing to the heavy character of the subsoil and the flat surface, water remains standing after heavy rains if the land is not well tiled. Care must also be exercised in plowing and cultivating at the right time to avoid puddling or the formation of clods.

Although this soil is high in organic matter, applications of manure would prove beneficial from the standpoint of improving the aeration and physical condition of the soil. Only part of the type is under cultivation. It yields well under good management but requires care in handling.

WEBSTER SILTY CLAY LOAM.

The surface soil of the Webster silty clay loam is a black or nearly black silty clay loam. The subsoil from 14 to 36 inches is a black to drab clay loam to clay, becoming heavier textured and lighter colored with increasing depth. The lower subsoil is calcareous, effervescing with acid.

This type has a flat or gently sloping surface. It occupies depressions in the upland, mainly narrow strips along intermittent drainage ways of low gradient. Owing to its small extent, the Webster silty clay loam is unimportant agriculturally in this county. It requires the same treatment and has about the same value as the Webster clay loam.

SHELBY LOAM.

The surface soil of the Shelby loam is a dark-brown loam, 8 or 10 inches deep. In places it is rather high in content of sand but still of loam texture. The upper subsoil to 20 inches is a yellowish-brown to yellow, gravelly, sandy clay loam or clay, containing seams of gravel here and there. The lower subsoil is a reddish-brown sandy clay loam, containing more or less of sand or gravel. Fragments of rock and disintegrating rock, usually granite, are numerous throughout the subsoil, and calcareous material is also found locally in the subsoil. In a few places the subsoil is composed largely of gravel, sand, and rock, with some admixture of clay. A few bowlders are found on the surface, but not enough to interfere seriously with cultivation. This type differs from the Carrington loam mainly in having a shallower and usually a little lighter colored surface soil and greater quantities of sand, gravel, and rock fragments in the subsoil.

The Shelby loam is fairly extensive and is rather widely distributed through the loess-covered parts of the county, where its development is the result of stream courses having cut through the loessial covering, exposing the underlying Kansan drift material. A few isolated bodies of the type are in the northwestern part of the county. It is confined largely to more or less narrow strips of land along both the perennial and larger intermittent streams, where it occupies the lower slopes to drainage ways, below the silty loessial soils. The topography of the type is generally the same as that of the adjoining type of soil, ranging from gently rolling to strongly rolling or broken.

Natural drainage on the type is generally moderate. On some areas of steep topography, or those which contain unusually large quantities of gravel in the subsoil, the drainage is excessive, causing crops to suffer during periods of dry weather. Erosion is a problem on some areas that are subject to gullying.

A good deal of the type is under cultivation, being farmed the same as the adjoining type. In some of the rougher areas, where the surface is steep and draws are numerous, the soil is not suitable for cultivation and is usually pastured. Such areas support a growth of the native grasses, largely bluegrass, and some timber. It is a common practice to use areas of this type for permanent pasture on farms otherwise made up of Tama silt loam or other better soils. Crop yields are somewhat variable on the Shelby loam. Corn yields 20 to 40 bushels per acre, oats 20 to 35 bushels, and clover and tim-

othy mixed, 1 to 1½ tons. The type is less desirable than the Tama silt loam, with which it is frequently associated. This type never comprises entire farms, being sold in conjunction with adjoining soils. Its value ranges from $100 to $200 an acre.

The Shelby loam can be improved by plowing under plenty of manure and an occasional leguminous green-manure crop. This treatment will increase the content of organic matter and the productiveness and will tend to decrease washing. The steeper areas, however, should not be cultivated and can best be utilized as pasture or timber land.

LINDLEY LOAM.

The surface of the Lindley loam is in general a yellowish-brown loam to a depth of 6 to 8 inches, underlain to 36 inches by a yellow, sandy, gravelly clay, locally mottled gray and brown and stained reddish from iron. The surface soil may vary locally from a silt loam to a sandy loam, but such variations are of small extent and could not be shown on the map without exaggeration. In rougher areas, where the type is subject to severe erosion, there are numerous local exposures of the yellowish clay subsoil on steep slopes and hill tops. In places the subsoil is a gritty clay, which contains mottlings of bluish drab and ashy gray and has no reddish stains.

The topography of the type ranges from rolling to steep or broken. The rougher areas are badly washed and eroded, with a close interlacing of draws and small laterals. Drainage is good to excessive.

The Lindley loam is not an extensive soil in this county, but is generally distributed over the loessial parts. It occurs in about the same positions as the Shelby loam, being exposed on lower slopes approaching drainage ways. The chief difference between the two soils lies in the lighter color of the surface soil and steeper topography of the Lindley loam.

Very little of the type is under cultivation, and the crop yields are low and uncertain. The low fertility and steep topography of the type make it unsuitable for cultivation, and practically all of it is in forest or native grasses. Even where not cultivated, much of the land is subject to erosion. Its best use is as pasture land or for timber growth.

A gray variation of the Lindley loam occurs in the northwest corner of the county. The surface soil of this variation is a rather ashy gray, somewhat silty loam, which is floury when dry but contains enough sand to give it a loam texture. This extends to an average depth of 12 inches and is underlain by a brown to yellowish-brown silty clay to clay loam, often mottled or discolored with brown, yellow, and iron stains in its lower depths. Some sand and fragments of rock are found in the subsoil.

The topography in general is rolling, although some areas bordering larger drainage ways are strongly rolling or broken. This gray variation of the Lindley loam occurs in one area comprising parts of sections 9, 10, 15, 16, 21, 22, 27, and 28 of Clear Creek Township.

Part of this soil is under cultivation but a good deal is in pasture and forest. The rougher areas are subject to erosion when plowed and should be kept in pasture. Where the surface is less rolling the

soil is suitable for cultivation and produces better crops than the typical Lindley loam. The use of farm manures and a rotation including a legume would increase the supply of organic matter in the soil, which is naturally low.

LINDLEY SILT LOAM.

The surface soil of the Lindley silt loam consists of 8 inches of grayish-yellow or grayish-brown silt loam. The subsoil is a yellow or brown heavy silt loam to silty clay loam, grading at about 24 inches into a mottled gray, brown, yellow, and reddish-brown sandy gravelly clay, stained with iron. This coloration, however, is not the result of poor drainage.

The topography of the Lindley silt loam is generally rather strongly rolling, although part of the type has less relief. The type is confined to the southern part of Lynn Grove Township. It occurs in rather narrow strips on the lower slopes along drainage ways.

The type is largely in pasture, supporting but little forest growth. It is unimportant agriculturally because of its small extent and low value. It is sold only in conjunction with adjoining types of soil.

WAUKESHA LOAM.

The Waukesha loam has a dark-brown friable loam surface soil to a depth of 15 inches, where it is a little lighter brown in color and of silty texture. The subsoil to 36 inches is a brown to yellowish-brown or yellow silt loam to silty clay, lighter in color and heavier in texture with increasing depth. The surface soil contains a moderate amount of organic matter. The subsoil is not calcareous and the surface soil is generally acid.

The topography is flat to sloping, or very gently undulating. Natural drainage is good and the soil is not droughty. The only well-established drainage ways on the type are those issuing from the adjacent uplands, and some of the smaller ones lose their courses in traversing areas of this type.

The Waukesha loam covers about 3 square miles in Jasper County. It occurs on benchlike terraces along the two Skunk Rivers and Indian Creek at elevations of 5 to 15 feet above the flood plains. The areas range in size from 10 to 150 acres.

The agriculture on this type is about the same as on the Waukesha silt loam. The same crops are grown with approximately the same yields. The methods suggested for the improvement of the silt loam apply also to the Waukesha loam.

WAUKESHA SILT LOAM.

The surface soil of the Waukesha silt loam is a dark-brown to very dark brown silt loam, with an average depth of 15 inches. The upper subsoil to 24 inches is a brown heavy silt loam approaching a lighter brown silty clay at 24 inches. From 24 to 36 inches the lower subsoil is a yellowish-brown to yellow friable silty clay loam to clay loam, becoming lighter colored with increasing depth. In a few areas the dark surface soil extends to a greater depth, but as a whole the Waukesha silt loam is uniform over the entire county. In color and texture of soil and subsoil the type resembles the Tama silt loam developed on the upland loess.

The Waukesha silt loam is found along the Skunk Rivers and Indian Creek, occupying terraces from 5 to 15 feet above overflow. The topography is flat to sloping, or may be slightly undulating along stream courses which cross the type from the upland. The type covers about 1,800 acres in the county in areas of various size from 10 to 275 acres. The most extensive area lies about 1½ miles west of Goddard, on the west side of Indian Creek. Although the slope on the Waukesha silt loam is not great, the natural drainage is good.

Originally this soil supported a heavy growth of native prairie grasses, but is practically all under cultivation at the present time. The common field crops are corn, oats, and hay. Corn yields 40 to 60 bushels per acre, oats 35 to 50, and clover and timothy hay 1 to 2 tons.

The Waukesha silt loam is managed much the same as the Tama silt loam, except that less clover has been raised. Continuous cropping without a legume has led to a decrease in crop yields. For the improvement of the soil there is a general need for manure, leguminous crops, and more thorough preparation of the seed bed. Means should be employed to build up and maintain the content of organic matter of the soil. Many areas of the type are acid, and it is very probable that applications of ground limestone would prove beneficial.

Land values on the Waukesha silt loam range from $200 to $300 an acre. It seldom comprises entire farms and is usually sold in conjunction with adjoining types.

BREMER SILT LOAM.

The surface soil of the Bremer silt loam is a very dark brown to black or nearly black silt loam, high in organic matter, and about 16 inches deep. The upper subsoil to 24 inches is a dark-drab to drab clay loam or silty clay loam, lighter colored and heavier textured at 24 inches. The lower subsoil from 24 to 36 inches is a drab to gray, heavy clay loam to clay, becoming lighter colored and heavier textured with increasing depth. Locally the subsoil contains iron concretions and stains. In places the subsoil is mottled with brown and yellow, but the gray color is always present and usually predominates.

This type includes some small bodies of silty clay loam texture not large enough to be shown on the map. These occur in depressed areas. Small areas having a loam texture in the surface soil are found along Skunk River and Indian and Sugar Creeks. With the exception of texture, the soil profile is similar to that of the typical Bremer silt loam.

The type is not extensive, covering about 3 square miles. It occurs on low terraces along the Skunk River and along the North Skunk River from near Kellogg to below Lynnville. The topography is flat to sloping in the direction of the adjoining first bottom. In a few areas the transition from first bottoms to the terrace position of the Bremer soil is very gradual. Where the adjoining soil is the Wabash silt loam, the boundary between the two in places is fixed arbitrarily. Natural drainage is generally good, although tile drains would prove beneficial in some flat areas. The type is retentive of moisture and withstands periods of dry weather very well.

The Bremer silt loam is practically all under cultivation and devoted to the common field crops. Corn yields from 40 to 60 bushels per acre, oats 35 to 55 bushels, and hay 1½ to 2 or more tons per acre.

The Bremer silt loam is sold in conjunction with adjoining soils. Its value is from $200 to $250 an acre.

The use of farm manure and a rotation including a legume once in about four years, combined with good farming practice, should maintain the fertility of the soil.

CHARITON SILT LOAM.

The surface soil of the Chariton silt loam is a dark grayish brown to grayish-brown, smooth silt loam. The upper subsoil, from 12 to 20 inches, is an ashy-gray, flourlike silt loam which seldom shows any mottling. This intermediate layer is characteristic of the type, and is sharply separated from the surface soil and lower subsoil. The subsoil at 20 inches is a drab or gray heavy clay loam, which quickly passes into a heavy, waxy, tenacious clay of bluish-gray color mottled with lighter gray. In places the lower subsoil contains mottlings of yellow and brown and stains of iron. In its typical development it is quite impervious to water.

The Chariton silt loam is a terrace soil occurring above overflow, but owing to the imperviousness of the subsoil, water stands on the surface after heavy rains. The type occupies four areas, aggregating about 125 acres, on both of the Skunk Rivers, 5 miles northwest and 2½ miles west of Reasnor, 3 miles southeast of Kellogg, and one-half mile northwest of Lynnville.

The type is farmed as are the adjoining soils. Corn, oats, and hay are the chief crops, giving fair yields in normal seasons. Good underdrainage, rotation of crops, and the use of manure are necessary to produce good yields.

BUCKNER FINE SAND.

The Buckner fine sand has a surface soil of brown to dark-brown fine sand, which extends to an average depth of about 17 inches and is underlain to a depth of 36 inches by an incoherent slightly lighter colored fine sand. The type is not very uniform. Much of it has a lighter brown surface soil and a yellowish-brown to yellow fine sand subsoil. In such areas the soil approaches the Plainfield soils, which are typically lighter colored. Some of these lighter colored areas, which occur on knoll formations, 10 to 15 feet above overflow, comprise parts of sections 1 and 2, Lynn Grove Township, and sections 4 and 16, Richland Township.

The Buckner fine sand occupies flat to undulating or knobby terraces. The areas are small and unimportant agriculturally. Much of this type is used for pasture. A little is under cultivation, corn, oats, and wheat being the chief crops. The yields are rather low. The methods for improving the Knox fine sand and Carrington fine sand apply also to this type.

BUCKNER FINE SANDY LOAM.

The surface soil of the Buckner fine sandy loam is a dark-brown to very dark-brown, mellow, fine sandy loam, varying in depth from 12 to 16 inches. The subsoil to 36 inches is a friable fine sandy loam, a little lighter colored than the surface soil. The type is uniform over

the county, except for an area of about 160 acres comprising parts of sections 3 and 4 of Poweshiek Township. Here the subsoil below 26 or 28 inches is a yellowish-brown to yellow sandy loam containing some very fine gravel. The content of organic matter in the surface soil is generally good.

The type occurs on terraces a few feet above overflow and is naturally well drained. It is not extensive, covering a total area of one-half square mile.

The soil warms up early in the spring and does not require heavy draft for working. The general field crops are grown, and the yields are good in normal seasons. Garden and truck crops do well, but are produced only for home use. The incorporation of organic matter in its various forms, good tillage, and crop rotation are needed for building up this soil.

BUCKNER LOAM.

The surface soil of the Buckner loam is a dark-brown friable loam, about 12 inches deep. The subsoil to 36 inches is a brown to somewhat lighter brown loam, more sandy than the surface soil and lighter colored in the lower subsoil. The content of organic matter in the surface soil is fairly high.

The Buckner loam covers about 900 acres in Jasper County. It occupies terraces along the Skunk River, lying 5 to 10 feet above the present flood plain. Natural drainage is good, and crops do well except in seasons of unusual drought.

This type originally supported a growth of prairie grasses but is practically all under cultivation at the present time. Areas of the type are not large and are farmed with the adjoining soils. Corn yields 35 to 45 bushels per acre, oats 30 to 40 bushels, and hay 1 to 1½ or 2 tons.

The Buckner loam is easily handled, but can not be worked with as high a moisture content as the fine sandy loam. Barnyard manure should be applied freely and a legume included in the rotation. Land values range from $125 to $200 an acre.

O'NEILL FINE SAND.

The surface soil of the O'Neill fine sand is a brown to dark-brown fine sand. The subsoil from 10 to 36 inches is a grayish to yellowish-brown, incoherent fine sand, containing some fine gravel. A little gravel appears also on the surface. Virgin areas have a darker color for the first few inches than those in cultivation.

The O'Neill fine sand occurs on low terraces in areas of 10 to 30 acres. It covers only 128 acres in the county along Skunk River and Indian Creek. In some areas there is no gravel within the 3-foot section and the subsoil is a yellowish incoherent fine sand. The area lying entirely in section 17 and the one on the line between sections 17 and 20 in Clear Creek Township vary somewhat from the typical in that the surface soil has a darker color and ranges in texture from a fine sand to loamy fine sand or light-textured fine sandy loam, and the subsoil is generally a fine sand or loamy fine sand, lighter colored than the surface soil.

A large part of the O'Neill fine sand is under cultivation, being farmed with the adjoining soils. It yields about the same as or in some cases better than the Buckner fine sand, and responds to the means of improvement suggested for that type. Drainage is good to excessive and crops suffer in dry periods.

O'NEILL LOAM.

The surface soil of the O'Neill loam consists of 10 to 14 inches of dark-brown friable loam, relatively high in content of fine sand in some areas. The subsoil is a sandy loam approaching a loamy sand to sand at 20 to 24 inches. Below this depth the subsoil is somewhat variable, but is generally an incoherent sand containing some fine gravel in the lower part as it approaches the 36-inch depth. In the area just south of Indian Creek, on the Polk County line, the subsoil below 14 inches is a brown loamy sand which grades into a stratified mixture of fine gravel and some sand at 24 inches.

The type occupies low terraces along Indian Creek in Clear Creek Township, and has a total area of about 200 acres. The surface is flat to very gently undulating, and drainage is good to excessive. A large part of the type is under cultivation and the remainder is used for pasture. Crops do not suffer for lack of moisture in years of plentiful rainfall, in which case yields are favorable. Land of the O'Neill loam is farmed and sold with adjoining types.

WABASH FINE SANDY LOAM.

The Wabash fine sandy loam has a dark-brown to very dark brown fine sandy loam surface soil, about 16 inches deep. The subsoil is a grayish-brown loam or silt loam to light silty clay loam, which grades at about 24 inches into a mottled gray, brown, and yellow, heavy clay loam. Iron stains and concretions are common in the subsoil.

The type occurs chiefly in small bodies within areas near the streams, which are cut up by old meanders. Four areas are mapped, which have a total extent of 128 acres. One of these was under cultivation during the year of the survey (1921), the others being in pasture. Location and position generally make cultivation inadvisable. The type supports a good growth of native grasses, bluegrass, or timber and brush. It is sold with adjoining types and has a rather low value.

WABASH LOAM.

The surface soil of the Wabash loam is a very dark brown, mellow, friable loam, somewhat silty in places, and rather high in organic matter. This extends to a depth of about 16 or 18 inches. The subsoil to 36 inches is a dark-drab to gray, or mottled gray, brown, and yellow, heavy loam to silty clay or sandy clay in the lower part. In places the subsoil is a heavy loam, a little lighter in color than the surface soil.

The type is not very extensive and occurs mainly along Indian Creek and the Skunk River, with a few areas along the North Skunk River. Although the surface is generally flat, the drainage is good except in areas subject to frequent overflow.

This soil is largely under cultivation, some areas being used as pasture land. Crop yields are good but average a little less than on the heavier soils of this series.

On this type it is advisable to follow a rotation of four or five years which includes a legume. Plenty of farm manure and an occasional green manure crop should be plowed under. This soil is more easily handled and warms up earlier in the spring than the heavier Wabash soils.

Land values range from $100 to $200 an acre. Few farms are comprised of this type alone, and it is usually sold with adjoining types.

WABASH SILT LOAM.

The Wabash silt loam to a depth of about 16 inches is a very dark grayish brown or nearly black silt loam, relatively high in organic matter. The upper subsoil is a heavy silt loam, which passes gradually into a dark-drab silty clay to heavy clay loam at 24 inches. The lower subsoil to 36 inches is a drab to gray clay loam to clay, mottled with brown and yellow in the lower part and generally containing iron stains and concretions. In a few places the brown and yellow colors predominate in the lower subsoil. In other places the subsoil may be a solid gray color with no mottlings or only a few iron stains and concretions. In a few narrow meandered areas the subsoil below 30 inches is a grayish fine sand or loamy fine sand.

The Wabash silt loam is the most extensive first-bottom type in the county, with a total area of 55 square miles. It occurs throughout the county along streams of various sizes. Bordering the smaller streams, it is in ribbonlike areas subject to rather frequent inundations. Along the larger creeks and the two Skunk Rivers the type has its most extensive development, and much of it is not subject to as frequent overflows as along the smaller streams. Here it is closely associated and interlaced with other first-bottom soils and with terrace types. The areas subject to more frequent inundations and more cut up with old stream meanders have a lower agricultural value and should be left in pasture or the forest growth they support.

A few small areas of Riverwash are included with the type along such streams as the Skunk River or Indian Creek. These areas are not suitable for cropping and are subject to annual change. Within some areas of the Wabash silt loam close to upland types of light color, there are patches of overwashed material consisting of a surface accumulation of 1 to 3 inches of light-colored silty soil, underlain by the dark-colored soil of the type.

The surface of the Wabash silt loam is flat to sloping, with some slight rises in the larger areas. Drainage is generally good but is deficient in places. Surface ditches, tile drains, dikes, and the straightening of some stream courses have facilitated drainage and reduced the frequency of overflow and consequent damage. On the more extensive areas the inundations are not annual or periodical but occur irregularly.

The Wabash silt loam is used in the production of the common field crops, which are largely fed to stock on the farm, except that some grain is sold. Corn yields 40 to 75 bushels, oats 40 to 65 bushels, and clover 2 tons or more per acre. Wheat yields well and

is not an uncommon crop, and seems to be a more desirable small-grain crop than oats. The less extensive areas along the small streams are generally pastured, but when farmed are managed the same as the adjoining upland soils. Higher yields than those mentioned are sometimes obtained in favorable seasons on fields that have been particularly well cared for.

Rotations are not in as common use as they should be, and continuous cropping with corn has materially decreased yields in some cases. The soil is a little more easy to plow and cultivate than the Wabash silty clay loam. The methods suggested for improving the silty clay loam also apply to the Wabash silt loam.

Land values for the Wabash silt loam range from $75 to $225 an acre, depending on the soil, location, and improvements.

WABASH SILTY CLAY LOAM.

The surface soil of the Wabash silty clay loam is a very dark gray or dark-brown to black or nearly black silty clay loam, high in organic matter. The subsoil, which begins at about 16 inches, is a dark-drab heavy clay loam, grading into a drab clay, stained with iron and mottled locally with gray and some brown and yellow. There are some variations in the texture of the surface soil, such as small areas of heavy silty clay loam and a few of clay loam texture. A few small spots of clay are included, but these are generally less than 100 feet across.

The Wabash silty clay loam is not as extensive as the Wabash silt loam. It is developed mainly along the Skunk and North Skunk Rivers and Indian Creek. Smaller areas are mapped along other streams, including Clear, Cherry, Alloway, and Rock Creeks.

The surface of the type is flat to sloping, or in some areas depressed. Drainage on this soil is good to deficient, depending on natural features or the artificial means employed to take care of excess water.

Considered from an agricultural standpoint, the type has a wide range, from areas that are worthless for crops to others that are extremely valuable. Some of the less valuable land includes areas which generally lie close to the present stream courses, where the surface is more or less cut up with old meanders. Such areas usually support a growth of trees and brush and are dissected locally by old cut-offs, some of which hold water the year round. In places the surface is uneven, in which case the soil is slightly lighter in texture on the higher land. Part of this land supports a good growth of grasses, commonly bluegrass, and can be best used for pasture, while some of the forested land has considerable value for cutting timber. Another kind of bottom land of low value includes areas which are subject to more or less frequent inundations yearly as a result of the rising streams or heavy rains. This may include such areas as described above, or others which, when not cultivated, support a luxuriant growth of wild grass but no timber. In some places along Skunk River and Indian Creek the type as mapped includes patches of Riverwash, comprising a mixture of textures from sand to clay. These are barren of plant growth, except for an occasional tree or a straggling growth of grasses. Such areas are of small extent, are subject to annual change, and do not comprise a total area of more than 40 acres. All these less valuable areas of bottom land in Jasper County are of much smaller extent than the bottom lands that are productive and suitable for cropping.

The greater part of the Wabash silty clay loam, as well as of other members of the Wabash series, is good agricultural land. Parts of the better land are seldom overflowed; other parts may be subject to inundations more frequently, but crop loss by floods is not regular or periodical. Artificial improvements have reduced this hazard considerably in recent years. The course of the Skunk River has been dredged and straightened through the entire county; this improvement has increased the gradient and carrying capacity of the river and has made floods less frequent. The construction of open ditches and dikes and the laying of tile lines have done much to facilitate profitable cropping. The tiling of bottom lands is satisfactory if the tiles are carefully laid and watched, but a good deal of the tile laid in the past is not working at the present time. In some places, where open ditches have not been dug or are too small, water stands for some time after very heavy rains.

Agriculture on the Wabash silty clay loam consists of the raising of the usual field crops and the feeding of cattle, hogs, and sheep. Corn yields 40 to 70 bushels per acre, and in favorable years yields as high as 80 or 90 bushels are sometimes obtained. Oats yield 35 to 65 bushels or more and hay 2 to 2½ tons. The experience of some farmers indicates that an early oat sown thickly will not lodge badly. Such varieties as Early Champion or Richland (Iowa No. 105) would be suitable. Wheat is grown to some extent and generally yields well.

The rotation of crops is not as common a practice on bottom soils as on the upland. Corn is grown almost continuously with only an occasional small-grain crop. Although the soil, being high in fertility, can stand this better than the average upland soil, the practice results in a poor physical condition of the soil, particularly of the heavy types, such as the silt loam and silty clay loam. Continuous cropping with corn makes the soil puddle and clod more easily. The cropping system on bottom soils should include a legume at regular intervals. One successful farmer has had good results from a rotation including 2 years of wheat, 2 years of corn, 2 of oats, and 1 of clover. In all probability a shorter rotation of about 4 years, such as one of corn-corn-oats-clover, would be more desirable. This could be made a good 5-year rotation by adding a year of wheat. The second growth of clover could be utilized best by plowing under or by pasturing and plowing under the remaining growth and the manure left by the pastured stock, rather than cutting for hay. Manure in liberal applications is desirable as it will help to maintain a good physical condition and tilth, as well as add to the fertility of the soil.

Land values on the Wabash silty clay loam range from $75 to $200 or more an acre, depending on the condition of the soil, location, and improvements.

WABASH CLAY.

The surface soil of the Wabash clay is a very dark brown to black sticky and tenacious clay, rather high in organic matter. This grades into the subsoil, usually at about 18 inches. Below this depth the subsoil is a dark-drab clay, lower in organic matter than the surface soil; in the lower part it is lighter gray in color, of extremely heavy texture, and contains iron stains and concretions.

The Wabash clay occurs mainly in the first bottoms of the Skunk River, with minor developments along Indian and Elk Creeks. It is not of great extent, covering less than 2½ square miles in the county. The surface is flat or depressed and the natural drainage is poor. Where the type borders stream banks it is subject to inundation with each rise of water, and the water escapes rather slowly after the recession of the stream. In isolated areas, back some distance from the stream banks, water stands for some time after floods or heavy rains, being removed largely through evaporation. Such areas are sometimes swampy and support water-loving plants. Surface ditches have been dug in places, but these are often unable to remove water rapidly enough.

The Wabash clay is difficult to manage because of its heavy texture and the narrow limits of moisture content within which it may be worked. Inundations and standing water make early seeded crops impracticable. The soil is high in fertility, and in other counties, where it has been drained successfully, it has been found very productive. In this county the type is used mainly for pasture and the production of wild hay. It has a low sale value and is sold with adjoining soils.

LAMOURE SILTY CLAY LOAM.

The surface soil of the Lamoure silty clay loam is a black or very dark brown silty clay loam, high in organic matter. The subsoil is a black to dark-drab heavy clay loam to clay, the clay content increasing and the color becoming a lighter gray with increasing depth. The subsoil contains lime and will effervesce with acid; this is the chief difference between this soil and the Wabash silty clay loam.

The type occupies one small area in the western part of section 30 of Clear Creek Township. It is subject to overflow and standing water after heavy rains. The area is in permanent pasture and supports a good growth of bluegrass.

PEAT AND MUCK.

Peat and Muck combined cover a small total area in Jasper County. No distinction has been made between the two materials because of their small extent and the fact that they are very closely associated.

Peat and Muck are accumulations of organic matter. The areas were originally covered with water and supported a luxuriant growth of water-loving plants. As the growth died in the fall of each year the plants fell to the bottom and remained undecayed because the water excluded air. When the water finally left the area there remained this accumulation of undecayed plants. Peat consists of material which has not undergone much decomposition, retains the original structure of the plants, and has a characteristic brown color. Muck is Peat in an advanced stage of decay, has a black color, and has lost the original form of the plant roots, stems, and leaves.

This material usually extends to a depth of about 3 feet or more, but in places is underlain at from 24 to 30 inches by a black mucky silty clay loam. There is very little mineral soil in either of these materials as found in Jasper County.

The drainage is naturally poor. A period of years is required to make such areas productive of the common field crops. Thorough surface and underdrainage is the first essential. The drains must have sufficient carrying capacity to prevent the standing of water after heavy rains. Pasturing for a year or two is desirable, as this assists in making the material firm. Alsike clover and timothy is a favorite mixture for pasture and will usually make a satisfactory growth. As the material becomes more firm and compact it might be sown to millet or used for some truck crop that grows well on such material, such as potatoes, celery, onions, or tomatoes. Since the material is made up of organic matter, it supports a good vegetative growth but does not fill out the grains of the cereal crops.

SUMMARY.

Jasper County, Iowa, is situated in the central part of the State, about 36 miles east of Des Moines, the State capital. It has an area of 730 square miles, or 467,200 acres. The greater part of the land lies between 800 and 1,000 feet above sea level.

The drainage is carried largely by the Skunk River and its tributaries, including the North Skunk River and Sugar Creek. The northeastern and southwestern parts of the county are drained, respectively, by tributaries of the Iowa and Des Moines Rivers. Natural drainage as a whole is very good. In general the surface of the county is gently rolling to rolling, with some flat areas on divides, and strongly rolling to broken regions bordering the larger streams. The areas of alluvial soils are mainly flat.

The total population in 1920 was 27,855 of which 67.2 per cent is rural and includes all persons outside of Newton and Colfax. The inhabitants are nearly all native born, although many in the northern part are of German descent and in the southern part of Dutch descent.

Railroad transportation facilities are good throughout the county, and there is a complete system of public roads, most of which are kept in good condition.

The climate of Jasper County is healthful and well adapted to the production of crops common to the Corn Belt. The mean annual temperature is 47.7° F., and the mean annual precipitation is 32.81 inches.

Agriculture, the leading industry, consists mainly of the raising of field crops and the feeding of livestock. Corn, oats, hay, and wheat are the chief crops raised. Rye, buckwheat, barley, potatoes, melons, and sorgo are crops of minor importance. Fruits and vegetables are raised for home use. The livestock industry consists of the feeding of cattle, hogs, and sheep, and the raising of breeding stock of these kinds of livestock.

The 1920 census gives the tenure of farms as follows: 58.7 per cent operated by owners, 40 per cent by renters, 1.3 per cent by managers. In that year the average size of farms was 149.1 acres, and the average assessed value of land was $224.37 an acre.

The soils of the county fall largely into two divisions—dark-colored and light-colored soils, or those developed under a grass vegetation and those developed under a forest growth. The groups may be subdivided with respect to the origin of the parent material into loessial

soils, glacial soils, and alluvial soils. The Tama, Grundy, Muscatine, Clinton, Knox, and Marion soils are of loessial origin. The Carrington, Clarion, Webster, Lindley, and Shelby soils are of glacial origin. The Bremer, Buckner, Waukesha, Chariton, O'Neill, Wabash, and Lamoure soils are of alluvial origin. Muck and Peat are derived from accumulations of organic matter.

The Muscatine silt loam is a productive and highly prized soil. It produces good yields of the common field crops and is practically all under cultivation. It is less extensive than the Tama silt loam, with which it is closely associated.

The Grundy silt loam is very much like the Muscatine silt loam from an agricultural standpoint. It is also a flat upland soil occurring on divides of varying width. It produces good yields of the common crops but is not an extensive soil in this county.

The Tama silt loam is the most extensive soil in the area. It occurs on gently rolling to rolling land, is dark colored, and is highly prized for general farming. The breeding and feeding of all kinds of livestock is an important industry on this type.

The Clinton and Marion silt loams are light-colored soils which occur on strongly rolling to broken land bordering stream courses. They are used for general farming, but have a lower value and are less productive than the Tama silt loam. Many areas of these types are in forest and used largely for pasture.

The Knox and Carrington fine sands are upland soils of light texture and excessive drainage. Yields of the common field crops are low and generally uncertain. Some areas of the Knox fine sand are subject to shifting by winds. Melons are grown to some extent on these soils, particularly in the vicinity of Colfax.

The Carrington and Clarion loams are dark-colored glacial soils, with a gently rolling to rolling topography. They produce good yields of the common field crops. The largest bodies of these soils occur in the northwestern part of the county. The Carrington loam, steep phase, has a steeper topography than the typical soil and is less desirable.

The Carrington and Clarion fine sandy loams are lighter soils than the loams of the same series. They give lower yields of the field crops. They are not extensive and occur only in the western part of the county.

The Webster clay loam and silty clay loam are dark-colored, heavy soils, which are fertile but require careful handling and the establishment of thorough drainage before good yields can be obtained. The Webster loam is a productive soil, but in places requires tile drainage. It is more easily handled and more extensive than the other two Webster types.

The Shelby loam is a dark-colored upland glacial soil, which is shallower and less productive than the Carrington loam.

The Lindley loam and silt loam are light-colored upland soils of glacial origin. They have a low agricultural value and are used largely as pasture and timber lands.

Most of the terrace soils of the county are dark colored and productive. These include the Bremer silt loam, the Waukesha loam and silt loam, the Buckner loam and fine sandy loam, the O'Neill loam, and the Chrariton silt loam. The Chariton silt loam sometimes requires tiling to improve the drainage. The O'Neill loam overlies

gravel beds, and crops are likely to suffer in dry years. The other terrace soils mentioned are retentive of moisture and produce well, and some of them are fairly extensive.

The O'Neill and Buckner fine sands are light-colored terrace soils of low agricultural value and small extent in this area.

The first-bottom soils of the county include the Wabash clay, silty clay loam, silt loam, loam, and fine sandy loam, and the Lamoure silty clay loam. The Wabash clay and fine sandy loam, and the Lamoure silty clay loam are inextensive and unimportant from an agricultural standpoint in this area. The Wabash loam, silt loam, and silty clay loam are dark-colored fertile soils which produce excellent yields of crops when well drained and not subject to overflow.

Peat and Muck consist of deposits of organic matter occurring in small areas that were formerly ponds. They require special treatment over a period of years to make them productive of the common field crops.

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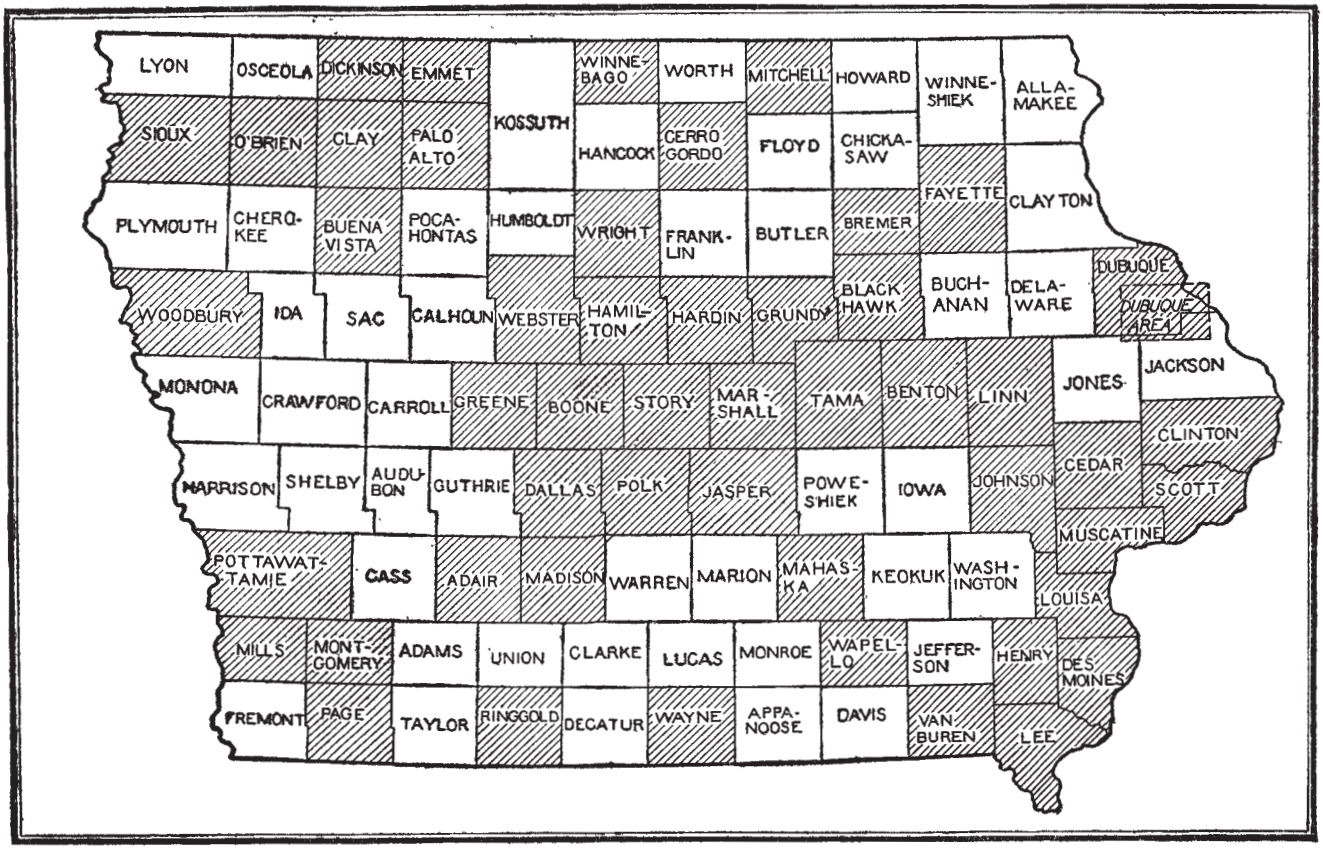

Areas surveyed in Iowa, shown by shading.

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