

SOIL SURVEY OF JOHNSON COUNTY, ILLINOIS.

By **GEORGE N. COFFEY** and **C. W. ELY**,

ASSISTED BY

R. C. LLOYD, CLIFFORD WILLIS, A. F. KIDDER, and G. A. CROSTHWAITE, representing the
ILLINOIS AGRICULTURAL EXPERIMENT STATION.

LOCATION AND BOUNDARIES OF THE AREA.

Johnson County is situated in the southern part of the State of Illinois. Its southern boundary, in the nearest place, is only about 5 miles from the Ohio River, and its western boundary about 12 miles from the Mississippi River. Williamson County bounds it on the north, Pope County on the east, Massac and Pulaski counties touch it on the south, and Pulaski and Union counties form its western boundary. Johnson County is situated between $88^{\circ} 44'$ and $89^{\circ} 4'$ west longitude from Greenwich and north latitude $37^{\circ} 20'$ and $37^{\circ} 38'$. Its latitude is, therefore, the same as that of Richmond, Va.

Johnson is one of the smallest counties in the State, the area being a little less than 340 square miles, or, to be exact, 217,088 acres. It comprises a little over nine Congressional townships. In shape it is almost a square. The western part of the southern boundary, for a distance of 8 miles, is formed

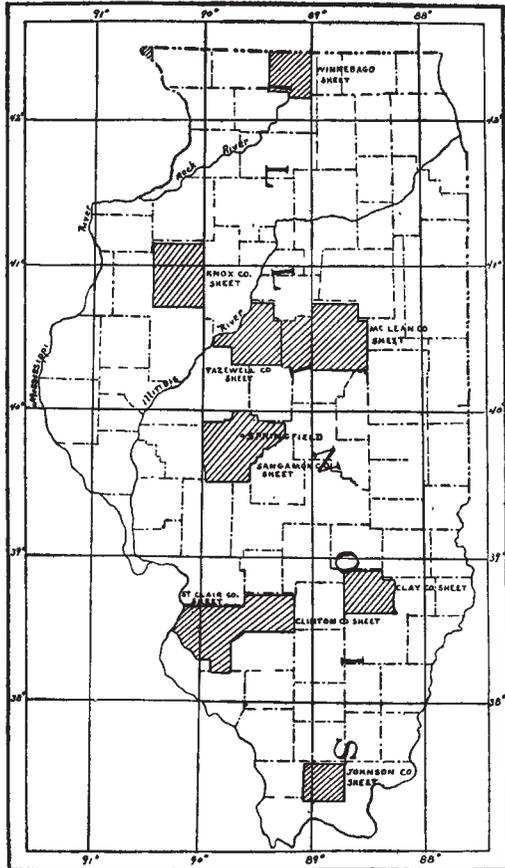


FIG. 35.—Sketch map showing location of the Johnson County area, Illinois.

by the Cache River, and the county here extends about 2 miles farther south than to the east.

The base map used was taken from a county map, but many corrections in the roads were found necessary. In some instances a plane table had to be used and the roads entirely resurveyed.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Johnson is one of the oldest counties in the State, its organization dating back to 1812, or six years before Illinois was admitted into the Union. It formerly embraced all of its present territory, and also all of the country south between it and the Ohio River.

It has not been possible to ascertain the date or location of the first settlement in Johnson County. Its early settlement was due to the fact that it is situated near the Ohio River, which, in the early development of the Mississippi Valley, formed one of the great channels along which the tide of immigration flowed into this part of the country. In 1820 the population was 843. The early settlers came principally from the Southern States, chiefly from Kentucky and Tennessee, and even to-day the percentage of foreign-born population is very small.

When the first settlers arrived they found the entire surface of the country covered with a heavy growth of timber. The prairies, which were so extensively developed farther north, were entirely absent. Among the important native trees were included the oak, hickory, elm, maple, locust, linden, hackberry, sycamore, mulberry, cottonwood, pecan, sassafras, persimmon, and, in the low, swampy areas along the Cache River, the cypress. Most of the timber has been cut off the uplands except upon the rougher areas. The bottoms are still largely forested.

The principal crops grown were wheat and corn. Many of the settlers who came from Kentucky brought flax with them, and the older inhabitants still remember when the flax brake was used. Cotton was also grown to some extent. During and after the civil war its production, owing to high prices, was much increased, but with a fall in price the acreage was reduced until its cultivation was entirely discontinued some years ago. In 1870 there were 465 bales produced in the entire State, all of which was grown in the southern counties. Tobacco was one of the principal crops for many years. The acreage devoted to this crop was much increased during the sixties, a result of the same causes which led to an increase in the cotton acreage. In 1875 there were 3,000,000 pounds grown, and some think that the production in that year was considerably less than for a few preceding years. Yields of 1,200 pounds per acre were sometimes obtained, and the product sold for 12 cents a pound. As the price declined the acreage was decreased until practically none is grown at the present time. In

the latter half of the eighties a few farmers in the northeastern part of the county began the growing of fruit. Since that time this industry has been increasing until it is now one of considerable importance.

CLIMATE.

The following table has been compiled from the records of the Weather Bureau at the different stations named. New Burnside is in the northeastern part of Johnson County, Cobden is about 12 miles west, in Union County, while Cairo is 36 miles southwest of Vienna. The first two stations are situated upon the northern slope of the Ozark Ridge. The records for Cairo cover a period of 31 years.

Normal monthly and annual temperature and precipitation.

Month.	Cairo.		Cobden.		New Burnside.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January	34.7	3.81	33.5	3.43	36.0	2.83
February	39.4	3.96	35.9	3.47	33.2	2.07
March	46.8	3.76	45.1	4.96	46.3	4.82
April	58.9	3.88	57.0	4.02	57.7	3.55
May	67.1	3.83	67.2	4.98	68.6	4.24
June	75.4	4.44	74.9	5.77	76.4	3.89
July	78.9	3.45	79.0	3.72	79.9	4.07
August	77.0	2.84	77.5	3.71	79.2	2.16
September	69.9	2.56	70.3	2.87	72.5	2.60
October	58.7	2.75	61.2	3.37	60.0	2.82
November	46.2	4.22	46.5	4.56	48.0	3.56
December	39.2	3.33	36.3	3.88	36.8	2.97
Year	57.7	42.83	57.0	48.74	57.9	39.58

The average annual rainfall, using the figures of the three stations, is 43.72 inches. March, June, and May are the months of the greatest rainfall, while September, August, and November show the least. The amount of precipitation varies considerably from year to year. The annual rainfall at Cairo has varied in thirty-one years from 61.58 inches in 1882 and 55.60 inches in 1876, to 26.52 inches in 1872 and 26.75 inches in 1887. During that period there have been 5 Mays, 6 Junes, 12 Julys, and 13 Augusts with less than 2 inches of rainfall.^a

The Ozark Ridge, which crosses the northern portion of the county, has an appreciable influence upon the amount of rainfall in Johnson, as compared with counties that lie to the north. The elevation of this ridge is nearly 800 feet above sea level, and this causes a condensation of the moisture upon its slopes. Fruits are less liable to be killed by frosts than in the lower parts of the county.

At New Burnside the average date of the last killing frost is April 14, the latest being May 14, in 1895, while the average date for the

^a Bull. 86, Ill. Exp. Sta.

first one in the fall is October 13. At Cobden the average dates are April 7 and October 23, respectively.

PHYSIOGRAPHY AND GEOLOGY.

Johnson County is one of the most hilly and broken counties in Illinois. Its northern part is crossed in a nearly east and west direction by an elevated ridge known as the Ozark Uplift. This ridge enters the State from Missouri and extends across the entire southern part. Goreville and Tunnelhill are situated near the crest of this ridge, the highest points of which, in Johnson County, rise to an elevation of 800 feet above sea level. The lowest part of the county is found along the Cache River, where the elevation decreases to 335 feet. The difference between the highest and the lowest points in the county is therefore 465 feet.

The Ozark Ridge forms the divide between the streams which flow toward the north and toward the south. The fall of the streams upon the northern slope is not so rapid as upon the southern, and the amount of erosion which they have accomplished is not so great. Upon the southern slope the streams have a very rapid fall, and erosion has been very active, therefore the most broken portion of the county is found here. The small streams have cut out narrow, deep, rocky, canyon-like gorges, sometimes as much as 200 feet in depth. The sides of these ravines are often formed by almost perpendicular cliffs. These gorges wind through the uplands, and often one does not suspect their presence until very close to them. A broken and irregular line of cliffs extends across the county parallel to the Ozark Ridge, and 2 or 3 miles south of its crest. These rise abruptly above the country immediately south of them. Sometimes isolated knobs are almost or entirely surrounded by a line of cliffs. While these cliffs and rocky gorges are most frequent in the part of the county referred to, making it the roughest and most broken portion, they occur also more or less in other sections of the area, especially in New Burnside and Grantsburg townships. Between the ravines are broad, rolling ridges, and the surface in general may be characterized as rolling and hilly.

The Cache River is the most important stream in Johnson County. It enters near the center of the western boundary, flows southeast to about the meridian of Vienna, then turns almost west, forming the southern boundary of the western portion of the county. Its principal tributaries are Lick, Dutchman, and Little Cache creeks. The eastern and southeastern portions are drained by Bay Creek and its tributaries, and the northern and northwestern portions by tributaries of Saline and Big Muddy rivers, respectively. The Cache River has carved out a valley varying in width from one-fourth of a mile to 2 miles. It has

practically reached base level, and is a crooked, sluggish stream. Its tributaries, and also Bay Creek, have considerable tracts of bottom land. The streams which flow to the north have narrow valleys, with little level land along them.

The general character of the topography has been determined largely by the difference in the rate of weathering of the underlying rocks. These belong principally to the sub-Carboniferous period, and chiefly to the St. Louis and Chester groups. The conglomerate represents the Millstone grit or Pottsville conglomerate. The rocks of the area consist principally of sandstones, limestones, and shales. They dip to the north, but the dip is not regular.

The principal area of St. Louis limestone occurs in the southwestern part of the county, but it is often seen outcropping along the foot of the bluffs south of the ridge. The Chester group consists largely of alternating beds of sandstones and limestones. The rock capping of nearly all of the hills is formed by sandstones or conglomerates, the latter being most common in the northeastern part of the county. The sandstones and conglomerates are hard, siliceous rocks which weather very slowly. When the streams succeeded in cutting their channels through these resistant rocks and came in contact with the limestones, erosion was accelerated and the country was worn down much more rapidly. As a part, at least, of the Ohio River once flowed near or along the southern boundary of the county, the opportunity for erosion was much better here than farther north; therefore the sandstones and conglomerates were removed here first, and the country has worn down more. Erosion gradually ate away the hard capping, and the broken line of cliffs, which extends across the county, represents the distance to which erosion had removed the greater portion of these protecting layers at the time the loess was deposited. Some areas have been left, and stand up as hills or bluffs.

The underlying rocks, however, have practically no influence on the character of the soil. Although Johnson County is below the lower limit of glacial action, and no drift material was observed, it has received a deposit of a layer of yellow silt, known geologically as "loess." In some other areas where this deposit is found it often contains many shells, but none were seen in Johnson County. This loess deposit covers the entire upland portion of the county—with the exception of areas of rough, stony land—to an average depth of 12 feet. It is found upon the highest points of the Ozark Ridge and also as low ridges in the bottoms. Some instances were noticed where it occurred upon the tops of isolated knolls, 100 feet in height, entirely surrounded by rocky ledges.

The method of the deposition of the loess is one of the most puzzling problems in geology. It is thought to be glacial flour, brought down and sorted by water and distributed by the wind. Its almost

uniform depth over areas varying 200 feet or more in elevation within a very short distance is very difficult to explain.

SOILS.

Johnson County does not have a great diversity of soils. Only three types, not including areas of Rough, stony land, were recognized. The name and extent of each type are given below.

Areas of different soils.

Soil.	Acres.	Percent.
Memphis silt loam	167,104	77.0
Waverly silt loam	31,936	14.7
Rough, stony land	16,384	7.5
Yazoo clay	1,664	.8
Total.....	217,088

MEMPHIS SILT LOAM.

The surface soil of the Memphis silt loam, an extensive and important type of soil, consists of a pale yellowish to slightly reddish yellow very silty loam, with an average depth of 10 inches. When dry, the soil is loose and incoherent, and its appearance in the field would indicate a larger percentage of very fine sand than is shown by the mechanical analyses. Its incoherence is partly due to the small percentage of clay and organic matter which it contains. It is locally called "clay land," but the soil does not show the heavy, sticky properties of a clay. The Memphis silt loam is very porous, very absorbent, and retentive of moisture. The latter property can be increased by the addition of organic matter. Upon many of the more eroded places the soil has been almost or entirely removed, while upon the more level areas it is 12 to 15 inches deep. The subsoil, however, is often turned up by the plow, and, wherever this is the case, the soil is a reddish yellow. Elsewhere it is a pale yellow to slightly reddish yellow, and when moist the more level areas are a light brown. The almost uniform light color shows it to be low in organic matter, and this should be increased as much as possible by the use of stable and green manures.

The soil and subsoil are not separated by any distinct line of demarcation, but there is, rather, a gradual change from one to the other. The subsoil contains more clay, and is heavier in character. It is a compact, but friable, silt, or slightly clayey silt, which crumbles very readily when dry, but becomes somewhat sticky when wet. The color of the subsoil is yellow to reddish yellow, although the reddish color is not very pronounced. Usually at from 24 to 36 inches there are whitish or gray streaks. These may be due to the leaching out of the

iron along cracks or joints. This material extends to an average depth of 12 feet, and rests upon the weathered, or partly weathered, product of the underlying rocks.

The following analyses show the texture of samples of the Memphis silt loam:

Mechanical analyses of Memphis silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
9921	1½ miles NW. of Belknap.	Yellow silty loam, 0 to 10 inches.	1.15	0.18	0.42	0.48	0.86	5.56	75.50	16.68
9917	¼ mile N. of Pleasantgrove.	Yellow silty loam, 0 to 10 inches.	.99	.00	.40	.50	.70	5.96	75.00	16.76
9919	8 miles N. of Vienna.	Yellow silty loam, 0 to 10 inches.	.72	Tr.	.70	.70	1.20	5.12	72.88	19.22
9922	Subsoil of 9921.....	Yellow silt, 10 to 36 inches.	.26	.18	.76	.52	.82	4.98	69.40	22.88
9918	Subsoil of 9917.....	Yellow silt, 10 to 36 inches.	.37	.00	.68	.52	.90	4.42	69.18	23.80
9920	Subsoil of 9919.....	Yellow silt, 10 to 36 inches.	.27	.20	.84	.70	1.16	3.90	68.60	24.40

The Memphis silt loam is by far the most extensive type of soil found in Johnson County. With the exception of the areas of Rough, stony land, the uplands are entirely covered by it. It also occurs as low ridges in the bottoms along the lower portion of the Cache River. Here it is often called "second bottom," and its agricultural value is somewhat modified by its topographic position.

Over the greater portion of the area the surface of the Memphis silt loam is rolling and hilly, and there are only small tracts of level land. The surface consists largely of broad ridges, between which are hollows or depressions. Sometimes these hollows have been cut more than 100 feet deep and are very rough and rocky. The tops of the ridges are level enough to make good farming land. The most level tracts of this soil type are found in the northwestern and southwestern parts of the county. The most broken area is found upon the southern slope of the Ozark Ridge, where the streams have cut out many deep, rocky gorges. The soil washes very easily, and wherever a gully is begun the water cuts rapidly down through the unresisting loess until erosion is checked by the underlying rocks. As the loess here has an average thickness of only 12 feet, there has not been the opportunity for the development of rounded knobs often seen in areas of loess deposits.

The Memphis silt loam has been formed, through the natural processes of weathering, from the layer of silt, or loess, and the addition of a small proportion of organic matter from the decay of vegetation. The loess is composed largely of angular rock particles. These particles are easily attacked by atmospheric agencies and are broken down, the elements necessary for plant growth being liberated. The entire layer of loess has been more or less affected by these agencies.

A variety of crops is grown upon the Memphis silt loam. Corn, wheat, oats, Irish and sweet potatoes, clover, cowpeas, timothy, and fruits are all found. Of these the first two are grown most extensively. The yields of all crops are quite variable, depending largely upon the season. In favorable seasons the best farmers secure from 30 to 50 bushels of corn and from 20 to 25 bushels of wheat per acre, while in some years these crops are an almost complete failure. The average yield of corn, computed for a period of ten years, is from 20 to 25 bushels and that of wheat about 12 bushels. Oats for a similar period will give an average yield of 20 or 25 bushels. Irish and sweet potatoes average 60 or 75 bushels per acre, although twice this yield is sometimes obtained. Clover and timothy give from three-fourths of a ton to 2 tons per acre. Cowpeas yield about 2 tons of hay. They are not extensively grown for seed, but yield about 10 or 12 bushels per acre. The growing of fruit and garden vegetables forms an important industry in some sections. New Burnside Township has more orchards than any other township in the county, but orchards are also being set out in other townships, especially those situated along the Ozark Ridge. Garden vegetables are produced in larger quantities along the line of the Chicago and Eastern Illinois Railroad than elsewhere.

The Memphis silt loam is well adapted to the growing of fruit and vegetables, and greater interest is taken each year in their production. Fruit does best upon the ridges or higher land. This is due to climatic conditions rather than to a difference in the character of the soil, there being always more danger from frosts near the bottoms. When sufficient moisture is present good yields of wheat are secured, and this soil is fairly well adapted to this crop. It is not, however, a good soil for corn. It washes so easily that it is not best to plant it in a crop which requires a frequent stirring of the soil. If such crops are planted some cover crop should be sown between the rows as far as possible to prevent washing. Some of the farmers use cowpeas or rye for this purpose. If the land were terraced the washing could be largely prevented, and it would be possible to improve the soil much more rapidly. It is believed that alfalfa would be a very profitable crop when once well established. As this soil is acid it will be best to lime it. It is usually necessary also to inoculate the fields with soil from old alfalfa fields. A dressing of manure will aid the alfalfa in

getting a start. Alfalfa makes very fine feed for all kinds of cattle, and the growing of it would make stock raising a very profitable industry. Fruit, vegetables, and hay are crops to which the farmers should give special attention.

WAVERLY SILT LOAM.

The Waverly silt loam consists of a surface soil of whitish, yellowish, or light-brown silty loam, underlain by material of about the same character. When dry it becomes loose and floury, but it is slightly sticky when wet. Along the smaller streams it is lighter in texture, more yellow in color, and more like the soil of the upland than that along the larger streams. In the former locations there has not been so great an opportunity for it to be sorted by the action of the water. It is usually mottled by brown stains of iron, and some small iron concretions occur. Dark streaks caused by organic matter are also found. The soil absorbs rains readily, but crops sometimes suffer in dry weather for lack of moisture. The percentage of organic matter is not very large, and the color therefore is rather light and sometimes almost white. There is no line of division between the soil and the subsoil and not much difference in the character of the material. The greatest change generally occurs at 12 to 14 inches. The subsoil is slightly heavier in character and contains less organic matter. It is grayish or whitish in color and is mottled with iron stains. Along the smaller streams the subsoil is more yellow and the texture is lighter.

Mechanical analyses of samples of the Waverly silt loam are given below.

Mechanical analyses of Waverly silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.06 to 0.005 mm.	Clay, 0.005 to 0.001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
9925	1½ miles W. of West Vienna.	Silty loam, 0 to 12 inches.	1.65	0.40	0.74	0.60	0.98	4.42	74.40	18.36
9927	3¼ miles NW. of Belknap.	Silty loam, 0 to 12 inches.	1.24	.34	1.24	.68	1.28	4.66	69.72	21.38
9926	Subsoil of 9925.....	Silty loam, 12 to 36 inches.	.46	.30	1.24	.68	.84	4.90	74.56	17.40
9928	Subsoil of 9927.....	Silty loam, 12 to 36 inches.	.29	.44	1.10	.56	.84	3.84	72.98	19.40

The Waverly silt loam is found only along the streams, or in areas which were formerly occupied by streams. The stream valleys are often very irregular, and sometimes a small stream, without running

water a large part of the year, will have a considerable area of bottom land along it, while in other places the larger streams have changed their course and have little bottom along them. The principal area of this type occurs along the Cache River, in the southwestern part of the county, but areas of considerable extent occur also along Lick, Dutchman, Little Cache, and Big Bay creeks, while smaller tracts are found along some of the lesser streams. Elvira, Cache, Vienna, Grantsburg, and Simpson townships are the only townships in which any considerable area of this soil occurs.

The surface of the Waverly silt loam is generally level, though somewhat broken by slight undulations and by the presence of old stream channels. In general, however, it may be classed as flat. Nearly all of it is subject to overflow, and in the larger areas the water-mark may be seen upon the trees from 2 to 6 feet above the ground. The overflow usually comes in the spring, and a crop can generally be grown after the freshets are over, but planting is often retarded, and there is always danger of losing the crop. Nearly all of the hills are cleared, and the water runs off very rapidly after rains, causing the streams to overflow their banks. This soil, especially in the larger areas, requires drainage to insure a good crop, and some tile drains are being put in. Along the Cache River in the southern part of the county a drainage district has been formed and a levee is being constructed. The State has appropriated \$10,000 to cover the cost of a survey to determine whether the Cache River has sufficient fall to allow the area along it to be drained.

The Waverly silt loam is an alluvial soil. The material composing it has been washed off the hills, brought down by the rains, and re-sorted and deposited by the streams during times of overflow. Leaves, twigs, and other forms of organic matter are covered by these annual deposits, and in this manner organic matter has been incorporated.

Corn and hay form the principal crops upon this type of soil. Corn averages 25 or 30 bushels per acre, although in favorable seasons larger yields are secured, and some farmers report yields of 50 or 60 bushels. Timothy is the grass commonly grown for hay, and yields of from 1 to 2 tons per acre are secured. A large proportion of the Waverly silt loam is still in timber and these tracts are used for pasture.

This soil is adapted to the crops grown upon it, but rotation should be more generally practiced. Cowpeas, or some other leguminous crop, should be grown. A small patch of alfalfa, which was doing well, was noticed southwest of Belknap, and this crop should be tried in other areas.

YAZOO CLAY.

The surface soil of the Yazoo clay consists of a dark-brown or drab, granular, heavy silty loam or clay. The dark color which this soil has is due to the large amount of organic matter which it contains.

The soil is quite granular and rather sticky, and special care must be taken to plow it at the time when it contains the proper amount of moisture, else it is very difficult to put the land in good tilth. The surface soil extends to a depth of 9 inches, and is underlain by a drab silty clay. The subsoil becomes lighter in texture with depth, and occasionally a material similar to that of the Waverly silt loam is found within less than 3 feet of the surface.

This type occurs only in the bottoms along the Cache River, in the southwestern part of the county. It is not extensively developed, and occupies less than 1 per cent of the area of the county. The surface is level, water stands in many of the sloughs and depressions for the greater part of the year, and, in general, the natural drainage is very poor. Some of the areas have been ditched, and most of the water runs off now as soon as the floods subside, but it is usually necessary to corduroy the roads passing through this soil in order to make them passable at all times of the year. In many places there are swamps, covered with a heavy growth of cypress and other water-loving trees.

The following table gives mechanical analyses of samples of this soil:

Mechanical analyses of Yazoo clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
9915	3½ miles S. of Cypress.	Brown heavy silty loam, 0 to 9 inches.	1.00	0.20	1.20	1.40	4.20	6.10	31.30	55.60
9916	Subsoil of 9915.....	Drab silty clay, 9 to 36 inches.	.70	.20	.80	.80	4.00	9.80	38.40	46.10

This soil owes its formation to poor natural drainage. After the water retreated from the areas of Waverly silt loam it stood in the sloughs the greater part of the year, and the finer particles were deposited in these places. The general wet conditions have, to some extent, prevented the complete decay of the leaves, twigs, cane, etc., and these have been incorporated in the soil, giving to it the darker color.

About 5 per cent of this type is at present cultivated, and this is devoted exclusively to corn and pasture. These areas have been cultivated only a short time, and have yielded 35 bushels of corn per acre. Other areas are being cleared at present, but it will probably be many years before the whole of this soil is brought under cultivation. From present knowledge, this soil is, when well drained, best adapted to the production of corn and hay, the crops now grown.

ROUGH, STONY LAND.

Under Rough, stony land are classed all areas where the soil is so stony and broken as to be of little agricultural value, or where the underlying rock forms the surface. In most instances there are cliffs, sometimes more than 150 feet high. At the foot of these cliffs are found large bowlders, often weighing many tons, which have broken off from the rocks above. Between these bowlders are patches of soil, which is sometimes silty, and sometimes a reddish clay, depending upon whether it has been formed from the loess or from the disintegration and decomposition of the underlying rocks. These patches of soil support a heavy growth of timber, and upon nearly all of these areas the trees have not been cut off.

The areas of rough, stony land are usually found as narrow strips, winding through the country or forming bluffs along the streams. These are of most frequent occurrence along the southern slope of the Ozark Ridge, but they are also scattered with greater or less frequency over the entire county, and their exact location can be best seen by reference to the soil map which accompanies this report. The areas of this land are used for pasture. It would be possible to use some of the areas for orchards or vineyards. In many places, however, the rock forms the surface, and the areas can never be of any agricultural value.

AGRICULTURAL METHODS.

The agricultural methods which have prevailed in Johnson County have tended to the deterioration of the soil rather than the maintenance or improvement of its productiveness. Too many of the farmers have followed along in the steps of their fathers with little change from the methods used by them years ago. There are, however, a number of wide-awake, progressive farmers, and there is, generally, a decided tendency toward better conditions.

The single walking plow is commonly used in breaking the ground. Upon many of the more hilly areas gang plows can not well be used, but upon the more level ones and in the bottoms, after the stumps are removed, they could as well be employed as in other parts of the State. There is very little fall plowing for corn. If the ground is loosened in the fall it makes it wash more easily during the winter months. Corn is grown in drills and cultivated one way, but in the bottoms and upon the more level areas of the upland it is planted in checks. The double-shovel plow is generally used for cultivating corn, but in the areas just referred to cultivators are coming into use.

Wheat is usually sown with a drill, though a part of the area is sown broadcast. It is cut with binders, cradles being used around stumps. About one-half the crop is thrashed from the shock, the remainder

being stacked. Home seed is commonly used, but some obtain seed from the North every few years.

Oats are usually sown broadcast, but some are sown with a drill. Cowpeas are sometimes sown in the corn when it is plowed the last time, in which case they are used for fall pasture. Some farmers also sow them after wheat and use them for pasture or for hay. When grown for seed this crop is drilled and cultivated. Some farmers have the erroneous idea that cowpeas are injurious to the soil, and so do not grow them, but all the soils of the county can be much improved by their use. Clover is usually sown in the wheat in the spring. Many farmers say that they have had difficulty in securing a stand, especially for the last two or three years. Some farmers think the land is "clover-sick," but the critical seasons in these years have been dry, and the difficulty is probably largely due to the insufficiency of moisture to germinate the seed, to carry the tender seedlings until well established, or to prevent their being killed when the nurse crop is removed. An application of lime would probably prove beneficial, as much of the soil is acid.

The larger orchards are usually well cared for, while the smaller ones are neglected. The commercial orchards are usually cultivated and pruned, and, in the majority of cases, sprayed three times a year. As a rule, the apples are sold on the trees, the buyer picking, barreling, and shipping them.

No systematic rotation of crops is followed, and the same crops are often grown several years in succession. The most common practice is to sow oats after corn, then follow with wheat, and when it is desired to change to clover, the latter is sown with the wheat. The use of more legumes, better cultivation, more careful husbanding of manure, and a more frequent change of crop are recommended as needful changes in the present agricultural practice.

AGRICULTURAL CONDITIONS.

There are many farmers in Johnson County who are well to do and prosperous. The majority are making little more than a living, and although a large percentage of the farms are unencumbered, few farmers have money to loan. The more prosperous ones have well-built, substantial dwellings, with good barns and other buildings, but usually the farm buildings are inexpensive. The value of the buildings in Johnson County, according to the Twelfth Census, was \$710,900, while that of the land and improvements, excluding buildings, was \$2,329,610.

Johnson is a county in which most of the farmers own and cultivate their own land, and the authority already quoted states that about 75 per cent of the farms are run by the owners. It is said that the number of farms so operated is increasing. There is practically only one sys-

tem of renting—the share system—less than 1 per cent of the tenanted farms being rented for cash. The better farms rent for two-fifths of the crop, while in the case of the poorer ones one-third is asked.

The average size of the farms in Johnson County, according to the Twelfth Census, is 92.7 acres. Some men own more than one farm, so the amount of land to the landowner is larger than the above figures. The size is changing very little. The largest tracts of land are found in the bottoms, where, however, the greater part of the land is not under cultivation.

According to the tax report for 1902 there were in Johnson County 108,738 acres of improved land, with an assessed value (20 per cent of true value) of \$3.26 per acre, and 102,581 acres of unimproved land, assessed at 99 cents an acre. The selling price varies with the differences in the character of the soil, location, topography, and improvements. The more level areas of the Memphis silt loam will bring from \$20 to \$50 an acre, while tracts which have considerable areas of broken land can be bought for \$5 or \$10 an acre. The bottom lands, where cleared and cultivated and least subject to overflow, are valued at \$40 or \$50 an acre, but some of the lower-lying uncleared areas will sell for as low as \$5 or \$10 an acre. The bottom lands are increasing in value, and when they shall be protected by levees and drained, will be among the most valuable in this part of the State.

The labor employed is generally resident in the area, is usually considered efficient, and the supply is equal to the demand. The wage paid unmarried men by the month is \$15, with board in addition, while married men receive \$20 a month and are furnished a house and garden also. In or near the bottom lands, where extensive lumbering is being carried on, labor is scarcer because better wages can be obtained in lumbering than in farming.

The principal products of Johnson County are corn, wheat, oats, hay, fruit, and vegetables. The acreage devoted to wheat and corn is nearly the same. The upland is not well adapted to corn and the yield is not very high. The production is less than the consumption and some corn is shipped into the county. Corn does well upon the bottoms, and as more of these lands are brought under cultivation the output will be considerably increased. Wheat produces fair yields of a grain of good quality and forms the principal export crop of the county. Oats are not extensively grown. The crop is consumed on the farm. Hay is an important crop. Upon the Memphis silt loam clover, timothy, and cowpeas are all grown for hay, while upon the Waverly silt loam timothy is most extensively used for this purpose. There is considerable difficulty in securing a stand of clover, especially in dry seasons. Examinations in the laboratory of this Bureau show this soil to be acid, and an application of lime would be beneficial where clover is the crop to be grown, as the bacteria which grow upon its roots can

not thrive in an acid soil. One thousand pounds of lime per acre would be sufficient in most instances to correct this acidity. Alfalfa should be thoroughly tested, for if this legume can be successfully grown—and it is believed that by inoculation it can be—stock raising can be made a very profitable industry. Alfalfa does not have to be resown every two or three years like clover, and upon a soil which washes as easily as the Memphis silt loam this would be a decided gain. Some farmers are shipping hay, but it is believed that more profit could be secured by feeding it to stock, while the gain in manure made would be considerable. On the whole, it is believed that stock raising should be given more attention.

Although the farmers of Johnson County, since its early settlement, have generally had small orchards to supply fruit for home use, the growing of fruit upon a commercial scale has been undertaken only within the last few years. The adaptability of the Memphis silt loam to the production of fruit is destined to make this one of the most, if not the most, important industry in the county. More fruit is grown in New Burnside Township than in any other part of the county, but the orchard area is being extended in other sections. Some of the farmers who put out orchards ten or twelve years ago are now receiving handsome returns upon their investment. A few instances are given to show what profits are being secured from well cared for orchards. The fruit upon one orchard of 30 acres sold this year upon the tree for \$1,200. The fruit upon another one of 15 acres sold for \$725. One farmer cleared \$80 an acre upon his fruit, and he thinks that with proper care an orchard, after it begins to bear, will average a net profit of \$50 an acre each year. Several young orchards have been set out this year, and it is believed that no more profitable investment can be made than to put the Memphis silt loam in fruit.

Since the building of the Chicago and Eastern Illinois Railroad, three years ago, through the western part of the county, considerable attention has been given there to the growing of vegetables. Tomatoes, cucumbers, and sweet potatoes are the products most extensively cultivated, but some strawberries are grown also. Last season one farmer, in another part of the county, sold \$500 worth of strawberries from 3 acres of ground. The cost of picking and crates was \$155, but the rest of the work was done by himself. Sweet potatoes do well and are of good quality. They are easily grown, and good profits are made from this crop.

The farmers generally recognize that the Memphis silt loam is better adapted to fruits and vegetables than to general farm crops, but the majority of them continue chiefly to grow the grains. An apple orchard does not begin to yield profitable returns until it is about seven years old. Some outlay of capital, upon which no return can be expected for that length of time, is necessary to put out and care

for an orchard, and many of the farmers do not have the capital. Small fruits, such as strawberries, raspberries, blackberries, etc., do well, but these are not grown in any considerable quantity at the present time. The question of adaptation of soils to crops can not be left without again referring, at the risk of tiresome repetition, to the possibility of growing alfalfa upon both the Memphis and Waverly silt loams. This question should be tested by thorough experimentation, as, if alfalfa can be successfully grown, it would form a basis upon which could be built up a great stock-raising industry.

Johnson County is well supplied with transportation facilities. The Cleveland, Cincinnati, Chicago and St. Louis Railway crosses the county from northeast to southwest; the Chicago and Eastern Illinois Railroad runs north and south through the western part; while the Illinois Central traverses the eastern part in the same direction. These railroads, with their connections, furnish ready means of transportation for the products of the county. There are few points in the area more than 6 miles from a railroad.

Dirt roads cross the county at frequent intervals in every direction and furnish a way upon which the products of the farms can be brought to the railroad stations. Some of these are rough and hilly, but otherwise are generally in fair condition the greater part of the year.

Although Johnson County is not situated near any of the great markets of the country, the railroads furnish ready means of communication with them. Chicago is about 350 miles north, St. Louis 125 northwest, and Indianapolis 275 northeast. Most of the vegetables are shipped to Chicago.

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