

Soil Survey of Tipton County, Indiana.

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DESCRIPTION OF THE AREA.

Tipton County is situated in the north-central part of Indiana and has an area of 166,400 acres, or 260 square miles. The county forms a rectangle about twenty miles long from east to west and thirteen miles wide from north to south. It is bounded on the north and west by Howard and Clinton counties, on the south by Hamilton County, and on the east by Madison and Grant counties. As a whole the surface of the county is a monotonously level and featureless till plain, interrupted in places by morainic knolls and swells. The boldest relief is found along the larger stream courses, especially along the lower course of Cicero Creek and in the vicinity of Duck Creek, which crosses the extreme southeastern part of the county. A rather prominent moraine in the southwestern section and small morainic areas in the northwest and northeast afford some relief to the generally level topography. The average elevation of the county is between 850 and 900 feet above sea level.

The summit of the drainage divide between Wabash and White rivers extend in a general east and west direction across the center of the county. The streams north of this divide empty into the Wabash, while those on the southern side lead to the White River. Since almost all of the area is so level that its streams have a very gentle, gradual fall, the entire area might be said to occupy the so-called summit of the watershed. There are no large rivers in the county.

The drainage of the area south of the divide is affected through Cicero, Duck and Pollywog creeks and their tributaries. Cicero Creek and its tributaries, including Prairie, Wallace, Jericho, Nixon, Wolf and Buck creeks, drain the central and southern parts of the county, emptying into the White River. Pollywog Creek receives most of the drainage from the southeastern portion of the area through various minor stream courses, most of which are merely open ditches, and flows into Duck Creek.

North of the divide Mud and Turkey creeks form the chief drainage outlets. These streams rise in the western part of the county, and, receiving the waters of various small tributaries, flow in a general northeasterly direction until they reach the northeastern portion of the area. There they unite to form Wild Cat Creek, which empties into Wabash River outside the county. Turkey Creek receives the drainage of the central portion of the county north of the divide, while Mud Creek drains the northern section of the area. Irwin Creek, a small tributary of Wild Cat Creek, drains a part of the northeast corner of the county. Swamp and Little Wild Cat creeks are minor streams which furnish the drainage for the northwest corner of the county.

The railroad facilities are adequate for all the needs of the county. In 1854 the Peru and Indianapolis Railroad was constructed across the county in a general north and south direction. This railroad is now a part of the Indianapolis and Michigan City division of the Lake Erie and Western Railroad. The Pennsylvania also has a leased service over this line from Kokomo to Indianapolis. In 1860 the main line of the Lake Erie and Western Railroad was opened, the line extending through the county from east to west. These two railroads intersect at Tipton and form the main transportation outlets for the county. The Logansport and Indianapolis division of the Pennsylvania system traverses the northeastern corner, passing through Curtisville, Windfall and Nevada.

In addition to the steam roads there are two interurban electric lines. The Indianapolis and Logansport division of the Indiana Union Traction Company parallels the Michigan City division of the Lake Erie and Western Railroad across the county. A line of the same company extends east from Tipton and parallels the Peoria and Sandusky division of the Lake Erie and Western Railroad. In addition to furnishing passenger accommodations these electric lines are well equipped with freight and express facilities which are used extensively by both farmers and merchants for shipping dairy and other farm products from local stations and towns to Indianapolis and other cities. The local passenger accommodations on the interurban lines are especially advantageous to the farmers, since the cars may be boarded at the intersection of many of the public highways, thus furnishing ready and convenient access to the cities and towns.

The construction of a few State roads through the county was commenced about 1830. Gravel-road building began in 1880, the principal thoroughfares being completed about 1905. Nearly all

the present roads have been constructed and graveled since that time under the three-mile gravel road law. Gravel pits have been opened at various points throughout the area and the gravel used for constructing and repairing the roads. Practically every section line in the county is traversed by a graveled road, and in many places they have been built even on the half-section lines. At present there are probably not more than ten miles of open roads in use by the public which are not improved. Next to the construction of outlet ditches for drainage purposes probably the one thing which has aided most in the development of the area is the development of an excellent sectionized public road system throughout the county.

Tipton county was created in 1844 and was one of the last in the State to be settled. The southern portion of the county was settled first, the first land claim being entered in 1829. The settlement of the northern half began in 1843. The earliest settlers were for the most part from southern Indiana, chiefly from Rush, Fayette, Jefferson and Switzerland counties.

New Lancaster, Tetersburg, Normanda and Canton, now Tipton, the county seat, which was settled in 1839, are among the oldest towns of the area. Prior to 1880 development was slow owing to the swampy condition of the land and the expenditure necessary in providing drainage systems. From 1880 to 1890 the settlers, mainly from Franklin and Dearborn counties, came in very rapidly. The greatest agricultural development in the county has taken place since 1890.

Originally the markets for the surplus products of the settlers were distant and the roads leading to them were almost impassable the greater part of the year. No railroad facilities were available until the Indianapolis and Peru Railroad was constructed in 1854. Indianapolis was and is still the leading market and trading point for the county.

At the time of the organization of the county it had a population of only a few hundreds. In 1880 the total population was 14,402, and in 1890 it was 18,157. According to the census of 1910 the population was 17,459. This shows a decrease, however, of 1,657 from the figures of 1900, due largely to the migration of the rural population to the large cities outside the county, the rapid growth of Indianapolis having drawn heavily upon the surrounding country. The population is generally quite well distributed over the area. The most thickly settled portion of the county is a neighborhood of small farms about four miles north of Tipton. The

average is from eight to ten houses on every section or square mile, or more than one house for every eighty acres. Some of the farms range as low as ten to twelve acres in size. In some portions as many as twelve or fifteen farmhouses may be found to a section. Of the 17,459 people in the county, only about 7,300 live in the towns and villages.

Tipton, the county seat, the largest town in the county, is located on Cicero Creek, a little south of the center of the county and thirty-six miles north of Indianapolis. It is a modern town and shows a steady growth. According to the 1910 census it has a population of 4,075. Its manufacturing interests are relatively unimportant, consisting mainly of two canning factories and an incubator factory. Tipton is a division point for the Lake Erie and Western Railroad, and the railroad yards located here furnish employment to a large number of men. It is also a division point for the Logansport and Indianapolis division of the Indiana Union Traction Line, and a number of its employes also make their homes in Tipton.

Windfall and Sharpville, in the northern section, and Kempton and Goldsmith, in the western part of the county, are thriving towns of 900, 700, 600 and 225 population, respectively. Hobbs, Curtisville, Normanda, New Lancaster, Jackson, Nevada, Tetersburg and Groomsville are other towns and villages in the county. Only parts of West Elwood, Ekin and Atlanta are included in this county.

The reclaiming of the swamp lands has given rise to one of the chief industries of the county, the manufacture of tile. Such factories are located at Hobbs, Curtisville, Kempton and Goldsmith. Gas wells are of frequent occurrence throughout the area. These afford fuel supply to Tipton and some of the other towns of the county and are also used largely by the farmers for home purposes.

In general the county presents a prosperous appearance, with excellent farmhouses and large, well-kept barns and outbuildings. Telephone lines and rural mail routes extend to all parts of the county. Numerous schools and churches are accessible to every section, but many of the smaller county schoolhouses are being abandoned in favor of the segregation system of schools, and large township high schools are being established in the towns and villages.

CLIMATE.

No official weather records for Tipton County are available, but the general climatic conditions are shown by the figures in the fol-

lowing table, which are taken from the records of the nearest United States Weather Bureau Station, located at Marion, Indiana. The table below shows the normal monthly, seasonal and annual temperature and precipitation covering a period of years:

NORMAL MONTHLY, SEASONAL, AND ANNUAL TEMPERATURE AND PRECIPITATION, AT MARION.

MONTH.	TEMPERATURE.			PRECIPITATION.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December.....	30	66	-12	2.4	3.3	2.4	6.0
January.....	26	66	-25	1.9	1.8	3.9	9.5
February.....	26	67	-19	2.6	0.5	1.8	7.6
Winter.....	27			6.9	5.6	8.1	23.1
March.....	39	81	- 2	3.3	2.2	6.2	5.0
April.....	51	89	15	3.5	1.7	2.6	1.0
May.....	62	96	26	4.7	0.8	8.4	0.2
Spring.....	51			11.5	4.7	17.2	6.2
June.....	71	100	35	4.5	1.4	4.3	0.0
July.....	74	105	37	2.9	0.8	2.1	0.0
August.....	73	101	40	2.9	1.4	2.1	0.0
Summer.....	73			10.3	3.6	8.5	0.0
September.....	67	101	29	2.8	2.5	2.5	0.0
October.....	54	91	15	1.9	0.9	3.5	T
November.....	40	75	2	3.6	5.4	3.5	2.9
Fall.....	54			8.3	8.8	9.5	2.9
Year.....	51	105	-25	37.0	22.7	43.3	32.2

It will be noted that the average annual temperature at Marion is 51° F. and the average annual precipitation 37 inches. An average from the records of the stations located at Indianapolis, Lafayette and Greenfield show the annual temperature for the territory covered by these stations to be 55° F. and the average annual precipitation 44.06 inches. From all these figures an approximate estimate of conditions prevailing over Tipton County may be obtained.

There are no very marked extremes in temperature, with the exception of an occasional extremely cold winter. The maximum and minimum temperatures quoted, 105° above and 25° below zero, are usually of short duration. Hot spells rarely last any great length of time except in very dry weather, when they may continue for several weeks, but any excessive heat is usually tempered by winds. The annual mean snowfall for the county is 32.2 inches. Snow

sometimes remains several weeks, and even months, but more frequently disappears within a short time. The thermometer occasionally drops to twenty or more degrees below zero, but these temperatures are rare. Even zero temperature is uncommon and when it occurs is of short duration. The depth to which the ground freezes is variable. Ordinarily it remains frozen only a few weeks and thaws in February or March.

The precipitation is fairly well distributed throughout the growing season, so that crops rarely suffer from extreme drought or excessive moisture. As shown in the foregoing table, the greatest amount of rainfall is received during May and June.

The length of the growing season is about five and a half months, the average dates of the last killing frost in the spring and the first in the fall being April 24 and October 2, respectively. The earliest date recorded of a killing frost in the autumn is September 14 and the last in the spring is May 22.

AGRICULTURE.

At the time of its settlement Tipton County, with the exception of a few swampy prairies, was covered with dense forests of oak, beech, maple, walnut, hickory, sycamore and tulip trees, with a dense undergrowth. The first attempts at clearing the forested areas for cultivation were made in the southern part of the county, where the natural drainage was better developed. With the exception of that used for domestic purposes the timber was burned.

Owing to the difficulty of hauling products over long and frequently impassable trails, practically no crops were grown for market. Corn, wheat, oats, rye, flax and potatoes were among the early crops grown in the area. Hay was cut from the open prairies. Wheat and corn were grown year after year on the same land, the wheat being grown principally upon the lighter colored upland soils and the corn in the bottoms and the so-called "black lands."

In 1855 the first agricultural society for the improvement of the area was organized, but it was not until about 1880 that the greatest development of the county began. At that time many of the main outlet drainage ditches were constructed and thousands of acres of the most productive land in the county brought under cultivation.

Originally the natural drainage ways throughout the greater part of the county consisted of shallow depressions, and the meandering streams were so sluggish as to carry off only a small part of the annual rainfall. This condition prevailed more generally in the

central portion of the county owing to its level surface over the crest of the watershed, and most of the territory was in a semi-swampy condition. In the southern, southeastern and extreme northern sections there was sufficient natural surface relief to give fairly adequate drainage to those areas. Cicero and Duck creeks in the southern part and Wild Cat Creek in the northeastern part of the county occupied much deeper and more clearly defined valleys than the water courses on the divide, and it was along these streams that the earliest settlement took place. The only solution of the problem of reclaiming the entire acreage of the county for cultivation was the establishment of connections for the swampy, water-soaked areas of the watershed with the larger and deeper drainage outlets of other sections. The first work of this kind was done between 1855 and 1860 by private companies.

In 1875 a law relative to the drainage of the surface water from the county was passed. By 1883 the county had built 190 miles of drainage outlets, and private companies and individuals had expended \$200,000 in reclaiming the swampy black lands.

Drainage was provided through the construction of wide, deep, open ditches or canals, generally in line with the natural stream courses. The channels of practically all the streams in the county have at some time been straightened and deepened by dredging throughout almost their entire length. Into these have been trained the numerous lateral ditches which receive the water from individual farms along their courses. About 1890 under or tile drainage began to take the place of the open ditches, 12, 18 and 24-inch tile being used. In recent years many of the open drains have been converted into underground or "blind" ditches by the use of tile, so that fields which were dissected by the open drains are now unbroken. Hundreds of thousands of dollars have been spent by private corporate enterprises to establish the excellent system of drainage which now prevails throughout the county.

The building of the several railroads and traction lines has been an important factor in developing the agricultural resources of the county by creating ready access to the larger markets. The establishment of canning factories at various places in the area has given rise to a more intensive system of farming in the vicinity of these industries, and the present high price of land is largely attributed to the farmer's greater income from the growing of peas, sugar corn, beans, tomatoes and other crops for the canning industry. The increasing demand for canned goods warrants the extension of this form of agriculture.

The introduction of labor-saving machinery has done much to increase the output of the farm, but increased returns must necessarily depend upon the successful handling of the soil to conserve it and add to its fertility. This requires a more intimate knowledge of the various soil types, including their limitations and possibilities as well as their needs.

Corn has always been the chief crop of the area. The acreage of this crop has steadily increased from 33,914 acres in 1880 to 55,476 in 1910. The yields have correspondingly increased from 1,115,816 bushels in 1880 to 2,935,971 bushels in 1910. It will be seen from the above figures that the average number of bushels per acre has also increased from thirty-three to fifty-three within that period. This increase has come about through the added acreage of black lands, which are among the best upland corn soils in the State, yields of seventy to eighty bushels per acre being quite common. The clay lands seldom yield more than thirty-five to forty bushels per acre.

Deeper plowing, supplemented by subsoiling, and better drainage would considerably increase the corn yields from the lighter colored soils since better stands of clover and other legumes could be obtained. The use of a complete fertilizer is also recommended. Where ground limestone is used the fertilizer should be applied at another time, preferably before wheat and clover. For the black lands a fertilizer consisting of ten parts of phosphoric acid and five parts of potash, or eight parts of phosphoric acid and four parts of potash, is recommended. This soil usually contains sufficient nitrogen, but is deficient in the other two elements of plant food. In applying phosphoric acid the acid phosphate should be mixed with barnyard manure at the rate of thirty pounds of the former to a ton of the manure, to be spread at the rate of eight tons per acre. This should be applied to timothy or clover sod and turned under in the spring.

The advantage of seed selection is generally recognized, but the methods of selecting the seed can be improved. No attempt at corn breeding to improve the quality of the corn is made.

Check drills are generally used in planting the corn, so that it may be cultivated both ways. This frequently does away with the necessity of hoeing. In general, three to four, and sometimes five, cultivations are given to the crop. The cultivators used are chiefly of the riding type. The use of power corn cutters has also reduced the labor of harvesting. A large per cent. of the corn now grown is cut usually late in September for ensilage.

Oats has never been a paying crop commercially, but it fits in well with the customary rotation of crops and is especially valued for its straw. The average yields are about thirty-five to forty bushels per acre. The introduction of the cowpea and soy-bean will probably cause a decrease in the acreage of oats in the future, especially where used with corn for ensilage. Oats are sown with an end-gate attachment at the rate of two and a half to three bushels per acre.

The acreage devoted to wheat was originally restricted by the expense and difficulty of harvesting the crop. With the reap-hook or sickle a good hand could cut only one-half acre per day. The manual labor necessary in harvesting the crop has been reduced to a minimum by the introduction of the self-binder, and the acreage has been increased. The yields, however, have not increased proportionately. At present an average yield of fifteen to twenty bushels per acre is obtained instead of the thirty-five to forty bushels produced when the land was first cleared. Wheat is generally recognized as not particularly profitable, but as a nurse crop it is conceded to be better than oats, since the straw is lighter and shades the clover less.

The use of ground limestone will be equally beneficial to the wheat and clover. The lighter colored soils of the area are better suited to wheat. They also show a stronger reaction when tested for acidity. Wheat should be seeded in corn during the latter part of September, not later than the 10th of October, preferably after the corn is shocked. It is generally sown with a disk drill having a fertilizer attachment.

The production of hay shown in the 1910 census report was only about half that for 1880. Of the 4,165 tons produced in 1910 the clover yield was 4,044 tons. The acreage of timothy is being rapidly reduced as its soil-robbing properties become more generally known. Some of the leading farmers of the area have excluded it entirely from their rotations. The growing popularity of the silo has also done much to reduce the acreage of timothy. The advantage of growing leguminous crops rather than such soil-depleting crops as timothy is becoming better understood.

The average yield of hay for the county is about one and a half tons to the acre, though as much as two and a half tons per acre are frequently obtained. The planting of cowpeas and oats for hay has been tried, but the results thus far have not been generally satisfactory. Hay makes a ranker growth on the black lands, but the quality is said to be better where it is grown upon the clay soils.

Heavier yields are obtained from the latter soils where ground limestone is applied.

Stock raising and dairying are important industries in the county. The 1910 census shows an annual production of 1,607,230 gallons of milk and 321,096 pounds of butter from 3,389 cows. The milk is handled through creameries, located in towns along the railroads and traction lines. The milk and cream is collected by wagons sent out from the creameries. Jersey and Holstein milkers are the favorite cows. A large number of beef cattle is marketed annually.

Fruit culture was profitable up to about 1880. Since that time various diseases have affected both trees and fruit, so that the neglected orchards have become practically worthless. It has been demonstrated, however, that with proper care excellent fruit can be produced. The pear is probably most seriously affected at present. One or two large commercial orchards in the vicinity of Tipton have recently been partially destroyed by blight. The growing of fruit for domestic use is to be encouraged, but it is doubtful whether its commercial production would prove profitable in this county. The orchards should be small, in order that they may be given proper attention. In many cases adequate care is given to the orchards, but the spraying is not practiced at the proper time.

Most of the farmers in Tipton County follow some form of crop rotation, but in many cases without a definite purpose. The rotation should be so planned as to produce larger yields, to distribute the work more evenly throughout the year, to be more certain of a regular income than is possible with a one-crop system, to maintain, or rather increase, the productivity of the farm, and to reduce to a minimum the injury from weeds, insect pests and disease which frequently accompany the one-crop system. Hence in formulating a rotation it is necessary to take into account the income it will bring, the needs of the land, the requirements of the stock at hand, the effects of one crop upon another if followed in succession, and the profitable distribution of labor. The three main classes of crops to be dealt with in planning a rotation are small grain, hay and cultivated crops. Every successful rotation must include some legume to enrich the soil. Red clover is now used for this purpose throughout a greater part of the corn belt. This crop often fails to make a stand, and in this case a good practice is to disk or plow the land and plant in cowpeas or soy-beans. The planting of cowpeas or soy-beans in the corn at the time of the last cultivation, as a green manure or for pasture, is particularly recommended for the light

thin land. Alfalfa sown at the rate of two to three pounds per acre with clover and timothy until the fields are thoroughly inoculated will enrich both the hay and the soil, and better yields of corn will be obtained. Alfalfa can be grown successfully in the county and should be grown more extensively. Wherever difficulty is encountered in maintaining a stand of clover commercial fertilizers or lime should be applied. Commercial fertilizers if depended upon alone for increasing crop yields will injure rather than improve the soil, but if used judiciously in improving the yields of clover and other legumes from which the ultimate enrichment of the soil must come they will generally increase the profits of the farm. A good rotation, with proper utilization of all the farm manure, is required for success in farming.

In 1909 there were mortgages aggregating \$598,810 held against the lands of Tipton County. These mortgages usually represent loans which were made to parties increasing their holdings of land. The price of land has increased rapidly within the past twenty years, and little if any land can now be bought in the county for less than \$150 to \$200 an acre.

Farm hands receive from \$20 to \$25 a month, in addition to board, lodging, washing and horse feed. Harvest hands and extra laborers receive from \$1.50 to \$2.50 per day.

SOILS.

A heavy mantle of glacial drift or till was deposited over the entire county during the glacial period by the last invasion of the ice, known as the Wisconsin stage. The drift material consists of a moderately stiff, clay-like mass at the surface, grading downward into a lighter, sandy and gravelly material. Occasionally rock fragments and boulders occur throughout the till, but nowhere in large quantities. The glacial deposit has a depth of forty to seventy-five feet along the northern and eastern borders of the county and 200 to 300 feet along the southern and western boundary.

The underlying geological formations have not contributed to the formation of the various soil types. The Devonian measures in the western part of the county and the Niagara limestone in the eastern section occur at too great depths to outcrop at the surface or influence the soils.

It is from the upper part of the glacial till that the upland soils of the Miami series have been derived directly through weathering.

This series is represented in Tipton County by two types, a silt loam and a loam. The loam member is confined to the more rolling areas along stream courses and the few moraines that were large enough to be indicated on the map.

Two soils of the Clyde series, a silty clay loam and a loam, are developed in numerous enclosed tracts formed by the promiscuous deposition of till material during the recession of the ice sheet at the close of the Wisconsin stage of glaciation. These areas remained in a semi-swampy condition until artificially drained, and this favored the accumulation of organic matter. The Clyde series therefore comprises essentially till material or wash from till soils modified by weathering under conditions of restricted drainage and by the accumulation of large quantities of black organic matter.

The alluvial deposits, consisting of reworked drift material, have been separated into two series on the basis of certain physical differences, principally in color. A dark colored, nearly black, soil has been classed as Wabash silty clay loam, and two types of brown soil are included with the Genesee series.

The narrow strips of unsorted alluvial material developed along some of the smaller streams are mapped as Meadow, while in some depressed areas which were formerly swamps or lakes the accumulation of organic matter has resulted in the formation of small bodies of Muck.

In the survey of Tipton County nine types of soil, including Muck and Meadow (Genesee material) have been mapped on the scale of one inch to the mile. These types are distinguished by separate colors.

MIAMI SILT LOAM.

The Miami silt loam includes the greater part of the better drained uplands of the county. It is known locally as "clay land," as distinguished from the "black land." The type is a silt loam, and the term "clay land" probably has reference to the tendency of the soil to clod or run together. This tendency is due to the lack of humus in the soil and to the fact that it is frequently plowed when too wet.

The surface soil to an average depth of about eight inches is a compact silt loam. It is light brown when moderately moist and grayish when dry. The subsurface portion of the soil frequently has yellow or a creamy-yellow color when partially dried out.

The subsoil between eight and about twelve to fifteen inches is a grayish-brown or yellowish-brown heavy silt loam or silty clay loam. Below this the material is a yellowish-brown silty clay loam to silty clay, mottled with gray in the upper part, grading below into a darker brown, friable silty to sandy clay, known as "boulder clay." This is generally encountered at about twenty-four to thirty inches, although along the stream courses and over the sharper knolls and ridges it occurs at a depth of eighteen to twenty inches. Below three to four feet the substratum gradually becomes lighter both in color and texture until at a depth of about eight to ten feet the material is made up largely of sand and gravel.

The surface soil throughout the area is fairly uniform, with occasional local variations. Upon the crests of the ridges and knolls it is sometimes slightly sandy, with a few chert, granite and quartz pebbles upon the surface. Where the type occupies nearly level areas the surface soil often has a leached or ash-colored appearance. This condition is generally found in those sections where the black soils are the predominant types. These areas are naturally poorly drained and artificial drainage must be established if the best results are to be obtained, since the soil is less productive than that of the better drained areas. Where the surface is more undulating and the natural drainage better developed the soil is darker in color, being more nearly brown. In the level areas the subsoil is more mottled, cold and dense, as if water-logged, while in the better areas it is more open and porous and has a yellowish-brown color. In addition to tiling and draining these level areas, they should also be subsoiled and limed to render the soil and subsoil more open and porous and to correct the acidity which numerous tests have shown to exist.

The Miami silt loam occurs in various areas throughout the county in association with the "black lands" comprising the Clyde soils. Next to the Clyde silty clay loam it is the most extensive soil type in the county. The largest proportionate acreage occurs in the southern and southeastern parts of the county and along the Howard County line. In the nearly level sections it occupies low, flat ridges, as previously described, where the "black lands" predominate. In general, the type is most extensively developed in the vicinity of stream courses.

In the early settlement of the county the Miami silt loam was one of the first soils to be cultivated because of its better natural drainage. When first cleared the soil was darker in color and much

more productive than at present. Subsequent cultivation has greatly reduced the natural store of humus.

This type can generally be distinguished in any particular field from the black soils by the more vigorous growth on the latter in the early development of the crop, particularly with corn, oats and hay. If the season is favorable the yields on this soil—the “clay land”—is generally a little more than half that of the associated black Clyde soils except in the case of wheat, which is better adapted to the Miami silt loam. The quality of the hay, corn and oats is generally better upon this type as compared with the darker colored soils.

Tests made with litmus paper show the soil to be distinctly acid in reaction. The use of phosphatic manures and liming is strongly recommended. The lime can probably best be applied in the form of finely ground limestone, since the type is already deficient in humus, and lime in the more soluble form might tend to destroy the remaining organic matter. Still, burnt lime could be used, and any lowering of the organic content thereby could be made up by plowing under vegetation or applying barnyard manure. From two to four tons per acre of the ground limestone should be applied, preferably on clover sod in advance of corn. The wheat and clover which follows will be especially benefited. Where barnyard manure is also used the addition of ground phosphate rock or acid phosphate would materially increase the yields of wheat and corn. The application of barnyard manure and phosphate is treated in the chapter on agriculture.

The deepening of the soil by deeper plowing and subsoiling will tend to correct the unfavorable “sour” condition of the land by the more thorough aeration thus brought about. The turning under of such crops as clover, cowpeas, Canada field peas, soy-beans, rye and oats stubble will improve the physical condition of the soil and furnish a store of food supply for the plants.

The one thing that has probably done most to reduce the crop yields from this type is the plowing of the soil when too wet and not in condition to produce the best possible tilth. This is generally due to a desire to force the crops in season. Under such conditions the soil clods badly and as a rule it is not reduced to the proper tilth by subsequent cultivation.

Tomatoes and potatoes grown on this type are generally superior to those grown upon the black lands. Owing to reduced yields, however, tomatoes are more often grown upon the Clyde silty clay loam.

The Miami silt loam is better adapted to fruit growing than the darker soils.

The native vegetation consists of beech, black walnut, white oak, yellow poplar, sugar maple, red oak, shell-bark hickory, chinquepin oak, white ash, hazel, pawpaw, redbud, wild plum, flowering dogwood, etc.

Farms upon this type are valued at \$150 to \$200 an acre.

MIAMI LOAM.

The surface of the Miami loam is a brown to yellowish-brown silty loam or loam to a depth of ten to twelve inches, grading into a yellowish-brown silty clay loam. At eighteen to twenty inches a dark-brown, brittle clay (boulder clay) is encountered which contains an appreciable amount of sand and gravel. The content of sand and gravel increases with depth, and below three to four feet the material becomes a lighter colored gravelly loam.

The type is not extensively developed in Tipton County. It occurs along the larger stream courses and over the larger morainic knolls and ridges. It is typically developed along Duck Creek in the southeastern portion of the county and also in the northeastern section. It occupies a well-defined morainic ridge in the southwestern part of the county and several smaller ridges and knolls throughout other sections.

This type is very similar to the Miami silt loam. Since it has a more rolling topography it is more subject to erosion, and this has had much to do with effecting a higher content of sand and other coarse materials.

The Miami loam is probably best adapted to fruit.

CLYDE SILTY CLAY LOAM.

The Clyde silty clay loam is the most extensive as well as the most productive soil type in the county. Owing to the dark color of the soil, due to its high content of organic matter, it is generally known locally as "black lands."

The surface soil of this type to an average depth of eight inches is a dark-brown to almost black silty clay loam. As the surface dries the material assumes a grayish or grayish-black appearance. The intensity of the dark color is proportionate to the amount of organic matter in the soil. This constituent also affects the chemical and physical properties and the agricultural value of the soil, making the land more retentive of moisture and mellow and easy to till.

The subsoil between eight and twelve to fifteen inches is a bluish-black silty clay loam, grading below into a drab silty clay. This in turn is underlain by a medium to light gray, stiff, plastic clay which is mottled with brown streaks or iron stains. Below twenty-four to thirty inches the subsoil is more deeply mottled, with a gradual tendency in texture from the stiffer clay to a lighter textured silty to fine sandy clay. Where this type follows the course of the natural drainage ways it is generally underlain with sand and gravel at various depths, usually at about six to eight inches. This sand and gravel is generally highly stained with iron compounds. Since Tipton County embraces but few morainic hills from which to draw its gravel supply, a large per cent. of the road material has been obtained by dredging the gravel from these old stream valleys.

This type comprises the greater part of the low-lying, poorly drained areas of the county which in their natural state were in a semi-swampy condition throughout the greater part of the year. After being drained the land was cleared of the underbrush and standing timber and put in corn, as this was about the only crop that could be cultivated and harvested among the roots and stumps. An occasional field is to be seen in which the stumps remain, but over far the greater part of the type they have been removed and the soil is in a high state of cultivation.

The Clyde silty clay loam is derived from the same material as the Miami silt loam, the glacial till of the late Wisconsin epoch, but owing to its low-lying position and water-soaked condition the character of soil and subsoil is very different. This type occupies irregular shaped depressions which are widely distributed throughout the county, but more generally confined to a wide strip extending diagonally through the center of the county from northeast to southwest. It occurs as low-lying or depressed areas in the uplands, and forms the main background of the soil map throughout which the Miami silt loam is shown.

The type was slowly developed. It was not until the early eighties that its possibilities were understood or appreciated. This came about through the building of good roads and adequate drainage outlets, giving the individual farmer an opportunity to drain his land. The development was attended by a rapid increase in land values, and the present high price of land in Tipton County is due in large measure to the productivity of this type and its wide distribution throughout the county. The value of individual farms is generally determined by the included area of this "black land."

The soil is fairly uniform throughout the area, but owing to differences in the natural drainage it has certain local variations in color, texture and depth of soil. The texture is heaviest and the color darkest where the depth of the surface soil is only about six to eight inches. This condition is largely found in the areas of the type east and southeast of Windfall, in the vicinity of the Madison County line, extending as far south as Cedar Point and West Elwood. The larger bodies of this soil in the vicinity of Tipton and elsewhere throughout the county have the same characteristics. The type usually reaches its maximum organic content and darkest color in the center of the depression or at its lowest point, shading off gradually toward the surrounding lighter colored soil of the Miami silt loam. The texture also follows this same general relationship. Both these conditions are due to the movement of the surface waters, and carrying in suspension and depositing the finely divided soil particles from the uplands as well as the decomposed native vegetation.¹⁰

The Clyde silty clay loam is used extensively in the vicinity of Tipton, Sharpville and other towns in the area for growing tomatoes, peas, beans, etc., for local markets and for the canning factories. The yields are larger from this type than from the Miami silt loam, but the weight and quality of the product are somewhat inferior. The tomatoes on the black lands decay more readily and in wet seasons crop yields are greatly reduced from this cause. By the judicious use of commercial fertilizers the yields from the clay lands could be materially increased.

The type is probably best adapted to corn and oats. Yields of sixty to eighty bushels of corn per acre are not infrequent, and fifty to sixty bushels of oats are obtained, but in wet seasons this crop lodges badly and considerable loss is incurred, except where it is mowed and used for hay. Its value as a green manure when turned back into the soil is not to be underrated, however. Alsike and red clover and timothy produce heavy yields, the average being from one and a half to two tons per acre.

Where commercial fertilizers are applied to this type it is recommended that a mixture be used containing about 8 per cent. of phosphoric acid and 8 to 10 per cent. of potash. Nitrogen is not generally needed for this soil and can best be obtained from the supply stored in the roots of leguminous crops, which should be included in all crop rotations.

The surface of the type is flat to depressed, so that ample drainage is required to remove the surface waters. Open ditches were

at first installed, but these have generally been replaced in recent years by underground or tile drains, which permit the cultivation of the land formerly dissected by the ditches, making it possible to cultivate the type in large bodies.

With proper drainage and liming of the soil alfalfa can be grown as successfully on this type as on the Miami silt loam.

The native forest growth of the Clyde silty clay loam consisted of swamp white oak, swamp pin oak, white elm, silver maple, burr oak, black ash, green ash, cottonwood, prickly ash, spice bush, buttonwood, wild rose, willows, etc.

CLYDE LOAM.

The surface soil of the Clyde loam to an average depth of eight to ten inches is a black, heavy silty loam or loam containing a high percentage of organic matter. The presence of this organic matter not only gives the soil its dark color, but also imparts to it a slightly pasty feel when wet, making it resemble Muck. However, the amount of organic matter in the soil is not sufficiently high to justify its classification as Muck.

The subsoil of the Clyde loam is a heavy black clay loam which grades below into bluish-black to grayish silty clay, and this in turn into mottled brown, drab, and gray, rather stiff, plastic clay. At a depth of about thirty to thirty-six inches silty to fine sandy clay of a lighter gray color mottled with brown is generally encountered. The content of sand generally increases with depth and in some instances a wet, loose, fine sand, similar to quicksand is encountered. This material is most common in the soils of "Round Prairies," southeast of Windfall, which was originally a lake or shallow basin.

The Clyde loam was originally treeless. The native growth consisted of sedges, grasses, cattails, flags button bushes and willows. The better drained areas supported a heavy growth of native prairie grass which was used extensively by the early settlers for hay and pasture for their stock. The annual decay of this vegetation was the source of the high content of organic matter in the soil, so that it is frequently referred to as "made land." Where this soil carries a very high content of organic matter it is generally loose, "chaffy" or fluffy, or mucky. The latter condition is more noticeable when the soil is first put under cultivation, following reclamation by artificial drainage. Corn planted on the mucky areas makes a vigorous growth in the early stages of its development, but usually turns yellow or "burns" before reaching maturity. The application of barnyard manure, deeper plowing, and

thorough cultivation so as to aerate the soil as much as possible will tend to correct this chaffy condition and greatly increase the yields from this type. The use of fertilizer mixtures containing potash and phosphoric acid in the proportion of about two parts of the former to one of the latter is also recommended.

The largest single body of this type comprises the area known locally as "Round Prairie."

The Clyde loam is naturally fertile, but generally the best results are obtained through the use of barnyard manure and commercial fertilizers. The soil is generally lacking in phosphoric acid and potash, particularly the latter. Corn yields have been greatly increased by the application of potash fertilizers. Lime is also beneficial.

It is only within the past few years that satisfactory yields have been obtained from this type. Oats produce a rank growth and lodge badly. It is recommended that the oats be sown thicker on this than on the lighter colored soils.

Clyde Loam, Prairie Phase.—In the vicinity of Kempton and running as far east as Goldsmith a darker phase of this type occupies an area which is known locally as "Indian Prairie." This development is almost 20 miles long and 2 to 3 miles in width. The term "prairie" was applied to this area because of its original treeless condition. It supported a dense growth of aquatic vegetation, consisting chiefly of sedges, grasses, cattails, flags, button bush, and willows. About 40 to 90 per cent. of the soil was under water throughout the year. The better drained portions supported a growth of bluestem prairie grass and numerous species of typical prairie plants. The grass was cut for hay by the early settlers. Interspersed throughout the low-lying prairie lands were small, low morainic knolls and ridges which supported a growth of hazel and sumac. Many of these knolls are now covered with hickory, and shingle, white, and red oaks.

The surface soil of the prairie phase of the Clyde loam to a depth of 8 to 10 inches is a black or brownish-black silty clay loam or heavy silt loam which grades into a bluish-black clay or clay loam, sometimes mottled with yellow. This in turn is underlaid at 20 to 24 inches by a bluish or drab, tenacious silty clay which becomes light gray in color and more intensely mottled with depth. The mottling in the lower depths consists of deep brown iron stains or streaks. At 30 to 36 inches a lighter textured, deeply mottled silty to sandy clay is encountered, and this in some places is underlain by marly material. Probably at least a part of the prairie

phase is underlain by gravel at various depths similar to that underlying portions of the Clyde silty clay loam.

The soil is deeper in the depressions, has a darker color, and is frequently loose and fluffy. The fluffy soil, which occupies button wood ponds, produces a good growth of corn and other crops, but the plants tend to "burn out" or turn yellow without reaching full maturity. This is possibly due to the excess of certain organic acids in these muck-like areas, which can be corrected by heavy applications of barnyard manure or by liming, or to a deficiency of potash. The use of commercial fertilizers containing a high percentage of potash has greatly increased the yields from this land. Where the barnyard manure is needed for the clay knolls it is advisable to use commercial fertilizers, maintaining a proper balance in the available nitrogen by crop rotation.

This land is especially well adapted to corn, producing an average for the past ten years of about 50 bushels per acre. Average yields of 50 bushels of oats, 12 to 20 bushels of wheat, and 25 to 30 bushels of rye per acre are obtained. Oats lodge badly, especially in wet seasons. Clover and timothy do well upon the prairie phase and an average of two tons or more to the acre is produced. Alsike clover does especially well. Potatoes yield from 200 to 300 bushels per acre.

GENESEE SILTY CLAY LOAM.

The surface soil of the Genesee silty clay loam is a medium-brown heavy silt loam grading at a depth of 5 or 6 inches into a silty clay loam which extends to 12 or 15 inches, when the subsoil is usually encountered. The subsoil is a gray or steel-blue, stiff, plastic clay mottled with shades of brown or iron stains, the color becoming lighter with depth.

This is generally subject to overflow, but where it occurs above ordinary high water the soil is a light-brown, loose silty loam to 18 to 20 inches, below which it is a dark-brown to drab, mottled silty to sandy clay.

The type resembles to some extent the Clyde silty clay loam, except that it is lighter in color and occurs in the better defined valleys of the streams along which it is found.

The largest single body of the type occurs in section 29, T. 21, R. 4, where Wallace and Prairie creeks unite to form Cieero Creek, extending along the latter for a distance of two miles or more. The soil is also found as first bottom land in a narrow strip along Mud Creek, which traverses the northern part of the county.

The Genesee silty clay loam, like the Genesee loam, belongs to the youngest group of soils in the county, representing alluvial material recently deposited by the streams along which it occurs. The soil is generally lighter in texture near the stream, where the currents during periods of overflow are swifter and can carry the heavier materials in suspension. The heavier materials are deposited in the outlying bends of the creek where the movement of the water is more sluggish.

Originally this type comprised poorly drained bottom lands along streams of very shallow, crooked channels, through which the water flowed sluggishly. In recent years the channels have been straightened and deepened by dredging, and the land along their courses has thus been reclaimed for cultivation through an improvement of the drainage.

Some of the largest yields of corn in the county have been obtained from this type, the average being from 50 to 60 bushels per acre, while a yield of 80 bushels is not unusual. Heavy yields of oats and hay are also obtained, but corn is the leading crop. Being subject to overflow, this type does not require as much fertilizer to produce maximum yields as is needed on the upland soils, since fertile deposits of alluvium are being laid down over the bottoms from time to time.

If cultivated under normal moisture conditions, this soil turns up a loose, mellow loam, but if plowed when too wet it has a tendency to form heavy clods which cannot be readily reduced to subsequent cultivation. Too often this physical characteristic of the soil is overlooked by the farmers in their haste to plant crops, especially when the season is late, and by such practice the crops are affected for even more than one season.

The native vegetation consisted of swamp oak, white oak, bur oak, pin oak, silver maple, white elm, cottonwood, black ash, prickly ash, spice bush, etc.

GENESEE LOAM.

The surface soil of the Genesee loam to a depth of about 6 to 8 inches is a medium dark brown silty loam to loam. This grades into a lighter colored brown loam as the depth increases. At 10 to 12 inches the texture is slightly heavier, and the material becomes a silty to fine sandy clay or clay loam. Varying amounts of sand and gravel are encountered throughout the soil and subsoil. The surface material varies to a fine sandy loam in places, but these spots could not be mapped on account of their small size. Occa-

sionally at depths of 24 to 30 inches a fairly loose, sandy and gravelly material is encountered.

The Genesee loam, being of alluvial origin, is subject to local variations over small areas, due to the uneven deposition of alluvial material at different intervals of overflow, the greatest uniformity being found in the broader bodies.

This type occurs as first bottom land along Cicero Creek, from the Hamilton County line to the junction of Cicero and Nixon creeks. A narrow strip also extends along Nixon Creek for about two miles. Where this type occurs near the Hamilton County line the soil is more nearly a fine sandy loam, but in the vicinity of Tipton it is much heavier in texture.

Only a limited acreage of the Genesee loam is under cultivation, since it is subject to intermittent overflow. It is used almost exclusively for pasture. There is generally some growth of silver maple, white elm, sycamore, buckeye and red oak. The type is cultivated only over the better drained areas which in places have the character of second terraces but are too small to be mapped separately. Corn and oats are the chief crops.

Where market facilities are adequate the lighter, sandy soil of the type might be used to advantage for trucking purposes since it is especially adapted to watermelons, muskmelons or cantaloupes, cucumbers, and potatoes, particularly sweet potatoes.

WABASH SILTY CLAY LOAM.

The soil of the Wabash silty clay loam to an average depth of about 8 inches is a black heavy loam to silty clay loam containing a high percentage of organic matter, the amount of which is sufficient in places to impart a mucky character to the soil. The subsoil consists of a bluish-black silty clay grading at about 12 to 15 inches into a stiff, impervious drab-colored clay. The water table is frequently encountered at a depth of 30 to 36 inches. The lower subsoil has a light-gray color, deeply mottled with brown and yellow.

The area in which the Wabash silty clay loam occurs is a slightly depressed or outlying basin adjoining the bottom lands along Prairie Creek. The supposition is that it is a part of that valley, representing an abandoned channel way of Prairie Creek. It is said that in times of high water a part of the overflow from Prairie Creek breaks across into this basin and finds its outlet through Devil's Den Run. The latter stream has in recent years been straightened and deepened as a drainage outlet for the basin. The

area was formerly a dense swamp which was inundated during a greater part of the year. Only in recent years has it been drained and made suitable for agriculture.

When first cleared and put under cultivation the soil was highly charged with organic matter and in places was chaffy, so that the corn showed a tendency to "burn" without properly maturing the grain. This condition has been gradually remedied by the use of large quantities of stable manure and subsequent cultivation. The use of potash as a fertilizer has also increased the efficiency of this soil.

The type occurs as a single body, and includes a greater part of the N. E. $\frac{1}{4}$ sec. 31, and the S. W. $\frac{1}{4}$ sec. 29, T. 21, R. 5. It extends to the southeastern and northwestern corners of sections 30 and 32 respectively.

Corn is the leading crop and has been grown continuously. Owing to the natural fertility of the soil yields of about 60 to 80 bushels per acre have been obtained, but unless crop rotation is practiced these yields will decline and the growing of corn become unprofitable.

MUCK.

The type of land classified as Muck consists of black or dark-brown organic matter in a state of partial decomposition, mixed with varying quantities of soil material or mineral matter. These areas are generally referred to locally as "made land." The depth is quite variable, ranging from a few inches in the margin to 3 feet or more in the center of the body. The color changes little with depth but the organic matter is more noticeable in the lower portion. At an average depth of about 24 inches the mucky layer is underlain by bluish-black, plastic clay or silty clay which grades below into a lighter colored or grayish, mottled clay. In places the lower portion of the 3-foot section consists of Peat. Occasionally an impure shell marl is found imbedded with the underlying material. Considerable mineral matter in the form of fine sand and silt have become incorporated with the Muck along the margin of the larger areas.

There is only a small total area of this type, the largest body being in the northeastern part of the county, north of Groomsville, in an old channel now drained by Swamp Creek and Turkey Creek. Two small bodies occur in the morainic areas of the extreme northwestern section of the county. A few isolated patches are found in depressions in various parts of the area. Some of these patches were too small to be indicated on the map.

Small areas of Peat consisting of pure deposits of less thoroughly decomposed decaying vegetable matter, were included with the Muck. These are so intimately associated with the Muck as to preclude their being mapped separately. The Peat deposits were formed along with the Muck in shallow basins and ponds from the decayed remains of water-loving plants and accumulations of other forms of vegetation, particularly mosses. The Peat commonly occurs near the center of the body of Muck where the deposition of vegetable matter has been more recent and has not undergone as thorough decomposition, though it sometimes occurs in spots throughout the entire body.

Since the Muck occupies low-lying, depressed areas which lack natural outlets, drainage must be supplied before the material can be successfully utilized for crop production. Muck land was first brought under cultivation about twenty years ago and most of the type in the county is now reclaimed. This has been accomplished by the construction of large open ditches into which many tile ditches drain. In the early settlement of the area the native grasses were cut from these soils and used for hay, but at present most of this land is under cultivation and used chiefly for general farm crops, such as corn, oats, and hay.

Corn will produce an average yield of 50 to 60 bushels per acre, and oats 40 to 60 bushels. Some very heavy yields of oats have been obtained, but the grain makes a rank growth of straw which becomes lodged so that harvesting is difficult as well as damaging to the crop. This condition may be partially remedied by the liberal use of mineral fertilizers. Corn frequently "burns" or turns yellow on this soil and does not mature. Timothy is easily set and makes a rank growth, but it usually "burns" at the ground, and the hay is lighter than that grown on other soils. Alsike clover is well adapted to this soil and should be grown in combination with timothy. The crops grown on this type are subject to injury from early and late frosts. It is often necessary to replant corn two or three times, and early frosts sometimes prevent the corn from maturing. If the seed bed were made firm with a heavy roller the movement of the soil moisture would be so regulated as to lessen the danger from frosts. Applications of potash salts and phosphatic fertilizers are very advantageous to these soils. Coarse barnyard manure and lime are also beneficial.

This soil is seldom used for the crops to which it is best adapted, including celery, onions, cabbage, Irish potatoes, beets, turnips, cauliflower, and other garden products. Such crops have been suc-

cessfully grown upon this material in northern Indiana and adjoining States, but for the cultivation of such special crops the accessibility of city markets and rapid transportation must necessarily be a matter of consideration, except in those cases where grown for local consumption.

MEADOW (*Genesee Material.*)

The term Meadow, as here employed, denotes a generalized type or classification embracing the narrow strips of first bottom land lying along certain minor stream courses of the county, such as Irwin, Turkey, Little Wild Cat, Nixon, Jericho, Wallace, and Prairie Creeks. These bottoms are subject to periodic overflow, but they are not particularly swampy, the drainage of much of the soil being fairly good between overflows. There is wide variation in the color, composition, and texture of the soil, as also in local drainage and surface conditions. The predominant material is a heavy silt loam, dark brown in color, and resembling the Clyde and Genesee soils. The boundaries indicated upon the map are arbitrary, since no definite line can be drawn between meadow and the other alluvial types having a similar origin.

The subsoil is a mottled drab or grayish silty clay. Near the stream channel the soil may be lighter in texture, but throughout most of the area the sediments are fine and the soil is rather heavy. Deposits are being added repeatedly, each successive overflow bringing in new deposits and spreading them over the bottom lands.

The areas of meadow are ordinarily too wet for cultivation yet they are not permanently swampy. By straightening and deepening the stream channels much of this poorly drained land has been reclaimed, like the Genesee silty clay loam, for agricultural purposes. Corn is the chief cultivated crop upon such areas, and when proper means of drainage are employed the yields are excellent. Where the valleys are deeply cut and narrow and the land frequently interspersed with shallow depressions or marshy places its chief value is for pasturage. Complete drainage of the meadow lands is not essential when they are used for this purpose.

The greater portion of meadow in this county is being used for pasture, the native forest growth generally being allowed to remain as shelter for stock. It also affords a supply of timber for domestic use, chiefly for fence posts and rough lumber.

Silver maple, white elm, sycamore, and red oak are the trees commonly found on such areas.

SUMMARY.

Tipton County, with an area of 166,400 acres or 260 square miles, is located in the north-central part of Indiana.

The surface is a level, featureless till plain, the greatest relief being found along the larger stream courses, especially along Duck Creek and lower Cicero Creek. The average elevation is from 850 to 950 feet above sea level.

The summit of the drainage divide between the Wabash and White rivers extends east and west through almost the center of the county. About half of the county drains to the north, the other half to the south. Much of the drainage is artificial.

The county was first settled in the southern portion. The greatest influx of settlers was between 1880 and 1890.

Tipton, the county seat and largest town in the county, is located near the center of the county. It has a population of 4,075. There are 12 other towns and villages in the county, not including Atlanta, Ekin, and West Elwood.

The county has a population of 17,457, of which only about 7,000 live in the towns and villages. The rural population is well distributed.

An excellent sectionized public system of graveled roads extends over the entire county. Adequate transportation facilities are furnished by three railroads and two electric interurban lines. The county has only a few manufacturing interests. Its prosperity is due almost entirely to its fertile soils.

The entire county is highly developed and prosperous, having good homes, towns, churches, schools, electric interurban lines, telephones, rural delivery routes, excellent public roads, and other modern conveniences.

The climate is not subject to very great extremes. The absolute maximum and minimum temperatures reported, 105 degrees above and 25 degrees below zero, are unusual. The mean temperature for the winter months is 27°, and the summer 73° F.

The county has an average rainfall of about 37 inches, which is well distributed throughout the year. The growing season is about 5½ months.

Corn is the principal crop, 50 to 55 bushels being the average yield. Oats, wheat, and hay are also grown in considerable quantities. These crops are largely fed on the farm to the stock, which constitutes one of the main sources of revenue. The surplus of corn, oats, and hay is sold in the local markets. The wheat is

generally sold or exchanged at the elevators for flour and meal. Corn is also being cut and stored as ensilage which is used as green food for stock in winter.

The growing of tomatoes, peas, beans, etc., for the canning industry is profitable, and there is promise of an extension of this form of agriculture. Dairying is an important industry.

The rotation of crops is generally practiced throughout the area. Barnyard manure is the principal fertilizer used, although some commercial fertilizers are applied, particularly with special crops and upon the black land of the county. Ground limestone could be profitably applied to most of the soils.

The average size of farms is about 80 acres. The tendency is to increase the size of farm buildings. The tenant system is growing.

The value of land ranges from \$150 to \$225 or more an acre. The price of land has advanced rapidly since 1880, owing to the reclamation of the black lands.

The soils are derived almost entirely from the glaciated till of the late Wisconsin epoch. The greater part of the soils are rich in organic matter and are classed as "black lands." The light colored soils are called locally the "clay lands." The soils generally are of a silty character. Those of the uplands, comprising nearly all of the county, are classified in two series, the Miami and Clyde soils, the former including the light-colored soils and the latter the black lands. Both are of wide extent. The black soils are best adapted to corn and oats while the lighter colored soils are better suited to wheat. One type of the Wabash series was mapped and this is also generally included with the black lands. The first bottom lands were classed with the Genesee of Meadow.

Nine soil types, including Meadow (Genesee material) and Muck, were recognized and mapped. The Miami silt loam and the Clyde silty clay loam are the predominating types. Muck and the Clyde loam represent the so-called "made lands" of the area, the latter type being especially rich in organic matter.

The alluvial soils are limited to narrow strips along the large streams. These were classed with the Genesee loam and silty clay loam, or Meadow. The Genesee loam is developed along Cicero, Duck, and Jericho creeks, while the silty clay loam is confined principally to Prairie and Mud creeks, Meadow (Genesee material) occurs along the upper courses of many of the smaller streams.

Practically all of the soils are under cultivation or used for pasture. The agriculture of the county is in a prosperous and highly developed condition. Scientific farming is being practiced to a considerable extent, but further recognition of its possibilities is necessary for the fullest development of the county.