

SOIL SURVEY OF ADAMS COUNTY, INDIANA.

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DESCRIPTION OF THE AREA.

Adams County is situated in the northeastern part of Indiana. It is bounded on the north by Allen County, on the east by the State of Ohio, on the south by Jay County, and on the west by Wells County. It is rectangular in shape and contains 337 square miles, or 215,680 acres.

The topography, as is typical of glacial regions, is varied, ranging from flat and depressed to hilly. Most of the central part of the county is level to slightly undulating. This section is bounded on the north by an uneven morainic belt which follows the course of the St. Marys River and on the south by the still more uneven moraine along the Wabash River. On the northern side of the Wabash River, in French and eastern Wabash Townships, are found the most uneven topographic features in the county. In the southwestern part of Wabash and the southeastern part of Hartford Township is a low-lying area known as the "Lob," which terminates 7 or 8 miles southwest of Geneva in some small lakes. Though artificially drained by means of large ditches, a large proportion in this area is still inundated in times of high water.

The drainage of the southern part of the county is into the Wabash River and of the northern into the St. Marys River, both of which flow in a northwesterly direction. In Adams County the St. Marys River carries three times as much water as the Wabash. In the more level section of the county the natural stream courses have been



FIG. 1.—Sketch map showing location of the Adams County area, Indiana.

straightened, widened, and deepened, and large artificial ditches have been constructed to assist in carrying off the drainage water.

A few settlers entered the territory now included in Adams County as early as 1820, but immigration to this region did not become important until about 1834. The county was organized in 1836, and Decatur, situated on the St. Marys River, was made the county seat. Most of the settlers were from the more eastern States, but some settlements were made by French, Swiss, and Germans coming directly from Europe.

According to the census the population of the county in 1910 was 21,840. In 1920 the number had decreased to 20,503, a loss of little more than 1,000, all of this loss being suffered in the rural population, which was 17,369 in 1910 and 15,741 in 1920. All the urban population is in Decatur, a town of 4,762 persons. Here are located several manufacturing industries, among them being the only beet-sugar factory in the State. Berne, Geneva, and Monroe are the next largest towns. Numerous smaller villages and hamlets are scattered over the county.

The county is served by three steam railroads and one electric railroad. The Grand Rapids & Indiana Railway traverses the area from north to south, passing through the largest towns. Both the Erie and the Toledo, St. Louis & Western Railroads cross the county from east to west through Decatur. The Fort Wayne & Decatur Traction Line connects Decatur and Fort Wayne. There are no steam or electric roads in the northeast and southeast parts of the county. All other parts are within a reasonable distance of shipping points. Except in these two localities, also, the county is well supplied with hard-surfaced wagon roads. Limestone, some of which is obtained from quarries along the Wabash River, is chiefly used as surfacing material. The mileage of improved roads is increasing each year.

The towns and villages have good high schools, and well-built modern school buildings have been erected throughout the county. In some instances district schools have been combined, thus offering better facilities.

CLIMATE.

The climate of Adams County is subject to the wide variations in temperature characteristic of all northern Indiana. Thus the minimum temperature, recorded in January, is -23° F. and the maximum, occurring in August, 106° F. The mean annual temperature is 50.3° F.

The mean annual precipitation is 37.23 inches, of which 10.64 inches fall during the months March to May and 11.30 inches during

the period from June to August, inclusive. Although the precipitation is fairly well distributed throughout the year, droughts not infrequently injure crops, unless care is taken to employ proper methods of cultivation. The average annual fall of snow is 24.7 inches.

The average date of the last killing frost in the spring is May 5, and of the first in the fall October 6, giving a normal growing season of 154 days. The latest recorded date of a killing frost in the spring is May 31, and the earliest in the fall is September 11.

The following table, giving in detail the more essential facts relating to the climate, is compiled from records of the Weather Bureau station at Bluffton. This station is in Wells County, which borders Adams County on the west, but the data may be taken to represent the conditions in Adams County.

Normal monthly, seasonal, and annual temperature and precipitation at Bluffton, Wells County.

(Elevation, 835 feet.)

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1910).	Total amount for the wettest year (1913).	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	28.2	62	-20	2.60	2.23	1.27	4.9
January.....	26.8	70	-23	2.67	2.92	6.88	6.2
February.....	24.8	66	-19	2.20	2.15	1.60	7.4
Winter.....	26.6	70	-23	7.47	7.30	9.75	18.5
March.....	39.4	88	-3	3.69	T.	9.59	4.1
April.....	49.8	92	17	3.19	2.63	3.01	0.9
May.....	61.0	101	24	3.76	3.28	3.33	0.0
Spring.....	50.1	101	-3	10.64	5.91	15.93	5.0
June.....	68.3	100	35	3.67	.96	1.71	0.0
July.....	73.9	104	42	4.05	2.07	8.83	0.0
August.....	72.1	106	36	3.58	1.35	4.87	0.0
Summer.....	71.4	106	35	11.30	4.38	15.41	0.0
September.....	65.7	100	28	2.78	4.53	1.79	0.0
October.....	53.4	94	10	2.27	2.37	3.34	T.
November.....	39.9	80	6	2.77	3.01	2.05	1.2
Fall.....	53.0	100	6	7.82	9.91	7.18	1.2
Year.....	50.3	106	-23	37.23	27.50	48.27	24.7

AGRICULTURE.

Agriculture is the principal resource of Adams County. It began as early as 1820 in a small way, and not until about 1834 was much progress made. Development was slow, as all the earlier homesteads were located only on land having good natural drainage, and this as a rule was heavily forested with hickory, oak, beech, elm, maple, and walnut.

Small fields were cleared and planted to corn and potatoes, and a little later wheat, rye, and buckwheat were introduced. Some flax also was grown and used in the manufacture of homespun. Later the higher parts of the poorly drained areas of black soils were gradually encroached upon, but several years passed before any large areas of these lands were reclaimed.

In recent years drainage systems have been greatly improved and extended through cooperative effort. The channels of the Wabash River and many of the creeks and small streams have been straightened and deepened, and larger ditches also have been constructed. Tile drains have supplanted the small open ditches which originally were used to drain the individual farms. Effective systems are in operation on practically all farms located on level, low-lying lands, composed of the Clyde, Brookston, and Genesee soils, nearly all of which were formerly too wet for cultivation. Such areas have been freed from surface water and now form the most productive lands in the county. Lands of the Miami silty clay loam type, with more relief and better natural drainage than the level areas, also have been improved by laying tile drains. While much has been done to improve the originally wet lands of the county, the question of drainage is still an important one, as more effective drainage systems could be installed profitably on many of the farms.

Corn, oats, and wheat are at present the principal crops, ranking in the order named. Rye, barley, sugar beets, alfalfa, buckwheat, sorghum, and truck crops are grown to some extent.

Corn has always been the leading crop. Wheat remained second in acreage until after 1899, but was third in 1909 and 1919, oats going into second place. According to the census the total value of all cereals produced in 1919 was \$4,030,469. The importance of the cereals in this county is brought out by a comparison of this sum with the value of all crops, which is given by the same authority as \$5,670,168.

The following table, compiled from census returns, gives the acreage and production of these three crops at the last five enumerations:

Acreage and production of corn, wheat, and oats, Adams County, as given by the last five censuses.

Year.	Corn.		Wheat.		Oats.	
	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Acres.</i>	<i>Bushels.</i>
1919.....	42,546	1,561,767	26,667	408,166	27,779	974,400
1909.....	46,581	1,982,923	12,163	167,177	33,307	1,085,451
1899.....	40,598	1,812,060	26,430	369,460	18,955	707,670
1889.....	32,091	1,109,205	17,927	257,983	16,733	623,787
1879.....	21,763	627,070	20,667	407,972	8,994	282,881

Corn is considered the most profitable of the cereal crops on most of the soils of the county. The Clyde and Brookston soils are especially well adapted to the crop, and the acreage has increased steadily with the reclamation of these productive black soils.

Hay and forage crops, with a total value of \$1,326,954, are next to the cereals the most important products of Adams County. Hay is grown on all the soils except the Genesee silt loam and Muck and Peat. The hay consists of clover, timothy, timothy and clover mixed, alfalfa, and an occasional cutting of oats. Seeding of clover and timothy may be done with either wheat or oats, the former being more generally used. Rye is also a very desirable nurse crop.

The importance of clover as a feed and as a soil renovator is generally appreciated, and it is grown on practically every farm.

The growing of alfalfa is not extensively followed; in 1919 there were approximately 200 acres in this crop, and the production was 365 tons. Small fields have been successfully established, but there have also been numerous failures. It is believed that the lack of proper drainage was responsible for many of these. For the successful production of alfalfa it is essential that the soil should be thoroughly drained, in some instances subdrained, richly manured, limed, and reduced to good physical condition. Three cuttings may be obtained each year.

Within the last few years the growing of soy beans has increased decidedly. The county agent has been particularly active in his efforts to increase the acreage in soy beans and alfalfa. He states that the soy bean acreage was increased over 1,000 per cent in one year—1917. The crop is considered a promising one for this section. The common method of planting for a seed crop is to drill the seed in rows. It requires one-half bushel of seed to plant an acre. Soy beans are planted about corn-planting time, May 15 to 20. Cultivation is given during the early stages of growth. The seed may also be planted in corn at the last cultivation, or sown broadcast on well-prepared ground. The yields range from 20 to 25 bushels per acre. Hollybrook. Ito San, and Early Brown have given good

results. For late planting the latter two varieties are considered best. These varieties mature early. The Hollybrook is the best variety to sow with corn for ensilage.

The practice of sowing soy beans with corn intended for silage should be extended. By this method a well-balanced ration is obtained, and at the same time the stubble adds more organic matter and nitrogen to the soil than where corn alone is grown.

Sugar beets have been grown rather extensively in the county for a number of years. The beets are sold to a sugar factory at Decatur. The cost of production has so far varied between \$18 and \$25 an acre. The yields average about 12 tons per acre, and a maximum of 35 tons per acre has been obtained under especially favorable conditions. The soils and climate are well suited to growing this crop. The better drained areas of Brookston silty clay loam give a larger tonnage and larger net returns than either the Miami or Crosby soils, though it is stated that the sugar content of the beets produced on the two soils last mentioned is 1 to 2 per cent higher. The sugar company, which is the only one in Indiana, receives beets from various parts of the State and Ohio. The price paid for beets ranges from \$5 to \$6 a ton. The townships of Washington, Monroe, Wabash, French, Kirkland, and Preble lead in the production of sugar beets.

Potatoes and other vegetables are grown for home use and to supply local markets, but there has been no marked development of the trucking industry. Fruit growing also is confined to production for home needs. Most of the farms have an apple orchard and usually a few peach, plum, cherry, pear, and quince trees. On many there also are grapevines and patches of small fruits.

Hog raising is the most important branch of live-stock farming at the present time, and the industry is growing. The raising of beef cattle is not very important, though a few head are fed in winter on a number of farms.

Commercial dairies supply the larger towns. Many farmers keep a few milk cows and sell the milk and cream to local creameries, ice-cream factories, and the milk condensers at Berne, and at Vera Cruz in Wells County. The dairy products from farms near the electric lines are shipped outside the county. Separators are commonly used, the cream being sold and the milk fed on the farm to the young stock. The Holstein predominates among the purebred cattle.

Decatur is a well-known horse market, drawing from a large territory, and many of the farmers in Adams County raise one or two colts a year for their own use or for the market.

There is considerable variation in the crop rotations on different farms. The one in most common use consists of corn, oats, wheat, and clover. The substitution of soy beans for oats would make a very desirable rotation.

The principal recognition of adaptation of crops to certain soils is that of corn to the Clyde clay loam and Brookston silty clay loam and of wheat to the lighter colored Miami silty clay loam and Crosby silty clay loam. The quality of corn grown on the lighter colored soils may be considerably better than that grown on the dark soils. Unusually early frost, coming before the grain has fully matured, may injure the crop materially. This is more likely to happen on the Clyde and Brookston soils than on the Miami soil. As a result there is in some seasons considerable soft or chaffy corn in the product of the lower lying black lands.

Acid phosphate at the rate of 150 pounds per acre is sometimes applied to corn on the Clyde clay loam and Brookston silty clay loam. For wheat about 200 pounds per acre is applied. The soils are benefited by liming; the application of 2 to 4 tons of ground limestone per acre has proved especially valuable in farming the Miami and Crosby soils. Ground limestone should be used in conjunction with stable manure to obtain the best results.

The farms of Adams County are well equipped with modern farm machinery, including corn planters, harvesters, shredders, wheat drills, disk plows, manure spreaders, hay loaders, and rollers. A number of tractors also are employed in plowing and other heavy farm work.

The 1910 census reports the total number of farms in the county as 2,353 and the 1920 census as 2,328, showing little change in number during the decade. There was also practically no change in the average size of the farms during this period.

Approximately 96 per cent of the area of the county is in farms and 87.8 per cent of the land in farms is improved. The 1920 census reports 65.7 per cent of the farms operated by owners, a decline of 17 per cent since 1880. Farms are generally rented on a share basis rather than on a cash basis, the owner receiving two-fifths to one-half of the produce, depending upon the terms of the particular lease. Leases usually cover a period of one year only. The average cash rent for improved farms is \$6 or \$8 an acre. For land to be used in the production of sugar beets as much as \$12 an acre is paid.

The majority of farms are well improved. As a rule, the buildings are large and substantial, and many are equipped with modern improvements. In the southern part of the county the buildings on many of the farms are small and agriculture is not in as prosperous condition as in other sections. In this southern section the income from oil leases has been for over 20 years in excess of the profits obtained from farming, and as a result agriculture has been somewhat neglected.

The usual wage for farm hands is \$25 to \$35 per month, with board. Harvest hands and extra help are paid \$2 to \$2.50 per day.

But little land has changed hands in the last few years. Clay lands, or the light-colored Miami and Crosby soils, are valued at \$90 to \$125 an acre; black land and bottom land are held at \$125 to \$200 an acre.

SOILS.¹

The soils of Adams County are derived from glacial material deposited by the late Wisconsin ice sheet. This drift, consisting of an unassorted mixture of silt, sand, clay, and gravel, varies in depth from 10 to 100 feet or more. To an average depth of 24 to 30 inches the material is weathered and in general is composed of a silty clay loam to silty clay; at 3 to 4 feet the material is more friable and only slightly weathered. The till is highly calcareous below the weathered layer.

The thickness of the silty covering varies somewhat with the character of the surface, the undulating to rolling uplands having the thinnest deposit and the level to very gently undulating areas the thickest.

Niagara limestone of the Upper Silurian age underlies the glacial deposits throughout the county. In the valleys of the Wabash and St. Marys Rivers this limestone occurs at shallow depths and in places is covered by only a few inches of soil. Limestone quarries have at various times been operated along these streams, particularly at Decatur and Linn Grove.

The soils of Adams County were developed under a heavy rainfall. The term heavy rainfall, when used in connection with soil description, does not signify an exceedingly large quantity as measured in inches, but refers to a quantity that is sufficient to maintain the loss by evaporation from the soil and by run-off, and in addition to maintain a downward movement of surplus moisture through the soil and to an indefinite depth into the material below the soil during the greater part of the year. In Indiana an annual rainfall of about 20 inches is required to accomplish this, and the more the rainfall exceeds this quantity, the more thorough will be the effect of the percolating moisture on the soil.

¹ Adams County is adjoined on the north by Allen County, which was surveyed in 1908, and on the west by Wells County, surveyed in 1915. The soils on opposite sides of those boundaries in many places apparently differ. This lack of correspondence is the result of fuller knowledge of the soils of the State gained since the earlier surveys and of resulting changes that have been made in the correlation of certain of these soils. What was mapped in Allen County as the Miami clay loam is divided in Adams County into two types of different series—the Miami silty clay loam for the better-drained areas and the Crosby silty clay loam for the flat or very gently undulating areas with deficient drainage; and the Miami black clay loam is now mapped as the Brookston silty clay loam. The differences between Adams and Wells Counties are mainly in detail in separating the light and dark colored soils. The Miami silty clay loam, flat phase, is almost identical with the Crosby silty clay loam of Adams County; also the Clyde silty clay loam with the Brookston silty clay loam. Where differences occur along the boundaries the names used in Adams County should be applied to abutting soils in the adjoining counties.

Soils that have been subjected to these conditions long enough to have changed the original soil material, both chemically and physically, to such an extent that its original characteristics have disappeared or have become very much subordinated to more recently developed characteristics, may be designated humid soils that have reached a stage of maturity in soil development.

The dominant soil of Adams County has been developed from the glacial till through the process of weathering under conditions of good natural drainage. The soil water passes through the soil at a moderate rate as long as there is a surplus; and the water does not become stagnant so as to produce a water-logged condition, or if it becomes stagnant it remains so for only a short period.

A 3-foot section of this dominant soil, as it occurs in virgin forest areas, includes five layers or horizons. The surface layer consists of an inch or two of silty material, which is dark in color, owing to the presence of organic matter, and is covered by a layer of leaves, leaf mold, and forest débris in various stages of decomposition. The second layer is composed of light, yellowish-brown or grayish-brown heavy silty material, which is somewhat heavier in texture than the thin surface layer, and in places it has a coarse granular or nut structure. It becomes heavier with depth and grades at about 7 inches into the third horizon. This is a yellowish-brown to brownish-yellow silty clay loam, with a more pronounced nut structure than in the second layer, and extends to a depth of about 15 inches. The fourth layer is a yellowish-brown, rather firm, compact, but not hard, silty clay loam to silty clay, extending to a depth of about 2 feet. This grades downward in a few inches to the unchanged or slightly changed parent material, which consists of glacial drift containing a very high percentage of lime carbonate. The soil, however, consisting of the first four layers, has no lime carbonate, or at least not enough to cause effervescence with hydrochloric acid. The absence of carbonates in the true soil horizons, the differentiation of the soil section into horizons, and the structure of the upper horizons are the three most important characteristics that make the soil differ from the material from which it has been derived. The soil of this character is mapped in Adams County as the Miami silty clay loam. Under cultivation the first two layers become mixed and lose their identity. Accordingly, the more detailed description of this soil type in subsequent pages of this report differs slightly from the outline given above, because in that place the soil is described as it occurs under ordinary field conditions.

One important soil in this county, derived from the same glacial material, appears to represent a stage past maturity in soil development. It seems probable that up to a certain stage in development,

which may be designated as maturity, this soil did not differ essentially from the mature soil described above. Owing to the flat or nearly flat surface under which it developed, however, one phase of its development was more rapid. In the mature soil the first two layers are light in texture when compared with the third and fourth layers, and the fourth is the heaviest of all. This is due primarily to the process known as eluviation, by which the finer particles of the soil in the upper layers are removed by percolating waters and transferred to the deeper parts. The surface layers become eluviated and the deeper layers illuviated. This process operates more rapidly on flat surfaces, it seems, than on rolling surfaces. Within the time, therefore, during which soils that have good surface drainage have developed a moderate degree of eluviation—have attained what we may call a mature stage of development—soils originally of the same kind and developed from exactly the same materials but developed on a flat or nearly flat surface will have reached a much more advanced stage in eluviation. The surface horizons will have become relatively lighter in texture and the subsoil layer or layers relatively heavier. As the subsoil becomes increasingly heavy the percolation of moisture is retarded by the increasing closeness of the subsoil texture. This holds the excess moisture on top of the heavy subsoil, causing a water-logging of a horizon of several inches immediately above it. The excess water fills the soil pores and the air is prevented from entering. The supply of oxygen is too low to oxidize the organic matter carried into the soil by the percolating water, and the soil itself is robbed of the oxygen it had absorbed during the early stages of its development, so it becomes deoxidized and assumes a gray color. The color in itself is not important, but it indicates the lack of that aeration so essential to a productive soil. Since this result is brought about by the process of eluviation—the same process that operates during the development of the soil from youth to maturity—but presents characteristics that are a natural result of this process continued for a longer time, we seem to be justified in concluding that, since the difference between the two stages is one of degree of development of the same features, the one developed farthest is the oldest. The Crosby silty clay loam appears to be a soil whose characteristics are those of old age or of an advanced stage in soil development.

Two important soils in Adams County have developed under conditions entirely different from those under which Miami soils are developed. The Miami soils have had good natural drainage from the beginning of their development. The Crosby soils seem to have been rather well drained or at least better drained during their early stage of development than at the present. The Clyde and

Brookston soils, however, have been developed under excessive moisture from the beginning. The Clyde soils were developed under conditions of permanent saturation or saturation during the greater part of the year, while the Brookston soils were developed under conditions of moisture intermediate between those of the Clyde and the Crosby.

The Clyde soils are black or very dark gray, owing to the presence of a high percentage of partly decomposed organic matter derived largely from grass roots. The subsoil is gray or bluish-gray, unoxidized glacial material.

The Brookston soils are dark gray in color in the surface soil and mottled brown and gray or bluish in the subsoil. The brown spots in the subsoil are in places where oxidation has taken place. The Brookston soils are developed mainly under a forest cover.

The alluvial soils occupying the flood plains or overflow land along the St. Marys and Wabash Rivers are classed in the Genesee series. The soils are brown to grayish brown and are subject to annual or occasional overflows. The silty clay loam and silt loam types of this series are mapped in Adams County.

The areas mapped as Muck and Peat contain deposits of remains of plants in varying stages of decomposition. These deposits have accumulated to considerable depths in various parts of the county.

The names and the actual and relative extent of the several soil types mapped are given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Miami silty clay loam.....	92,160	42.7	Genesee silt loam.....	1,600	.7
Brookston silty clay loam.....	69,312	32.1	Muck and Peat.....	1,152	.5
Crosby silty clay loam.....	41,728	19.4			
Genesee silty clay loam.....	5,952	2.8	Total.....	215,680
Clyde clay loam.....	3,776	1.8			

MIAMI SILTY CLAY LOAM.

The surface soil of the Miami silty clay loam consists of a gray to brownish-gray heavy silt loam, 6 to 8 inches deep, underlain by a yellowish-brown to brownish-yellow, friable silty clay loam, faintly mottled with gray, extending to depths of 12 to 15 inches. Below this the subsoil material is a yellowish-brown compact silty clay to an average depth of 24 to 26 inches. The lower subsoil, from 24 inches to 36 inches, is in many places an admixture of considerable quantities of sand and fine rock fragments. The material below 24 to 30 inches is calcareous.

In the higher locations the soil nearly always contains a larger percentage of medium and fine sand than elsewhere and the subsoil

carries more sand and coarse material. Stones and rock fragments are also more numerous in such areas, but large boulders are nowhere abundant.

The Miami silty clay loam, locally called clay land, is derived from weathered glacial till. It occupies gently undulating to rolling or hilly uplands, consisting in part of moraines. The roughest areas lie east of Ceylon and along the Wells County line north of the Wabash River. The main development of the type is in the southern third of the county and along the St. Marys River. Smaller areas lie along Blue Creek and the other larger creeks of the county.

The original tree growth consisted of oak, ash, elm, hickory, beech, and sugar maple. There still remain many fair-sized wooded areas.

The Miami silty clay loam is the best general-purpose soil in the county. It gives good yields of all grain and hay crops and is especially well adapted to fruits of all kinds. Corn, oats, wheat, and hay are the principal crops. The yield per acre of corn ranges from 25 to 50 bushels; of oats, from 30 to 60 bushels; of wheat, 12 to 25 bushels; and of hay from 1 to 1½ tons. For oats and wheat the Miami silty clay loam is considered one of the best soils in the county. These crops are less likely to lodge on this soil in wet seasons than on the Clyde clay loam and Brookston silty clay loam. Crop yields on the more rolling areas are larger in wet than in normal seasons.

The type is deficient in organic matter, as is clearly indicated by the characteristic grayish color of the soil. It is also deficient in lime in the surface soil and in the upper compact layer of the subsoil.

Stable manure is liberally applied on the farms on this type. A common application is 6 tons per acre, made usually to corn, once in the rotation, which in most cases consists of corn, oats, wheat, and clover. The use of stable manure and green manuring crops is probably the best means of keeping up the productiveness of this type. Clover, soy beans, and other leguminous crops should be grown in order to add to the supply of nitrogen. Acid phosphate at the rate of 200 pounds per acre, especially where stable manure has been applied, will increase the yield of corn and wheat. Liming will improve the soil for clover or alfalfa.

Farm values on this type range from \$75 for unimproved land to \$100 or more an acre for improved farms.

CROSBY SILTY CLAY LOAM.

The surface soil of the Crosby silty clay loam consists of about 8 inches of light-gray or light brownish gray, heavy silt loam, grading into a light-gray and yellowish mottled heavy silty clay loam which extends to depths of 12 to 15 inches. Below this the subsoil is a

yellowish-brown silty clay, faintly mottled with gray, which becomes heavier and more plastic downward to a depth of about 24 inches, where it changes to a more friable clay loam of a light-brown color.

The surface soil is deficient in organic matter, except in areas intimately associated with and grading into the Brookston silty clay loam. The subsoil below 24 inches is calcareous, but the soil to a depth of 2 feet shows considerable acidity. This type with the other light-colored type, the Miami silty clay loam, is locally called clay land.

Areas of the Crosby silty clay loam have a level or very gently undulating surface, marked by occasional low mounds and ridges. Stronger relief than this gives rise to the Miami silty clay loam.

The Crosby silty clay loam is the third soil in extent in the county. It covers 41,728 acres, or about 20 per cent of the area of the county. It occurs in numerous detached areas, commonly surrounded by Brookston silty clay loam, or adjoins areas of the Miami silty clay loam, developing where the topography flattens out. It occupies a position intermediate in elevation between that of the Brookston silty clay loam and the higher lying Miami silty clay loam. In places a definite boundary line can not be determined between the members of these three series when they are intermingled, and many small areas of the other soils are included with the predominating soil in such places.

The drainage of the type is for the most part adequate, and it has been improved through the drainage systems installed to reclaim the adjacent areas of Brookston silty clay loam. Tile drains have proved effective on the Crosby soil, but have not been used extensively on this type.

Practically all the Crosby silty clay loam is under cultivation, the general farm crops being grown. The yields are about the same as upon the Miami silty clay loam.

The type is in need of organic matter, and liberal applications of barnyard manure are applied by the farmers on this soil. It is recognized that this practice and the growing and plowing under of clover are the most practicable means of improving the soil and maintaining it in a productive condition. Soy beans produce well and have the same beneficial effect upon the soil as clover, and the acreage in this annual legume could well be increased.

Farms in which the Crosby soil predominates range in price from \$125 to \$175 an acre.

BROOKSTON SILTY CLAY LOAM.

The surface soil of the Brookston silty clay loam, to a depth of about 10 inches, is a dark brownish gray, heavy silt loam or silty clay loam, underlain by a drab-colored plastic silty clay, which becomes

mottled with yellowish brown and light gray with increase in depth. The lower subsoil is more compact and tenacious. Except in the larger and lower lying areas, where the humus content is highest, the substratum of brownish till is encountered within the last foot of the profile or immediately below the 3-foot section. Where the type grades imperceptibly into the light-colored soils, the dark surface covering thins out to a veneer overlying material similar to the subsoil of the lighter types. The soil contains a high percentage of organic matter, to which is due its characteristic dark-brown color when wet or dark-gray color when dry. The type is locally termed "black land."

The Brookston silty clay loam is closely associated with the Crosby silty clay loam. While it is an easy matter to distinguish these two types, it was difficult and frequently impossible to represent upon the soil map many small patches of the one occurring within areas of the other. Besides these inclusions some areas of the Clyde clay loam and silty clay loam are not shown separately for the same reason. The principal variations in the Brookston soils are due to differences in drainage. In places the soil occupies depressed areas of irregular shape in the uplands, where there has been a greater accumulation of organic matter than elsewhere. The soil in these areas is darker, more friable, and frequently approaches the Clyde clay loam in its general characteristics.

The Brookston silty clay loam is the second most extensive soil in Adams County, of the area of which it forms practically one-third. Its chief development is in the central and northeastern parts, particularly in Monroe, Washington, French, Kirkland, and Union Townships. Good-sized areas also occur in Blue Creek and Preble Townships.

The type is derived from glacial material that has weathered under the conditions existing in depressions and low-lying, poorly drained flats. The surface in general is level to gently undulating, the areas having little or no natural drainage, but practically all of the type has been reclaimed by the construction of many large open mains and the laying of miles of tile drains. There still remain some areas, however, that would be greatly benefited by more complete drainage systems.

When thoroughly drained and properly managed the Brookston silty clay loam becomes very productive. It is capable of producing large crops of corn, oats, hay, wheat, and sugar beets. The soil is especially well suited to corn and grass, and these two crops occupy the greater part of the type. Oats and wheat give good yields, but often run too much to straw, especially in wet seasons. This is due to the high content of available nitrogen in the soil and plentiful

supply of moisture. The ordinary yield of corn ranges from 50 to 75 bushels per acre; of oats, 30 to 60 bushels; of wheat, 15 to 20 bushels; and of hay, 1 to 2 tons. Larger yields of the minor crops also, such as potatoes, soy beans, alfalfa, and vegetables, ordinarily are obtained than on the lighter colored soils. Crops mature later than on the light-colored soils and the risk of damage by early frosts is greater.

The growth in the hog-raising industry in Adams County is in part due to suitability of this soil for the production of corn. Planting soy beans with corn and turning hogs into the fields to pasture off the crop is a good practice, resulting in the saving of much labor and the enriching of the soil. Rape and oats furnish excellent pasturage for hogs, and are grown to a small extent for this purpose.

The present price of land over most of this type is \$150 to \$200 an acre.

CLYDE CLAY LOAM.

The surface soil of the Clyde clay loam consists of 9 to 12 inches of very dark gray to black friable clay loam to silty clay loam. The subsoil in the upper part is a gray to bluish-gray tough clay loam to clay, grading below into a more friable clay loam and this within a few inches into the parent material, which is only slightly weathered and strongly calcareous. Normally the upper subsoil is a dull gray with streaks and mottlings of yellow and rusty brown, while at greater depth is developed a lighter or bluish-gray color with more pronounced yellow and brown mottlings. The soil and upper subsoil have been leached of free carbonates, but they are not everywhere acid or at most only slightly so and applications of lime are not essential for large yields.

The characteristics of this type are intermediate between those of the Brookston soils on the one hand and those of areas of shallow Muck underlain by clay on the other. The areas approaching nearest a true Muck have the deepest soil and the darkest color.

The Clyde clay loam occupies large flats and smaller depressed areas where a marshy or semiswampy condition prevailed for a long period of time. While not an extensive type in Adams County it occurs in several widely scattered areas. The largest lie south of Geneva, occupying the large flat known as "The Lob," north of Ceylon, along Blue Creek southwest of Monroe, and bordering the areas of Muck and Peat east of Berne, and west of Peterson. Areas of an acre or so may be found in many places through the Brookston silty clay loam. These usually occupy slight sags or swales.

With the other dark soils of the area, nearly all of the Clyde clay loam has been artificially drained and brought under cultivation.

The area near Ceylon and a part of "The Lob" at Geneva is subject to occasional overflows by back water from the Wabash River.

The type is used for the same crops and farmed in the same way as the Brookston silty clay loam, corn and hay being the chief crops grown. It produces heavy yields of oats and wheat, but the tendency of these crops is to run too much to straw and lodge badly, especially if the weather is wet during the maturing season.

It is an excellent soil for growing sugar beets, but little or none of it is being used for this purpose. Corn yields from 40 to 75 bushels, oats 30 to 70 bushels, wheat 12 to 25 bushels, and hay from 1 to 2 tons per acre.

The selling price of land of this type ranges from \$150 to \$250 an acre.

GENESEE SILT LOAM.

The Genesee silt loam consists of a brown friable loam to silt loam, with average depth of 10 to 15 inches, underlain by a subsoil of brown silt loam to silty clay loam, mottled with gray.

The type, as developed along the upper reaches of the small streams and branches, merges into the Brookston silty clay loam; along the lower courses it passes by imperceptible stages into the Genesee silty clay loam.

In many respects the Genesee silt loam as developed in Adams County closely resembles Meadow. It lacks uniformity, ranging in texture from light loam to heavy silt loam; the surface is usually uneven, being cut by numerous abandoned channels; and on account of frequent overflows the land is used almost entirely for pasture.

The type is inextensively developed and from an agricultural standpoint is of little importance. Its largest development occurs along Blue Creek, which has been straightened and deepened, thus reclaiming a considerable area sufficiently to make it suitable for pasture. Other less extensive areas are found along Yellow Creek, Boram and Seventeen Mile Runs, and smaller streams.

The native forest consists of elm, oak, ash, maple, sycamore, and willow.

GENESEE SILTY CLAY LOAM.

The Genesee silty clay loam, to an average depth of 8 to 12 inches, is a brown, heavy silt loam to silty clay loam, or, in places, silty clay. Below this the material grades into heavier silty clay loam or silty clay of somewhat lighter color. There is no sharp line between soil and subsoil.

Adjacent to the stream channels the surface soil is not uncommonly a silt loam. Where the type occupies depressions the surface soil is darker than typical, and the subsoil is often mottled with shades of brown and gray. This variation of the type is similar

in color characteristics to the Clyde clay loam. In general the type is very uniform in color. Along the Wabash River, notably at Linn-grove and east of Geneva, the underlying limestone in places is within a few feet of the surface. In the Wabash Valley the type is generally heavier than along the St. Marys River. This is especially true of areas in the vicinity of Geneva and eastward, where the quiet back-waters from the river have deposited the finer grades of silt and clay. In such places the soil is a very heavy silty clay loam or silty clay.

The Genesee silty clay loam does not contain a very high percentage of humus, although there is sufficient to make it friable and retentive of moisture. The soil is not difficult to keep in good tilth when properly handled. It is sticky when wet and has a tendency to clod and bake if plowed when in this condition.

This soil is the principal bottom-land type of the county. It occurs along the St. Marys and Wabash Rivers, where it occupies a strip of overflowed land averaging less than one-half mile in width. The areas subject to back-water inundation and upon which water remains for some little time are wider. There is a gentle slope toward the stream channel, and the type as a whole is well drained except for overflows.

Corn, oats, clover, and wheat are the chief crops. In favorable seasons the yields of these crops, except wheat, are about the same as on the Brookston silty clay loam. Wheat does well, the yield being practically the same as upon the Miami silty clay loam.

There are many favorable localities for alfalfa, the best being farthest from the stream channel, where the flood water does not stand for any length of time, and where the water table is at least 3 feet below the surface.

The Genesee silty clay loam is seldom sold separately, but farms upon which it occurs are held at \$125 to \$200 an acre.

MUCK AND PEAT.

In the areas mapped as Muck and Peat the material consists of a mass of dark-brown to black more or less decomposed vegetable mold in different stages of decomposition, with which is mixed a small proportion of mineral soil particles. Where the vegetable matter is thoroughly decayed and the quantity of mineral matter mixed with it is relatively large true Muck exists. The Peat areas consist of coarse, raw, fibrous material, much less advanced in decomposition than in Muck and containing less material of mineral origin.

Thus, while Muck and Peat are alike in origin, they are distinguished from each other by the state of decomposition of the vegetable tissues of which they are largely composed. Muck is dark

brown to black in color; Peat is brown to reddish brown and lighter and more chaffy in texture. Owing to the small extent of the type and the numerous transition stages between Peat and true Muck it was found impracticable to attempt a separation.

The soil is of variable depth, usually grading from a few inches at the margins of the areas to a depth of several feet at their center. The substratum, as shown in exposures along the deep-dredged ditches, consists of a stiff drab to bluish-black clay containing a high percentage of lime.

The largest area of Muck and Peat in Adams County lies northeast of Berne. It forms a narrow strip nearly 4 miles in length and represents a former lake bed. This area is locally known as prairie, owing to its level surface and the almost total absence of trees. With the exception of the eastern extremity practically all of this area is under cultivation. This was made possible through large open ditches leading north into Blue Creek. To the east of this area occurs a small unreclaimed body of Muck and Peat, which together with the area southwest of Magley constitutes the total acreage of the type in the county. This latter area, which is a continuation of the type from Wells County, is fairly well developed Muck.

Corn, the main crop, when not injured by heavy rains or early fall frosts, yields from 60 to 100 bushels per acre. On those areas where the soil is light and chaffy—resembling Peat rather than Muck—the crop is usually poor, both in yield and quality. Oats and other small grains are not successfully produced, because the growth of straw is forced at the expense of the grain, and the crop lodges badly.

Potatoes, cabbage, onions, and celery are grown successfully on the large area northeast of Berne, and abundant yields are obtained. Peppermint, a crop well suited to Muck and Peat, is grown extensively in some other counties in the State. None, however, is produced in Adams County.

It is generally recognized that commercial fertilizers containing a large percentage of potash salts are especially beneficial upon Muck and Peat soils. It also has frequently been found that they can be improved by the application and thorough incorporation of coarse barnyard manure.

SUMMARY.

Adams County is situated in the northeastern part of Indiana and adjoins the eastern boundary of the State. It has an area of 337 square miles or 215,680 acres.

The topography varies from level to rolling, with the highest elevations in the southern part. Practically all of the area is tillable, with the exception of steep slopes in the more rolling country and

the narrow strips of overflowed land along the smaller streams. The St. Marys and Wabash Rivers are the main drainage outlets of the county. They follow a general course from southeast to northwest. Tile drains and open ditches have been installed extensively and supplement the natural drainage in the more poorly drained sections of the county.

The first settlers came to this section about 1820 and the county was organized in 1836. The population of the county in 1920, according to the census, is 20,503, of which three-fourths is classed as rural. Decatur, the largest town and county seat, has a population of 4,762. Berne has 1,537 and Geneva 879.

Transportation and shipping facilities are good, except in the northeast and southeast corners of the county. Three steam roads and one electric interurban line, together with a considerable mileage of improved public roads, provide adequate facilities for moving the farm products to market.

The mean annual temperature at Bluffton, in Wells County, is 50.3° F., and the mean annual precipitation is 37.23 inches. Where careful tillage is employed to conserve the moisture in the soil crops are not likely to suffer from drought. The average date of the last killing frost in the spring is May 5 and of the first in the fall October 6, giving a normal growing season of 154 days.

The agriculture of Adams County is in a highly developed state. Corn, oats, wheat, and hay are the principal crops grown. Sugar beets, soy beans, potatoes, and alfalfa are the special crops. Surplus oats, corn, and hay find a local market. Hog raising is the principal animal industry, although considerable attention is given to cattle and horses. Dairy products find a ready market within the county, and some are shipped from the northern part of the county to Fort Wayne.

According to the 1920 census there are 2,328 farms in the county. This is a slight decrease as compared with the number returned in 1910. In this decade the average size of farms increased from 88.7 to 88.9 acres. Ninety-six per cent of the area of the county is included in farms, and of the farm land 87.8 per cent is improved.

Improved farm lands rent for \$5 to \$8 an acre, and the lands best suited to sugar beets, for \$8 to \$12 an acre. The price of farm land ranges from \$75 to \$200 an acre.

In addition to Muck and Peat, soils of five series are mapped. The Miami, Crosby, and Brookston series are each represented by a silty clay loam type, and the Clyde series by the clay loam type. These are upland soils and are well suited to the general farm crops.

The Miami silty clay loam, locally known as clay land, is a light-colored, fairly well drained soil especially adapted to grass and wheat.

The Crosby silty clay loam, also a light-colored type, has a flat to gently undulating topography. It is not as well drained as the Miami type. Corn, oats, and hay are the main crops.

The Brookston silty clay loam is extensively developed. It is a dark-colored soil. With thorough artificial drainage it is especially well suited to corn, oats, and hay, and it is considered the best soil for sugar beets.

The Clyde clay loam is of small extent. It is a black soil with poor natural drainage, but nearly all artificially drained and farmed very successfully.

The Genesee series is represented by a silty clay loam and silt loam. These soils are brown in color and occur in the first or overflow bottoms. The Genesee silty clay loam is the most important. It is best suited to corn, although good yields of oats, wheat, and hay are obtained. The silt loam occupies narrow areas along the smaller streams. This type is of low agricultural value, being subject to frequent overflows, and is used almost exclusively for pasture.

The area of Muck and Peat is small. Corn and vegetables are grown on the better drained areas.

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