A SOIL SURVEY OF RANDOLPH, WAYNE, HENRY, RUSH, FAYETTE, UNION AND FRANKLIN COUNTIES.

BY

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A Soil Survey of Randolph, Wayne, Henry, Rush, Fayette, Union and Franklin Counties.

By Arthur E. Taylor.

The area under consideration in this report comprises 2,431 square mile in east-central Indiana. For good schools, roads, railway facilities, farms, farmers and general progressiveness, the people living in this area claim second place to none in the State. Yet, with all of their advancements, they realize that their great industry, agriculture, is far from being at its best. The land will have to be put into better condition for plant growth, and more intensive farming take the place of the extensive, in order that the necessities of life may be supplied to the increasing population. Is it possible to so improve the soil that the people of this area may realize an increase of 50 per cent. in their annual yield? The answer of the leading farmers throughout these seven counties is in the affirmative. A careful study of the crop and stock tables of each county, giving the average crops of the poor, average and best farmers, also bears out such a conclusion. It is not the fault of the farms that better yields are not realized, but it is the fault of the farmer. A horse cannot furnish its best labor, unless it is properly fed, groomed and housed; neither can a farm furnish you its best yields unless it is properly replenished, cultivated and underdrained.

PHYSIOGRAPHY AND GEOLOGY.

With exception of along stream courses where erosion has exposed the bed rocks, this whole area lies beneath a blanket of glacial drift. The drift that occurs as the main surface formation is known as the Later Wisconsin and the other is known as the Illinoian. The only places that the Illinoian drift covers the surface are found in southern Fayette County, the western half and west of the Whitewater River in Franklin. The thickest drift known in the State is located near Newcastle of Henry County,

where it was penetrated 500 feet in well boring. As one goes south the general thickness of the moraine becomes less and less, until it is only about 10 to 30 feet in the Illinoian area of Franklin County. The topography of the drifts varies quite noticeably, that of Randolph County, in the northeast corner of the area, is in great part a gently undulating plain, containing shallow stream valleys, while Wayne County, immediately south, is rolling, leaving a series of ridges and valleys extending northeast and southwest. Henry and Rush counties would be classed topographically between Randolph and Wayne counties, having some of the gently undulating and some of the rolling surface. Fayette and west Union counties are considerably broken by rather deep stream valleys, while east Union County and a strip in northeastern and east central Franklin County is of the gently undulating and gently rolling types. The remainder of Franklin County is the most broken portion of the area, there being in places a difference of altitude of 500 feet between the stream beds and the tops of the ridges along them. The topography both of the present and of the past has had much to do with the character of the soil. When the Later Wisconsin ice sheet covered a large portion of what is now the State of Indiana it contained a very heterogeneous load of clay, rock flour, sand, gravel and boulders, which were the ingredients from which most of the soils of this area were derived. Upon the melting of the ice this load, known as glacial drift or moraine, was dropped, leaving a hummocky and undrained surface, dotted with numerous ridges, hills, little lakes, ponds and marshes.

Vegetation, such as mosses, grasses and sedges, grew about the waters and ultimately filled the lakes and ponds with partially decayed vegetation, where they had not been drained by streams working their heads back into them. The sites of these accumulations of vegetation are very conspicuous even today, dotting all of the Later Wisconsin drift area as patches of black land (Miami black clay loam), which runs very high in organic matter. The types dotted by these dark areas and which comprise over 90 per cent. of the late drift in this part of Indiana are the Miami clay loam and Miami silt loam. These have been derived directly from the drift through the various processes of weathering, such as decomposition and disintegration. Where streams have been established in the glacial areas, Huntington and Wabash loams are the types found covering the flood-plains and terraces. Occupying the outwash plains is the Miami loam, while the Miami fine sandy loam

occurs on the surfaces of kames. The Oak Forest silt loam is the Illinoian drift land of Franklin County, while the limestone slope clay loam is largely a residual soil, derived from the weathering of the Cincinnati limestone in the same county. A bottom land, that is found along the smaller streams in the Oak Forest silt loam and the limestone slope clay loam area, is known as Hamburg loam.

Miami Clay Loam.

The Miami clay loam, which comprises 55 per cent of the seven counties, has a medium or light brown to a light or ashy gray color. The medium brown is commonly known as sugar tree land, because the rock maple grew abundantly on it, while the ashy gray soil, for a similar reason, is called white beach or white oak land. The soils of intermediate colors are considerably more numerous. These have growing upon them the rock maples, red beech, white beech, white oak, yellow poplar, elm, ash, hickory and black walnut.

The subsoil of the medium brown type is generally a sandy clay at a depth of one foot, grading into a fine sandy loam at 1½ feet. The lighter colored soil is sometimes underlain by a very tough and compact clay, containing some gravel, but more often it is a tough sandy clay. As one goes deeper in the section the texture becomes more sandy and gravelly. The intermediate soil most frequently grades into a sandy clay and in going deeper into a fine sandy loam or medium sandy loam.

The land on which the sugar trees grow and which has the medium brown color is the warmest and richest in plant foods of the Miami clay loam, while the ashy gray soil, which has had a heavy growth of white beech and white oak timber, is the coldest and is the most deficient in plant food. Farmers claim that the sugar tree land can be planted from one to two weeks earlier than the white beech. Some reasons that might help to account for these differences are the following: (1) As noted above the soil of the medium brown land is of a much looser nature, containing more gravel and sand, and thus facilitating the circulation of the ground water. This more rapid circulation, through capillary action, brings a greater amount of water into the soil from beneath. This water carrying various salts, in solution, deposits them, sometimes by chemical reaction, but generally upon the evaporation of the water, thus imparting to the soil the medium brown color, caused by the iron separating out from the solution. The water that carries the iron salts also carries salts of potash, phosphoric acid and other

plant foods. Owing to the more compact nature of the clay loam underlying the ashy gray soil, the circulation of underground waters is comparatively slower than in the subsoil of the medium brown land, thus bringing less iron and other salts to the surface. (2) The fact that the medium brown soil has received more moisture by capillary attraction gives it a more thrifty plant growth which supplies a greater amount of humus. (3) The dark color of the sugar tree land enables it to absorb more of the radiant heat energy from the sun, thus warming it more than the white beech land. (4) The looser nature of the medium brown soil gives the air a better chance to circulate and come in contact with the plant roots, furnishing the leguminous plants (those having the bacteria tubers, such as clover, alfalfa, cow-peas, and soy-beans, which extract the nitrogen directly from the air) with a good supply of nitrogen. Where the leguminous plants supply the soil with considerable nitrogen, the succeeding corn crop, which has not the power of taking the nitrogen from the air, has a good supply of a very important nourishment. Because the white beech land is seldom as productive as the sugar tree, it does not follow that it cannot be made so. In showing the results of improvements the white beech land has no equal in the area. Where farmers have given careful attention to tiling, green manuring, using commercial fertilizer, selecting seed, cultivating and feeding stock over the places, their general crop averages rank among the best.

The Miami clay loam, when well cared for, is an excellent general farming soil. Annual corn crops ranging from fifty-five to sixty-five bushels per acre is no more than an average for the better farms, but from twenty-five to thirty-five bushels is about all the unimproved and poorly tended farm can be expected to yield, and crops of ten and twelve bushels per acre are not uncommon. The best farmers are getting about twenty-two bushels of wheat per acre, while the general run will average about fourteen. More and more the farmers are learning the importance of systematic cropping, though only a very low per cent. always follow out a three-years rotation. The order of cropping is corn, wheat and clover, the clover, or clover and timothy, being sowed with the wheat. If the stand of wheat is not good, corn is tried again. Usually the clover is cut for both hay and seed and then pastured. The succeeding year it is plowed for corn again. Oats ordinarily average from thirty to forty bushels per acre, potatoes seventy-five to 150, and tomatoes six to eight tons.

To show how tiling affects a typical Miami clay loam, with a gently rolling surface, I can do no better than tell of the experience of Edwin Druly, with his 375 acre farm, one and one-half miles northwest of Fountain City, Wayne County. By examining the soil at different places on Mr. Druly's farm to a depth of three feet, the writer found the upper four to seven inches to be a medium to light gray color, becoming, in places, almost an ashy gray when dry. From 3 to 6 inches deeper the texture remained almost the same, but the color was lighter. For the next 8 inches to 1½ feet was a tough, heavy, sticky, dark brown sandy or gravelly clay, containing less pebbles and sand, and crumbling with difficulty. Below, to a depth of 3 feet, is an easily crumbled light brown, very fine, sandy clay loam, with limestone pebbles. In 1905 Mr. Druly planted corn, without doing any tiling, and realized twenty bushels to the acre. Subsequently, on every acre, at a cost of less than fifteen dollars, he has put in from twenty to twenty-seven rods of tile, which vary from 4 to 12 inches in diameter, the mains, which drain fifty acres, being 12 inches and the laterals 4 inches. After experimenting by placing the tile at various depths ranging from 52 to 30 inches, he found that the tile did the best work at the depth of 30 inches. In 1908 and 1909 Mr. Druly got sixty bushels of corn to the acre, an increase of forty bushels, which more than paid all of the expense of tiling. Numerous other cases could be enumerated where tiling on the Miami clay loam in these seven counties has brought about increases in corn crops ranging all the way from 15 to 500 per cent., the amount of increase depending on how wet the land was before tiling.

Miami Black Clay Loam.

The Miami black clay loam occurs more or less throughout all of the Wisconsin drift region of the area under consideration, but has its greatest extent in Randolph County and least in Fayette. It generally occupies the site of an old lake or swamp and has a flat surface. When it is first broken it often, especially when it contains very little sand or gravel, is found as a heavy, black, sticky, clay loam that is very difficult to plow. At such a time a spade thrust into it will cause it to shake for several feet around. If rubbed in the hands it breaks up into numerous little irregular solids. Upon being turned up and dried out it becomes very hard, and numerous deep cracks form on the surface, but as soon as a shower moistens it pulverization sets in and an excellent seed bed is the

result. In the newly broken soil the texture frequently changes very little to a depth of 20 inches, but the color becomes a shade lighter. At a greater depth the color becomes a dark brown, grading at 2½ feet into a medium brown clay, with little pockets of light colored sand, due to the decomposition of limestone pebbles. In other cases, where the water has not long been absent, the color at a depth of 2 feet is a drab, with a slight bluish tint. Iron concretions are common in the subsoil.

After the Miami black clay loam has been cultivated for several years and a few crops of clover have been plowed into it, the tough, sticky nature disappears, leaving a very loose, granular and warm soil. Tiles are laid as deep as 52 inches and 30 rods apart on some of the most open textured of this land, and are claimed to do the work; but from 36 to 45 inches are more common depths and 12 rods apart a more common distance. When this soil has been thoroughly drained and well aerated, it is the best for corn in the area, containing a greater abundance of the proper plant foods, absorbing an excellent supply of air and water and more of the radiant energy from the sun. An average corn crop for the best farmer is about sixty-five bushels per acre, while a few exceptional farmers get as high as ninety bushels and even 100 in good years; but the ordinary run will not exceed forty-five bushels.

The average wheat yields are not more than twelve bushels, while the oats range from twenty-five to forty-five. Clover does well if the land is drained, otherwise it heaves and the plants die.

An especially strong soil is found in some cases where the Miami black clay loam has been covered by the wash from the upland, giving a mixed soil of 6 or 7 inches at the surface, underlain by 9 or 12 inches of black clay loam. This, in turn, is underlain by a dark clay loam grading into a gravelly brown clay loam, which contains highly decayed limestone pebbles occurring as pockets of light colored sand. On this kind of land the banner alfalfa crops are grown.

The deep cracking which occurs as the land dries is a serious difficulty with some farmers. These cracks, which are sometimes 3 feet deep and 1 inch wide at the surface, permit the air to come in contact with the plant roots, which not infrequently results in the death of the plant. The bad effect of this cracking can easily be avoided, in case of corn or any other crop that can be cultivated during the growing season, by stirring the soil frequently and keeping the cracks filled up.

Miami Silt Loam.

The principal development of the Miami silt loam has been in the southern half of the area. In color and size of crops it is comparable to the Miami clay loam, unless it would be that the silt loam averages a shade lighter. The methods used in improving the Miami silt loam are identical with those used for the Miami clay loam. For the texture and a more detailed description of this type, see reports under Franklin and Union counties, where its most extensive areas are found.

Miami Loam.

This type is a warm, well aerated and very productive soil, with its main areas in the outwash plains of Wayne and Rush counties. It resembles the Huntington loam in that it has originated from material which has been assorted by water, in that it is generally underlain at from 4 to 6 feet by a bed of either sand or gravel, and in that it is a very early soil in the spring and can be cultivated much sooner than the Miami clay loam or the Miami silt loam after a heavy rain. A more detailed description of this type will be found in the reports for Wayne and Rush counties.

Huntington Loam.

Although fine, medium and coarse sand, gravelly and silt loams occur in the stream bottoms, the Huntington loam is by far the leading type over the bottoms of this area covered by the Wisconsin drift. In one instance it is found for some distance beyond this moraine, where it comprises the various terraces of Whitewater River in southern Franklin County. With exception of the Wabash loam, in Henry and Randolph counties, there exist only very limited areas of other bottom land types, scarcely any being of sufficient extent to be mapped. Along the smaller streams the bottoms are generally narrow, thus receiving a relatively large amount of wash from the upland. This develops an impure form of Huntington loam, running higher in clay than the average type.

The surface soil of the Huntington loam is generally a medium to a dark brown loam of 7 to 12 inches deep, but in places changing very little in texture until a depth of 2 feet, or even more, are reached. Immediately beneath the surface soil is often a heavy loam with considerable gravel or sand intermixed. The amount of gravel and sand continues to increase downward until at a depth

ranging between 3 and 6 feet, where beds of nearly pure gravel or sand may be expected. In general the more loose and lighter varieties of the type are found as one approaches a stream, while the heavier phases occur near the upland. The first bottom is ordinarily more sandy than the second. Both the surface and subsoils vary greatly in texture, only remaining uniform over very small areas. The reason of this can be readily understood from a brief description of the origin of the Huntington loam.

Since the Huntington loam is almost always underlain by either stratified beds of gravel or sand, it is evident that its subsoils, from which it has been largely derived, were laid down by water; and since these beds of gravel have the same rock composition as the glacial drift of the surrounding country, they, undoubtedly, have been transported from the drift to the terraces by stream work. This work can be seen best at the time of a heavy rain, when innumerable little streams are rushing down the slopes with their loads of mud, sand and gravel, which they carry to the brook. This brook, like the rills of the hillside, deposits some of the heavier material wherever its current slackens; but succeeds in getting a portion of it to a larger stream. Each stream, no matter what its size may be, deposits the coarser material where the current is swiftest and the finest where it is more sluggish; so we may find boulders under the stream current, gravel just outside of the current, coarse sand beyond the gravel, silt well out in the flood-plain, and possibly clay beyond that. Where the velocity becomes less, coarse sand is deposited over the gravel and medium on the coarse, etc., thus developing a stratification.

All farmers of this locality are familiar with the fact that the bottom land is often considerably above the maximum extents of the greatest floods, and this question naturally arises: What relation exists between these high bottoms (terraces), the flood plain and the streams? At some time in the past the flood plains of the streams were located where the highest terraces are at present, thus leaving these terraces as the remnants of former flood plains. More than 99 per cent. of the terraces of this area received the material of which they are composed from the gravel, sand, silt and clay depositions taking place as stream currents slackened.

The normal development of the class of terraces, described above, takes place in the following manner: The valley plain or flood plain is formed when the steep gradient of the stream's course gives way to the gentler. This junction first occurs at the head of the

valley, and then farther and farther up as the stream works back into the land. After awhile this advance becomes sufficient that the stream loses much of its load on reaching the head of its valley plain. It will then sink its channel into the flood plain farther down. When the flood plain stage is reached, meandering will likely take place. The meandering belt is narrower than the flood plain but continues to widen until it becomes sufficient in extent to hold the waters of ordinary floods; at which time a new flood plain is formed and the remnants of the old are left as terraces. At a later stage in the stream's history, erosion becomes less at the head, a smaller quantity of material is carried and the channel is deepened. Other factors, such as an uplift, an increase in the volume of a stream, the removal of a dam or the recession of falls, might also account for terraces, but would be classed as accidental causes.

At the melting of the Wisconsin ice sheet great floods were formed, which were heavily loaded with drift, and it was the deposition from this increased supply which built the flood plains high upon the sides of the valleys. When later the ice retreated, and the excessive supply became exhausted, streams began to cut or degrade their channels. The outcome of this has been some of the high gravel terraces of the Whitewater River.

For agricultural purposes the Huntington loam ranks high as a corn producer, forty-five bushels to the acre being probably a general average. When the land overflows in the early spring, but does not interfere with the growing season, corn often averages seventy bushels to the acre. The sediment deposited by the floods is a great replenisher for the land. Wheat, oats and hay all do better than they do on the Wabash loam, but often lodge and do not properly mature. This soil is used, near the larger towns, for gardening, owing to the fact that it is earlier than the Miami clay loam. The main difficulties with bottom lands are that they dry out badly in droughts, are exceedingly weedy where they are flooded, especially during a wet season, and are not benefited for ten or more years by a manure or commercial fertilizer like the Miami clay loam, two or three years being about as long as the improvement can be noticed. This seems to be due to the sandy subsoil, which permits the water to flow away through this natural underdrainage with the plant foods in solution.

Wabash Loam.

The Wabash loam most often occurs as stretches of black land in the Huntington loam bottoms. These have a very high percentage of organic matter and make excellent corn land. They mark the sites of old bayous, swamps, or pondings of streams, where vegetation has accumulated in the presence of water. Sometimes these vegetal accumulations have not decomposed or become sufficiently mixed with other soils to show the earthy character—in which case they might be termed muck. The general texture of the Wabash loam is much like that of the Huntington loam, except for the high content of organic matter, and sometimes clay. Along some of the streams of Randolph and Henry counties this seems to be the leading bottom land type.

This type of bottom land is a better corn land than the Huntington loam, because of its high supply of humus, but not as good for wheat. Sixty-five bushels of corn to the acre is an average crop for the better class of farmers. A more complete discussion of the Wabash loam is taken up under Randolph and Henry counties.

Wabash Silt Loam.

This type is similar in topographical occurrence and derivation to the Wabash loam, but runs higher in silt and clay. It has a very limited occurrence in Henry and Randolph counties, under which it is described in more detail.

Muck.

This soil appears in both the bottom lands and the uplands of Randolph and Henry counties. It is an impure form of peat; a light, chaffy, partially decomposed vegetal matter, which in its natural state is deemed worthless in these seven counties, but when underdrained, mixed with other soils and properly cared for, it becomes equal to the Miami black clay loam for corn and has no equal for onions. Something more of its physical properties, how to improve it and the crops raised on it are treated in the reports of the counties in which it is found.

Other Soils.

Since the Oak Forest silt loam, the limestone slope clay loam (both upland soils), together with the Hamburg loam, a bottom land soil, are confined, almost exclusively to Franklin County;

they are not discussed in this part of the report, but are described in the report for Franklin County.

CHEMICAL ANALYSES OF SOILS.

Ten samples of soils were obtained from the more typical developments of the various types and were sent to Dr. R. E. Lyons, Professor of Chemistry at the University of Indiana, for chemical analyses. The results of these analyses appear in the following table:

CHEMICAL ANALYSES OF SOILS.

Collector, Soil Sample, Description.	Taylor. Oak Forest Silt Loam Subsoil.	Taylor. Oak Forest Silt Loam Soil.	Taylor. Limestone Slope Clay Loam Soil.	Taylor. Huntington Loam Soil.	Taylor. Miami Black Clay Loam Soil.	Taylor. Miami Clay Loam Soil.	Taylor. Miami Loam Soil.	Taylor. Miami Clay Loam Soil.	Taylor. Miami Silt Loam Soil.	Taylor. Miami Clay Loam Soil.
Laboratory Numbers	31	32	33	34	35	36	37	38	39	40
Reaction to litmus	Acid.	Acid.	Neutral.	Acid.	V. F. Acid.	Acid.	V. F. Acid.	Neutral.	Neutral.	V. F. Acid.
Moisture from air dry at 105° C.	2.36	1.83	3.30	1.69	3.07	1.97	2.19	2.38	1.60	2.54
Total soil nitrogen	.052	.162	.198	.184	.235	141.	.242	.286	.169	.079
Carbon dioxide					1.557					2.773
Analyses of Fine Earth Dried at 105°C.										
Volatile and organic	2.488	3.409	5.480	3.813	7.129	4.008	5.079	6.850	3.921	5.996
Insoluble in 1.115 HCl	88.894	89.991	81.209	89.844	78.667	88.632	86.819	83.303	88.526	77.689
Soluble silica	.173	.161	.175	.132	.124	.142	.092	.133	.101	.112
Ferric oxide ($Fe_2 O_3$)	2.539	2.117	4.599	2.538	3.431	2.480	2.616	3.539	2.633	4.329
Alumina ($Al_2 O_3$)	4.784	2.555	5.398	2.183	5.911	3.150	3.052	3.012	2.846	7.169
Phosphoric acid anhydride ($P_2 O_5$)	.110	.130	.421	.180	.169	.121	.237	.146	.118	.115
Calcium oxide (Ca O)	.084	.349	.851	.338	2.309	.349	.575	.986	439	2.912
Magnesium oxide (Mg O)	.487	.378	.759	.319	.757	.448	.431	.804	.554	.715
Sulphuric acid anhydride ($S O_3$)	.043	.035	.037	.043	.043	.050	.056	.074	.037	.051
Potassium oxide ($K_2 O$)	.250	.230	.382	.259	.421	.180	.251	.291	.341	.319
Sodium oxide ($Na_2 O$)	.265	.183	.164	.199	.489	.195	.309	.378	325	.314
Total	100.117	99.538	97.475	99.848	99.450	99.755	99.517	99.516	99.841	99.721

In the above table samples 31 and 32 were obtained from the Oak Forest silt loam of Franklin County. This soil and subsoil run very low in lime (CaO) and organic matter. It is the lightest colored soil of the area of survey. Number 33 was procured from the residual soil of the Cincinnati limestone. It is dark colored and has a high content of organic matter. Number 34 represents the leading bottom land type. Number 35 belongs to the dark brown to black soil of the Miami series, which leads all others of the upland types in production of corn. Number 36 is of the lighter colored soil of the Miami clay loam, commonly called "white beech land," while number 40, which is commonly known as "sugar tree land," is of the medium brown color. Number 38 was taken from a special soil of the sugar tree variety of the Miami clay loam, which is particularly well adapted to the growing of the *"American Beauty Roses." Number 37 is a typical sample of the Miami loam and 39 of the Miami silt loam.

CLIMATE.

The climatic conditions of this portion of Indiana are generally favorable for the growing of crops. The rainfall is well distributed throughout the year, 39.51 inches being about the normal annual average; droughts are rare, extreme temperatures seldom occur, and the growing season ranges from five to six months, no killing frosts occurring during this period, while the winters are seldom severe.

Mauzy, which is located near the center of the area, had its warmest month since 1882 in July, 1901, with a mean temperature of 80.2°, and its coldest month in January, 1884, with a mean of 14.2°. The coldest winter (December, January and February) was that of 1884-85, with a mean temperature of 19.3°, and the mildest, that of 1889-90, with a mean of 37.6°. The warmest summer (June, July and August) was in 1901, with a mean temperature of 75.6°, and the coolest in 1883, with a mean of 66.0°. The highest temperature recorded was 108°, on July 22, 1901, and the lowest 26°, on January 6, 1884. The wettest year was 1883, with a total precipitation of 57.31 inches, and the dryest, 1895, with 27.05 inches. The greatest monthly precipitation was 10.67 inches, in March, 1898, and the least, 0.26 inches, in August, 1889.

*See page 77.

NORMAL MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION.

MONTH.	Cambridge City.		Connersville.		Farmland.		Mauzy.		Richmond.		Greensburg.	
	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.	Temperature. °F.	Precipitation. Inches.
January	26.6	3.00	27.5	3.00	26.5	2.69	25.5	3.29	26.9	3.00	29.8	2.00
February	25.1	2.30	29.5	3.40	28.9	3.17	28.2	3.75	29.2	2.64	25.1	2.71
March	39.0	4.08	38.8	3.58	37.6	3.02	36.9	3.75	36.8	3.56	41.6	5.83
April	50.8	3.36	51.2	3.07	50.5	3.22	50.4	3.13	50.3	3.05	53.4	3.48
May	60.7	3.82	61.6	4.10	61.1	4.48	61.0	4.30	60.6	3.15	63.8	3.10
June	70.6	4.22	71.6	4.19	70.8	3.80	70.5	4.47	70.7	4.14	74.3	4.58
July	74.5	3.23	74.7	2.93	73.7	3.46	73.4	2.86	74.7	3.24	75.8	3.95
August	72.2	3.15	71.8	3.90	71.2	3.72	70.6	2.79	71.0	4.23	74.9	1.98
September	65.3	3.29	65.5	2.59	65.1	3.37	64.1	2.88	65.7	2.76	65.6	4.59
October	53.3	1.99	52.9	2.21	52.8	1.77	51.4	2.40	53.2	2.40	58.2	2.93
November	40.1	3.65	40.7	3.88	.....	3.50	40.2	4.03	40.6	3.70	45.8	3.53
December	30.9	2.67	32.1	2.82	32.3	2.57	30.2	3.31	31.2	2.81	30.4	2.80
Year	50.7	38.57	51.5	38.67	.....	38.77	50.2	40.96	50.9	38.68	53.4	41 41

DATES OF FIRST AND LAST KILLING FROSTS.

	Cambridge City.		Connersville.		Farmland.		Mauzy.		Richmond.		Greensburg.	
	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.	Last in Spring.	First in Fall.
1904	May 16	Oct. 7	May 16	Oct. 7	May 16	Oct. 27	May 16	Oct. 23	May 16	Oct. 7	April 21	Oct. 23
1905	April 23	Oct. 12	April 18	Oct. 12	April 22	Oct. 12	April 22	Oct. 12	May 1	Oct. 12	April 22	Oct. 12
1906	May 11	Oct. 10	May 10	Oct. 10	May 10	Oct. 10	May 10	Oct. 10	May 11	Oct. 11	May 9	Oct. 11
1907	May 28	Oct. 9	May 28	Oct. 29	May 21	Oct. 14	April 21	Oct. 12	May 28	Oct. 9	April 24	Oct. 12
1908	May 2	.....	May 1	Oct. 12	April 17	Sept. 3	May 2	Oct. 2	May 1	Oct. 2	May 1	Oct. 2
Average	May 10	Oct. 9	May 8	Oct. 12	May 5	Oct. 7	May 6	Oct. 12	May 11	Oct. 8	April 27	Oct. 12

SNOWFALL AND NUMBER OF RAINY DAYS FOR THE YEAR.

	Cambridge City.		Connersville.		Farmland.		Mauzy.		Richmond.		Greensburg.	
	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.	Total Snowfall in Inches	Number of Rainy Days.	Total Snowfall in Inches.	Number of Rainy Days.
1904	27.6	115	34.5	105	.....	108	33.5	113	.....	95	.....	115
1905	19.1	110	14.4	89	26.7	101	29.7	125	10.2	109	25.7	124
1906	37.5	93	41.4	109	42.7	101	46.3	129	32.6	107	39.4	137
1907	.....	106	5.3	105	.....	116	18.3	135	11.9	118	19.7	135
1908	14.5	82	18.1	105	11.6	100	21.9	104	12.8	99	17.9	90
Average	24.7	101	22.7	103	27.0	105	29.9	121	16.9	104	25.7	120

GROWING AND USES OF ALFALFA.

Alfalfa is little more than passing through its initiatory stages in this part of Indiana. Few of the fields exceed five acres, and the average is not over two and a half. It is being raised successfully on all of the types of land represented in this area except the Oak Forest silt loam, where it has not had a fair trial. The best crops of alfalfa have been grown on the Miami black clay loam underlain by a gravelly yellow clay and covered by the wash from the upland. A splendid example of such conditions is found on the farm of Dr. Clark, one-half mile south of Economy.

In April, 1903, Dr. Clark, after carefully inoculating with alfalfa dirt and preparing the ground of a five-acre field, which was well tiled, sowed his alfalfa seed. The next year he cut two tons of hay, and the following the same amount. Because of the poor stand, which was found to be due to a poor grade of seed, he again broke up the land in April, 1906. This time he inoculated with sweet clover soil and used great care to obtain a good seed. After getting his seed-bed into as good condition as he knew how, he sowed his seed, and the result was a most excellent stand. On June 8, 1908, he cut six tons of hay from these five acres; on July 17, six tons, and on August 8, eight tons. He could have cut another crop, but instead turned his sheep into the field. Later in the fall he scattered manure over the ground with a manure spreader. His crop on June 15, 1909, was eleven tons; on August 2, eight tons, on September 16, twelve tons, and another good crop could have been taken off, but the sheep were again permitted to pasture on it. The roots of this alfalfa are covered with the little nitrogen tubers that are developed by the minute organisms known as bacteria.

Dr. Clark informed the writer that his sheep received no feed except alfalfa, that the old ewes kept fat, and in January, 1908, when they dropped their lambs their udders were large and contained abundance of milk. The lambs were large and sound and all lived. In May, 1908, these lambs weighed ninety-six pounds. The doctor says that he only has to feed his horse one-half as much alfalfa as other hay, and by cutting it up, sprinkling a little bran over and pouring hot water on that it makes a very good feed for chickens, causing them to lay better than any feed he has ever tried.

Where the Miami clay loam or Miami silt loam is well underdrained, good seed is used and proper preparation of the soil is made, a stand invariably follows. For the area under consideration no better description of alfalfa raising on the Miami clay loam can

be given than to relate the experience of Oliver La Fuse, the leading alfalfa grower of Union County.

A three acre field, partly Miami black clay loam and partly Miami clay loam, was selected. Across both of these soils a gravel road had once passed, but had been abandoned thirty years previously, thus permitting the gravel to become thoroughly mixed with the soils. In the latter part of April, 1902, Mr. La Fuse sowed his alfalfa seed, but he did not get a healthful growth. The leaves turned yellow after it began to grow. The second year he got about three tons of hay from the field. In April, 1903, he procured 800 pounds of alfalfa dirt, and, after pulverizing, scattered it over the field with a shovel. No apparent difference in the growth of the alfalfa could be seen until late in September, when streaks of a dark green color began to show, these being due to the unequal distribution of the inoculation dirt. Upon examining the roots of the alfalfa growing in the streaks, little tubers were found to be developing, when nothing of the kind had been seen before. Later the darker streaks began to widen, and finally this color covered the entire field. In 1905 twelve tons of hay were taken off in three cuttings, and it was noticed that where an old road had been, on the Miami clay loam, the crop had doubled that on either side and was also much better where this road had crossed the Miami black clay loam, thus showing the effect of a loose, warm, well aerated soil. In 1906 fifteen tons were obtained from the three acres.

Probably more alfalfa is raised on the Huntington loam than on all of the other soils combined. This seems to be due to its being easy to get a good stand on this warm, sandy soil, with its natural underdrainage. The roots have a loose, well aerated subsoil to penetrate, which enables them to get their supply of nitrogen at a considerable depth as well as at the surface. The most successful alfalfa grower on the Huntington loam which the writer met in the area surveyed was John Martin, of Franklin County. His farm is situated two miles west of Brookville, the county seat of Franklin County. The land on which Mr. Martin grows alfalfa is a first bottom that overflows during the time of the freshets in the spring, and is in some cases old gravel bars that were considered waste land, being entirely too gravelly for corn, wheat or oats. After planting in almost all months between April and October, Mr. Martin considers the best method and time to plant is to break the ground immediately after the wheat is taken off. Then, by dragging his ground every two weeks until September, he obtains a good seed-

bed and gets rid of his weeds. At this time the seed is sown. By the next spring the alfalfa is ready for cutting and the farmer has not been deprived of his land like he would have been had he sown in April or May. In that event he should not take off any cutting the first year, but leave it lay as a mulch to protect the roots and enrich the land. Mr. Martin gets an average yield of four and a half tons to an acre, while the general run of farmers get about three tons.

As a feed for cows and horses alfalfa, in Mr. Martin's estimation, has no equal. When a change is made from other feed to alfalfa, in a very few days an increase in the flow of milk, and the amount of butter that can be made from a pound of milk is noted.

The size of crops and the growing of alfalfa on the Miami loam resembles that of the Huntington loam, while the Miami silt loam, in this respect, is more like the Miami clay loam. Good crops of alfalfa are in the reach of all, if the proper care is exercised. In brief, the chief requirements are: (1) A well underdrained land; (2) a soil that is warm, loose and open, so the air can circulate through it; (3) a good seed-bed, free from weeds; (4) a careful inoculation with either alfalfa or sweet clover dirt, good seed, and the land in a high state of fertility. If the land is a clay or silt loam, a few loads of crushed limestone sand or local gravel can be very profitably scattered over it. This gives a looser texture and adds a material that will decay in time and supply lime. If the ground is first bottom, one should be careful and not plant too near the ground-water level, since as soon as the roots get to the water the alfalfa will begin to die.

CORN.

The crop that is grown most, yields the best and brings the largest returns in the area of survey is corn. On the other hand, there is no crop so small, when compared with what it really should be. This fact impressed the writer very strongly while visiting almost every square mile of the country designated and noting that the best class of farmers were getting crops that would average 40 per cent. better than the general run. Neither the ground nor the natural facilities for improving it were any better than those of their neighbors.

One of the leading difficulties in the year 1909 was that the land was too wet to cultivate, this giving the weeds a chance to encroach upon the corn. Another difficulty was that it was very

late in the spring before the corn could be planted. The best farmers overcame both of these obstacles by having their land tiled, so they were able to plant a couple of weeks before their neighbors and tend their corn when it needed it most. In 1908 the crop average was very low on account of the drought, but the best farmers in general got good crops. They accomplished this by keeping up a shallow and level cultivation, and so conserved the moisture; or, more properly speaking, their stirring of the surface allowed the moisture in it to evaporate and create in the upper interstices of the soil partial vacuums which brought the water up from below by capillary attraction. I found that some of these farmers had cultivated their corn every other week from the time they had planted until the husk began to turn yellow, and the man that raised the best corn crop in the State for 1908 went through his corn every week. He used a lapped board drag for his shallow cultivation, except after a rain, when he used a 1½-inch spike drag.

A neglect to replenish the soil is another common cause of poor corn. The best farmer believes in giving nourishment to his land as well as to his stock. He feeds almost everything that he raises on the place and in this way gets a large portion of the plant food back from the droppings. Hog men generally aim to feed their hogs over the poor portions of the farms. A careful rotation is practiced, and green manuring is resorted to. Good farmers are often found buying hay and plowing under clover. By a careful selection of their typical soils, which they have had analyzed by the State Experimental Station at Purdue, and also by trying various commercial fertilizers on special rows of corn or over particular plats of ground, they have been able to get the fertilizer that will supply the plant food which is lacking in their soils. Many farmers are very careless in breaking the land in the spring, merely skimming over the surface, instead of setting the plow down to a good depth and turning up, at least, all of the plow soil. Some of the more progressive farmers make it a rule to plow into the subsoil slightly each time and in this way get a greater amount of plow soil so that the corn roots will have a larger scope from which to obtain their nourishment. Too much care cannot be exercised in getting a good seed-bed after the breaking has been completed.

Matters that are much neglected and at the same time rank among the most important in obtaining a yield of corn, are the selecting, breeding and testing of seed corn. In fact, these are

of sufficient consequence that the foremost corn growers of the United States say that an increase of yield, ranging from twenty-five to forty bushels to the acre can be realized in five or six years by observing them in practice. These leading corn growers maintain that the seed should be selected in the field before cutting, that the ear should be about 4 or 4½ feet from the ground and should come from a hill that has produced three good stalks. The corn should then be ranked or hung up in a dry place, where there is a free circulation of air, in order that it will thoroughly dry before the cold weather sets in.

Some farmers through breeding of corn can guarantee it to grow if true to type. By means of a careful record they know the dam and sire of an ear and know almost exactly what it will produce to the acre. A simple method of keeping a record is to take a box 20x40 inches and 3 inches deep, filled with dirt, and divide it into squares 2x2 inches by drawing a string back and forth across it. Number the squares, then take three grains from an ear, one from each end and one from the middle; turn the ear and in the same manner select three more grains. By planting the six grains in one of the squares and numbering the ear, one has his record when the corn comes up. A box 20x40 inches will test 200 ears, which will plant about fifteen acres. This method gives a reasonable assurance that corn will grow in every hill. Suppose corn fails to grow in every tenth hill, which is a common occurrence, it means that one acre is lost in every ten.

Other very important factors in corn raising or doing anything else in the agricultural line is to keep in touch with what the leading agriculturists are doing through good farm papers, by attending farmers' institutes, fairs and lectures, or by visiting and investigating the methods of the most progressive farmers of your own vicinity and adjacent vicinities.

HOW TO AVOID THE WASHING OF THE LAND FROM THE HILLSIDES.

In the more hilly portions of the section of country under discussion, erosion, or washing, has rendered worthless a high percentage of the hillside land. In some cases the farms which were once reported to produce fair crops have been so cut up and washed that they have sold for $2 per acre. The reason for such deterioration in the land has been due largely to careless plowing. Instead of plowing as near as one can conveniently at right angles

to the steepest slope, farmers often plow almost with the slope, giving the water after a rain a gutter in which to flow. Crops that necessitate the ground being bare for long periods, like corn and tobacco, should not be raised so much on the hillsides, but, instead, blue grass, alfalfa or something that will hold the soil. Underdrainage is also a great help in keeping the land from washing, large volumes of water being carried off through the tiles that would otherwise flow off on the surface.

HOW TO MAKE A SOIL OUT OF AN EXPOSED SUBSOIL.

How to get into a high state of cultivation a Miami clay loam or Miami silt loam subsoil that has been exposed to the surface on account of the soil being washed away has been a very difficult problem for farmers to solve. The consensus of opinion of leading farmers seems to be to (1) see that the land is well underdrained; (2) then put straw or something on for humus; (3) sand or gravel plowed in is also a good thing to make the soil more porous and better aerated; (4) apply a manure dressing; (5) and if a stand of clover is obtained it should be plowed under without cutting it either for hay or seed. By pursuing a treatment about like the one given above, farms that would not produce an average of ten bushels of corn to an acre, are today yielding sixty.

A special treatment given by Wm. A. Lewis of Williamsburg, some years ago, to one and one-half acres of subsoil, occupying the site of an old brickyard, may assist someone in developing a soil out of subsoil. Mr. Lewis, when he had completed the tiling, broke this ground with a three-horse sulky plow, after which he put on a coating of wood ashes, then applied five loads of plaster sand. He next added seven cords of rotted wood (chip manure), which he procured at a sawmill. When two years had elapsed, giving the chip manure, straw and sand a chance to become well mixed with the ground, this one and one-half acre was as productive as any other part of Mr. Lewis' farm.

AGRICULTURAL METHODS AND CONDITIONS.

In order to consider the cultural methods generally practiced, it is necessary to divide the surveyed area into two divisions the larger of which comprises eighty-five per cent. of the seven counties and the smaller fifteen per cent. With exception of some very limited areas of the limestone slope clay loam, and the Hamburg loam,

all of the soil types of the larger division occur on the Later Wisconsin drift and have originated from it; while the type occupying the surface of the Illinoian drift makes up the smaller division.

Later Wisconsin Drift and Soils. Throughout the Later Wisconsin drift area, where the Miami series occupy the upland and the Huntington and Wabash loams the bottom lands, there have been marked advancements in cultural methods. In spite of the fact that the pioneers had the new and strong virgin soils on which to grow their crops, it is not uncommon to find the present generations getting better crops from the same fields. Especially is this true for corn. By going back four or five decades, we find the farmer turning his ground with a breaking plow, harrowing once and sometimes not at all. Rotation was hardly ever thought of, corn being grown upon the same field for twenty consecutive years, and the same was true of wheat. The benefits derived from tiling, systematic stock feeding, selection of seed, green manuring and commercial fertilizers were almost unknown. Today, the average farmer has gotten out of the old rut and is using, to some extent, the more advanced methods; but he yet falls far short of complying with the requisites necessary to get the best crops from the soil.

The best farmers make it a rule to rotate corn, wheat and clover, generally using the clover as a green manure; but the great majority could not be said to follow any system of cropping. A good many raise corn for two or three years, then wheat or oats, followed by clover and timothy, which is cut for hay and seed. What is left of the clover is pastured, after which corn is again planted. In other cases the corn is followed directly by clover or timothy, because of frequent failures in their wheat and oats crops. Some grow corn as long as possible, then follow with oats and once in a great while clover is grown, while others alternate corn and oats and then in every four or five years introduce clover. Timothy is often grown instead of clover, because of heaving, which is due to the undrained condition of the ground.

As a hay, clover is preferable to timothy for improving the land, since it takes the nitrogen out of the atmosphere and puts it into the soil. As a clover hay the little red clover is considered best, but as a green manuring crop the big English clover is generally liked better on account of the great amount of organic matter that it adds to the soil. When the soils do not run too high in organic matter, wheat is grown instead of oats as a nurse crop for clover, since it draws less upon both the moisture and the available plant

foods of the soil, giving the clover a better show after the grain is taken off. A hay that is far richer in nutrition, yields more tons to the acre and supplies the nitrogen to the soil as well as any of the other clovers, is alfalfa. By a proper preparation of the soil of the Miami clay loam, Miami silt loam, Miami black clay loam, Huntington loam, or Miami loam, a stand is almost sure to follow. Farmers of this area will find themselves highly repaid if they will grow it.

The stable manure is almost always scattered over the corn ground and the old fork method of spreading it is rapidly giving away to the manure spreaders, which pay for themselves in a few years. Commercial fertilizers are used by two-thirds of the farmers of this area in growing wheat, but not near so much for corn. The few farmers, who are trying different commercial fertilizers on various plats of land or on certain rows of corn, and in addition are having their soil analyzed by the Purdue Experimental Station to learn whenever it is lacking in plant foods, are realizing excellent results. But many seem to have no conception as to what their land needs in the way of a commercial fertilizer and use it without any system. If it happens to have some of the plant foods needed, it meets their approval; but if not, all brands are considered injurious to the ground.

The rule seems to be that the poor farmers sell their corn and hay at the elevators or to the better farmers who feed it in addition to what they themselves raise. The average farmers sell a small part of their hay and grain, except wheat. Wheat by all three classes, is almost always sold at the elevators.

Of late years the growing of tomatoes has received some attention, especially in Henry County, where over 200 acres were devoted to this crop in 1908. Some five or six canning factories have been established in this county. An average yield ranges from six to eight tons per acre.

With exception of north central Henry County, very few potatoes are raised for the outside markets. Crops range from seventy-five to 150 bushels to the acre.

During the last decade there have been steady advances in the value of land. This has been due partly to the increase in prices and demand for farm products, but also to numerous improvements. Taking the area as a whole, the farm improvements are above the average for the State of Indiana. The average farm dwelling is a neatly painted two-storied frame building, while the barns are large and substantially built. Fences are generally good,

mostly being wire, but some hedges and a few rail fences are found. Several million rods of tile lie beneath the surface of this area, yet it is not one-fifth of what is needed.

About sixty-five per cent. of the farmers own the land they cultivate. More renting is done on shares, under a five-year contract, than by cash. When rented on shares, the landowner generally furnished one-half of everything except labor, and gets one-half of the net income. From $3.50 to $6.00 per acre is the usual cash rent. Owing to a common practice of cash renters in getting all they can from the soil without replenishing, it is considered very unadvisable for land owners to rent for cash.

There seems to be a growing tendency toward smaller farms and more intensive farming. Experienced farm hands are rare and many farmers claim that they can realize more from an eighty-acre farm, where they can attend to almost everything themselves, than they can from a 160-acre farm, where it is necessary to do considerable hiring. It is especially difficult to get hired help during harvest, when it is needed most. Where labor is hired by the month or year, from $18.00 to $22.00 per month is about the average wage, while during harvest from $1.50 to $2.50 per day is the customary rate.

The live stock interest centers largely in hogs, farmers turning off, annually to the 100 acres, all the way from 20 to 125 head. These consist largely of Duroc and Poland-China, and a few Chester White and Berkshire. One or two farmers in almost every neighborhood, will fatten each year from ten to twenty young steers. Very few farmers are in the dairy business on a large scale, although almost every farmer has, at least, two or three cows for butter and milk. Dairy herds consist principally of Jerseys and some Holsteins, while the beef cattle are Shorthorns, Herefords and Angus, the former predominating. In each county there are a few men making a specialty of raising horses, but the ordinary farmers raise very few for the outside markets. Probably more Percherons are found than any other breed. About one farmer out of six has from ten to thirty head of sheep, the Shropshire blood predominating. The few mules raised are used mostly to supply the local demand for work animals of this type.

Almost every farm has a few apple trees and sometimes a few pear, peach, cherry and plum trees, but generally little attention is given to them other than to have enough fruit for the home supply. Much better yields can be realized by giving the trees the proper attention.

There is some difference in the agricultural value of the various soil types. Of the upland soils, the Miami black clay loam is the best for corn but the poorest for wheat, while the Miami clay loam and Miami silt loam are good for general farming purposes. The Miami loam is about as good as the Miami clay loam and Miami silt loam for wheat and oats, but better for corn. Of the bottom land the Wabash loam and Wabash silt loam are the best for corn, and the Huntington loam for general farming. The land ordinarily ranges from $65.00 to $125.00 per acre, the Miami black clay loam demanding the best prices, the Miami loam the next best followed by the Huntington loam, and this in turn by the Miami clay loam and Miami silt loam.

Illinoian Drift Soil. Over the one representative of the Illinoian drift soil (the Oak Forest silt loam), the cultural methods, being practiced, are little in advance of the forefathers. There is no system of rotation, very little clover is grown and tile are very exceptional. The land is badly worn out and is in a cold, clammy and sour state. By using considerable fertilizer wheat is grown, which is the principal crop. Corn yields are very low and oats only fair. Timothy is the leading hay. Very little stock is raised and consequently the amount of manure is meagre.

The buildings, fences and general farm improvements are poor, except for a few neighborhoods. Where the land is badly cut up by stream valleys not over five per cent. is cultivated. Such land sells as low as $2 per acre, while the best farms will bring $60.

By tiling, using lots of lime to correct the sourness, growing clover, incorporating humus by means of green manuring crops and more stable manure, by raising more stock and feeding them over the farms, practicing a judicious rotation of crops, selection of seeds, and a careful cultivation, this type will produce crops almost as good as the Miami clay loam and Miami silt loam.

RANDOLPH COUNTY.

Immediately north of Wayne County, south of Jay and bordering the Ohio line on the east is Randolph County. It has an area of 450 square miles.

The first settlement in Randolph County was made in April, 1814, by Thomas W. Parker in sec. 28 (16 N., 1 W). A considerable number of land entries were made in 1814 and 1815, but the act creating the county was not approved until January 10, 1818. As early as 1815 both a school and church existed, and in 1818 Winchester was selected as the county seat.

Many of the early settlers were transient and gave very little attention to agriculture, but turned their attention to trapping, hunting and bartering. But some men came to stay and these made clearings, built cabins and planted corn. One of these men, Henry W. Way, planted an orchard west of Winchester, prior to 1820. In these early days, salt sold for $18 per barrel, corn 10 cents per bushel, oats 12 cents, pork ¾ cents per pound and beef 1½ cents. Good milk cows were worth $7 apiece.

There is one thing that the people of Randolph County can be especially proud of, and that is the fact that in 1856 the first tile ever made in the State of Indiana were burnt at the brickyard of Elisha Martin, situated south of Winchester. In 1881 there were seventeen tile factories in the county turning out 100,000 rods annually. Since that time there has been a steady increase in the demand for tile, and today Randolph County boasts of over 1,000,000 rods of tile lying beneath her splendid farm land.

Although agriculture, by many odds, is the leading industry of the county, yet its largest towns have some very good manufacturing plants. At Winchester, the county seat and a town of 6,000 inhabitants, are the works of the Woodbury Glass Co., which are said to be the largest of their kind in the world. It gives employment to 550 men. Union City, in the east central part of the county, with a population of 4,000 on the Indiana side and 1,000 on the Ohio, has two carriage works, one wheel factory and a back stay factory, which give employment to 1,000 men. In the north central portion of the county, is Ridgeville with its large stone quarry and a brush and broom plant. Besides these towns already named are Farmland, Lynn and Saratoga, all of which are prosperous and growing, with populations ranging from 700 to 1,200.

Out of 900 miles of road in Randolph County, about 325 are gravel or macadam. Although the county is rather deficient in its supply of gravel for road building, yet it has an inexhaustible supply of limestone, in the northern portion, that is being used extensively for road building.

The railway facilities are excellent. Two divisions of the Big Four cross it from east to west, one through the center and the other across the southern third. The G. R. & I. bisects it from north to south; the P. C. & St. L. crosses the northwestern quarter and the C. C. & L. the southwestern. An interurban traction line passes through the center of the county from east to west.

As an agricultural county, Randolph takes its place among the best of the State. In 1908 over 27,000 acres of wheat, 86,000 of corn, 26,000 of oats, 1,200 of rye, 29 of buckwheat, 21,000 of clover, 450 of potatoes, 120 of tomatoes, 600 of tobacco, 11,000 of timothy, and 110 of alfalfa were harvested. On January 1, 1908, there were on hands 9,800 horses and colts, 220 mules, 7,400 dairy cattle and 5,000 beef cattle. Over 70,000 hogs and 9,000 sheep were sold during the same year. The tillable land of Randolph comprises about seventy-six per cent of the total area, while the cleared land in pasture is about thirteen per cent. and the woodland in pasture about eleven per cent.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																	
						Bushels Per Acre.												Tons Per Acre.					
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Franklin	Miami clay loam	Farmers				50	37		14			30							1½						
	Miami black clay loam	Farmers				65	40		13																
	All types occurring	Statistical Report	14,000	9,885	1,578			35			18			19			1⅓			1			1⅕		
Green	Miami clay loam	Farmers				60	38		14			35													
	Miami black clay loam	Farmers				70	44		11			25													
	All tpyes occurring	Statistical Report	18,916	4,576				36			16			19			1⅓			1¼			1⅒		2
Green's Fork	Miami clay loam	Farmers				55	35		19	17		35							1½						
	All types occurring	Statistical Report	24,939	20,732				32½			18½			20			1			1¼			1⅓		2
Jackson	Miami clay loam	Farmers				60	40																		
	All types occurring	Statistical Report	18,423	15,633				34½			16			21			1			1			1		3
Monroe	Miami clay loam	Farmers				60	35					35													
	Miami black clay loam	Farmers				70	40					30													
	All types occurring	Statistical Report	15,726	9,148				35			21			24			1½						1⅓		
Nettle Creek	Miami clay loam	Farmers				50	30		15	12		40													
	All types occurring	Statistical Report	20,145	17,464				36½			15⅓			19			1⅛			1⅕			1		
Stoney Creek	Miami clay loam	Farmers				55	35			14		30			1½			1½							
	Miami black clay loam	Farmers				60	40					30			1½			1½							
	All types occurring	Statistical Report	16,829	13,852				30½			23			16			1⅓			1¼			1⅕		

West River	Miami clay loam	Farmers				50	32		20	15			35																			
	Miami black clay loam	Farmers				60	40			14			35																			
	Huntington loam	Farmers				50	40			15																						
	Wabash loam	Farmers				70	45			13																						
	All types occurring	Statistical Report	25,037	20,490				31½		15			18½			1½			1¼			1									
Ward	Miami clay loam	Farmers				55	35		25	13			40			2			1½													
	Miami black clay loam	Farmers				60	40																									
	All types occurring	Statistical Report	23,324	21,000				30		15			24½			1			1⅛			1⅜									
Washington	Miami clay loam	Farmers				45	30			15			35						1½													
	Miami black clay loam	Farmers				70	40			14			35						1¼													
	All types occurring	Statistical Report						40		17½			19			1			1⅛			1									1⅓
White River	Miami clay loam	Farmers				55	35		18	15			35						1½			1½										
	Miami black clay loam	Farmers				70	40			13			33																			
	All types occurring	Statistical Report	29,739	22,058						19			24			1			1½			1¼									2
Wayne	Miami clay loam	Farmers				60	40			15			25			2			1½												4½	
	Miami black clay loam	Farmers				70	45			12			25			2																
	All types occurring	Statistical Report	23,301	21,035				41		19			24½			1			1			1⅛									1
Totals and averages for Randolph County			230,379	175,873		60	38⅓	35½	19	14	17½		3	21		1½	1⅛		1½												

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909.						Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Franklin	Miami clay loam	Farmers							35			10	$70 to $90.
	Miami black clay loam	Farmers							40				$75 to $100.
	All types occurring	Statistical Report	408	17	350	214	632	1,173	22	½			
Green	Miami clay loam	Farmers							30	1			$70 to $100.
	Miami black clay loam	Farmers							40	1			$75 to $125.
	All types occurring	Statistical Report	710	11	593	697	898	2,635	31	½			
Green's Fork	Miami clay loam	Farmers							35	1½	½	2	Av. $75.
	All types occurring	Statistical Report	956	53	738	129	429	1,486	12½	⅛			Av. $100.
Jackson	Miami clay loam	Farmers							45	1	1	½	Av. is $100.
	All types occurring	Statistical Report	727	17	528	419	336	1,366	15	1			
Monroe	Miami clay loam	Farmers							35	1	7	6	$70 to $100.
	Miami black clay loam	Farmers							45				
	All types occurring	Statistical Report	591	2	395	700	937	2,666	28½	⅛			
Nettle Creek	Miami clay loam	Farmers							30		2	5	$40 to $80.
	All types occurring	Statistical Report	755	13	474	403	652	3,299	33⅓	2½			
Stoney Creek	Miami clay loam	Farmers							30		5	7	
	Miami black clay loam	Farmers							40				
	All types occurring	Statistical Report	824	11	587	644	1,192	4,419	36	1			

West River	Miami clay loam	Farmers	....	....	.....	.....	.....	.....	35	1	2	5	$50 to $80.
	Miami black clay loam	Farmers	.....	....	.....	.....	.....	.....	50	.....	.....	.....	$60 to $100
	Huntington loam	Farmers	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Wabash loam	Farmers	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	All types occurring	Statistical Report	1,029	54	716	666	1,111	3,964	36⅔	⅑	.....	.....	.....
Ward	Miami clay loam	Farmers	.....	....	.....	.....	.....	.....	40	2	2	1½	$65 to $115.
	Miami black clay loam	Farmers	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	All types occurring	Statistical Report	760	6	520	359	260	.....	8½	⅓	.....	.....	.....
Washington	Miami clay loam	Farmers	.....	....	.....	.....	.....	.....	35	2	3	5	$5 to $90.
	Miami black clay loam	Farmers	.....	....	.....	.....	.....	.....	45	.....	.....	.....	$75 to $110.
	All types occurring	Statistical Report	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
White River	Miami clay loam	Farmers	.....	....	.....	.....	.....	.....	35	....	3	4	$70 to $100
	Miami black clay loam	Farmers	.....	....	.....	.....	.....	.....	40	....	.....	.....	Av. is $100
	All types occurring	Statistical Report	122	15	927	622	1,119	9,363	31	⅑	.....	.....	.....
Wayne	Miami clay loam	Farmers	.....	....	.....	.....	.....	.....	35	2	1	4	Av. is $85.
	Miami black clay loam	Farmers	.....	....	.....	.....	.....	.....	40	.....	.....	.....	Av. is $100.
	All types occurring	Statistical Report	923	20	788	237	334	3,227	23½	⅓	.....	.....	.....

PHYSIOGRAPHY AND GEOLOGY.

The surface formations of this county belong to two geological periods. The Niagara limestone, which is found outcropping at various places in the channels of the Mississinewa and White Rivers, is Silurian in age; while the Wisconsin drift, covering the entire county, is Pleistocene.

Taken as a whole, this is the most level of the seven counties of which this paper treats. A small moraine of less than a mile in width and ranging between 25 and 50 feet in height enters the State at Union City and follows the north bank of White River entirely across the county entering Delaware County a short distance north of Windsor. The topography north of this ridge is a gently undulating plain sloping gradually to the south bank of the Mississinewa River, which lies 6 miles north. This plain is dotted with numerous small shallow basins, which are now Miami black clay loam areas, but in the past were small lakelets, ponds and marshes. North of the Mississinewa one again encounters a rather pronounced morainic area, extending from east to west across the north end of the county. The strongest morainic belt is located in the southern tier of townships. It has a breadth of 5 or 6 miles and carries knolls and ridges varying from 30 to 50 feet in height. It is also the principal watershed and divide between White and Whitewater Rivers. Between Martindale Creek and Green's Fork, is what is known as the "Summit," with an altitude of 1,234.4 feet, which is the greatest measured in the State. Hills south of this point are estimated to be 50 feet higher. Between this heavy moraine and White River is another almost level plain, with the frequent occurrences of dark colored areas (Miami black clay loam) occupying depressions in the light colored soils.

In the southern part of the county, where the surface is rolling, these old kettle basins, occupied by the dark colored soil, are rare. This is not due to the basins never having been developed in these portions, because the pronounced moraine would indicate that many were present immediately after the recession of the ice; but rather to the fact that many streams and their tributaries worked their heads back into this moraine, and thoroughly drained at a time sufficiently prior to the present, that decomposition has had a chance to decompose almost all of the organic matter, that once collected in the ponds and marshes.

SOILS.

The soils of the Miami series extend over almost all of the upland of the county. Of these, the Miami clay loam is the most extensive and next to it is the Miami black clay loam. Quite limited areas of the Miami loam are found along West River, Green's Fork and the East Fork of Whitewater River. In the bottoms are found the Huntington loam, Wabash loam and Wabash silt loam; while very small areas of muck occur in both bottom and upland. The following table gives the extent of each of these types.

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	382.0	84.9
Miami black clay loam	50.0	11.1
Miami loam	1.0	.2
Huntington loam	6.0	1.3
Wabash loam	10.0	2.2
Wabash silt loam	.5	.1
Muck	.5	.1
Total	450.0	99.9

Miami Clay Loam.

The Miami clay loam contains more clay and is more uniform in Randolph County than it is in any of the other counties treated in this report. In general, it consists of a clay loam of a light or medium gray color and having a depth ranging from 7 to 12 inches. Underlying this is from 1 to 2 feet of a medium to dark brown and sometimes a yellowish brown subsoil. At the top, this subsoil is generally a silt or clay loam, which becomes more clayey as it occurs deeper in the section, grading into a sandy clay at the bottom. This, in turn, is underlain by a gravelly or sandy clay of a little lighter color.

Although the Miami clay loam is the predominating type in all parts of the county, yet it occurs most typical and covers the highest percentage of area over the glacial ridges and rolling country It is always found occupying the higher land.

It is reported by many farmers that the Miami clay loam only produces about one-half as much corn as the Miami black clay loam. Inquiry reveals that most of the tile is put under the Miami black clay loam and the Miami clay loam is left with a poor underdrainage. Such land yields from twenty to forty bushels of corn to

the acre, depending upon how it is farmed; but when tiled and properly cared for, sixty bushels are not uncommon. Wheat ranges from twelve to twenty-five bushels, but an average is about fifteen, while oats average thirty to thirty-five, clover one to one and one-half tons and from one to two bushels of seed, and timothy one to one and one-half tons. The selling price of land per acre is from $60 to $90.

The following table shows the results of the mechanical analyses of samples of the Miami clay loam:

MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
66a	2 miles west of New Lisbon.	Soil, 0 to 10 inches.	.6	1.3	2.5	6.7	7.8	61.0	20.0
66b	First subsoil of 66a	Subsoil, 10 to 30 inches.	.2	.6	1.6	3.8	4.4	52.3	40.1
66c	Second subsoil of 66a	Subsoil, 30 to 42 inches.	1.8	2.1	2.8	5.8	6.9	45.4	35.4
31a	½ mile south of Randolph	Soil	2.0	2.0	3.2	7.7	9.2	51.4	24.7
31b	Subsoil to 66a	Subsoil	.5	.8	2.3	9.1	10.7	59.7	17.0
47a	2 miles east and ½ mile north of Arba	Soil, 0 to 9 inches	1.0	1.9	3.0	9.8	11.7	42.7	31.0
47b	First subsoil to 47a	Subsoil, 9 to 23 inches.	1.3	2.7	3.8	8.0	9.4	47.7	28.0
47c	Second subsoil to 47a	Subsoil, 23 to 36 inches.	4.9	3.2	4.6	9.2	18.1	36.4	24.7
54a	2½ miles north and ¾ mile west of Arba	Soil, 0 to 11 inches	.7	1.4	1.6	6.2	6.9	55.0	29.0
54b	First subsoil to 54a	Subsoil, 11 to 35 inches.	1.2	1.6	2.8	7.2	8.3	43.4	35.1
54c	Second subsoil to 54 a	Subsoil, 35 to 41 inches.	3.6	2.9	4.4	8.8	10.0	36.6	33.1
11a	1½ miles south of Pleasantview	Soil	2.0	1.7	3.2	6.8	8.0	50.7	29.6
11b	Subsoil to 11a	Subsoil	1.5	2.1	3.5	8.0	9.6	49.0	27.0

Miami Black Clay Loam.

The low flat gently undulating plains both north and south of the Union City ridge contains a larger area of Miami black clay loam than any other county of the surveyed area. Some of this land is yet undrained and much of it has been drained during the past decade.

The texture is very much like that given in the general discussion. The surface soil, ranges from 9 to 14 inches deep, is a clay loam of a black color, and sometimes the subsoil continues to a depth of 3 feet with about the same color, but the texture changes to a clay of a heavy, tough nature. A more common case is for the soil at 1½ to 2 feet to grow lighter in color and take on a drab appearance. A little deeper the drab color becomes streaked with a bright yellow and carries iron concretions. A rather striking characteristic of both the surface soil and subsoil in occasional low flat areas is the low content of sand and gravel.

Difficulty is often encountered in plowing this soil, because of the tough, cohesive nature, but if taken when moisture conditions are favorable, it is not difficult to put it in good tilth. After being well tiled and cultivated for awhile it becomes loose and granular.

As in other counties, the Miami black clay loam in Randolph, leads all other types as a corn producer, but falls short in wheat. The better class of farmers average sixty-five bushels of corn per acre, while the average yield is about forty. Wheat averages from ten to fifteen, oats about thirty-five and clover from one to two tons. Almost all of the corn is converted into beef and pork on the farms. Some corn is raised for ensilage and used largely for fattening cattle.

Miami black clay loam is changing hands at prices ranging from $75 to $140, depending on improvements.

The following table shows the results of mechanical analyses of samples of this soil.

MECHANICAL ANALYSIS OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
5a	1¼ miles west of Lynn.	Soil, 0 to 10 inches.	U. S. Bureau of Soils.	.0	.7	1.0	5.0	8.7	61.7	23.2
5b	Subsoil of 5a...	Subsoil, 10 to 36 inches.....	U. S. Bureau of Soils.	.6	.7	.7	2.6	10.9	59.1	25.4
32a	1 mile south of Randolph.	Soil, 0 to 14 inches.	Taylor.....	.7	.5	1.0	5.0	8.0	59.0	24.8
32b	Subsoil of 32a..	Subsoil, 14 to 36 inches.	Taylor.....	.6	.1	.2	4.9	5.7	47.3	38.9
16b	5 miles northeast of Farmland.	Subsoil, 12 to 36 inches.	Taylor.....	5.6	1.2	1.7	2.4	2.8	50.8	37.0

Huntington Loam.

The Huntington loam of this county differs very little in texture from the general run of the seven counties, unless it would be that its color is a shade darker and it is more often associated with the Wabash loam, frequently grading into it or containing large spots of it. Owing to the flat nature of much of the county, the higher bottoms are not very much above the flood plains. In many cases, on account of the absence of a bank or old bluff, one can scarcely tell, without boring, just where the Miami clay loam or Miami black clay loam leaves off and the Huntington loam begins.

On this type the better class of farmers are getting about fifty-five bushels of corn to the acre while the average get forty.

The difference in production is due to the manner of cultivation, selection of seed and nursing the soil. Wheat averages about fifteen bushels and oats about thirty-five. The selling price of land ranges from $60 to $110 per acre.

Wabash Loam.

The Wabash loam occurs as a black bottom land soil, running high in organic matter. It has a little more clay and is darker than the Huntington loam, but otherwise the texture is much the same.

A characteristic section of the Wabash loam, taken 1 mile southwest of Fairview from the second bottom of the Mississinewa River, shows at the surface 10 inches of a black loam, that breaks up into small irregular lumps. At the bottom this grades into 1 foot of a drab loam, with a tinge of red. The 2 feet underlying this are either a gravelly or sandy loam. Often the limestone pebbles are completely disintegrated and fall to pieces about like a lump of soft sugar. This characteristic causes them to be frequently taken for sandstone. The lower foot of the section is found to be stratified beds of gravel and sand. More or less silt loam and even clay loam patches intersperse the Wabash loam.

As a corn producer this type is superior to the Huntington loam, but is not as good for wheat. The better farmers get as high as eighty bushels of corn to the acre on good years, but average about sixty-five, while the ordinary farmer will not exceed an average of forty-five. The selling price of land is a little higher than that of the Huntington loam.

The results of the mechanical analyses of the fine earth of this type are given in the table below.

MECHANICAL ANALYSIS OF THE WABASH LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
13a	1 mile southwest of Fairview.	Soil, 0 to 12 inches.....	3.0	7.3	10.8	15.4	17.9	33.6	10.7
13b	First subsoil to 13a.....	Subsoil, 12 to 22 inches.	2.3	7.5	11.4	9.7	11.3	41.0	16.0
13c	Second subsoil to 13a.....	Subsoil, 22 to 46 inches.	.4	6.3	7.7	8.4	9.5	53.8	13.0

Wabash Silt Loam.

Along Dismal Creek, Greenville Creek and a few other small streams occurs a heavy silt loam or clay loam of 1½ feet in depth. It contains a high percentage of organic matter and has a black color. The soil is difficult to break, unless taken at the right time, because of its sticky and adhesive qualities. It will form clods which will not pulverize until moistened. If allowed to dry without stirring, the surface cracks. The soil is very much like the Miami black clay loam and has originated under almost similar circumstances; the Miami black clay loam having been formed in lakes and ponds; and the Wabash silt loam in ponded stream valleys, where the vegetation accumulated in the presence of water.

At a depth of 1½ feet the color becomes a drab and the clay loam gives place to a silty clay, which at a depth of 3 feet grades into a still lighter colored clay loam, carrying many iron concretions. This, at a depth of 4 or 5 feet, is underlain by either stratified sand or gravel.

For agricultural purposes this land is comparable to the Miami black clay loam. Corn averages, by the best farmers, about sixty-five bushels to the acre. In order to get the best yields, tiling is often necessary.

The results of the mechanical analyses of this soil are seen in the following table:

MECHANICAL ANALYSES OF THE WABASH SILT LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
51a	½ mile west and ¼ mile north of Bartonia.	Soil, 0 to 16 inches....	.3	1.5	2.5	8.4	9.9	47.3	20.4
51b	Subsoil of 51a.....	Subsoil, 16 to 36 inches.	.5	1.1	2.6	7.0	8.0	47.7	32.1

Muck.

There are a few very limited areas of muck in the county, most of which occur in undrained depressions, but a few in the poorly drained portions of the stream bottoms. This muck is an impure form of peat, resulting either from a concentration of the inorganic matter by decomposition in the presence of the atmosphere or a mixing with the underlying formation. It is often referred to

as a light chaffy soil. The muck* of this locality has had its derivation, mainly, from the partial decomposition of grasses and sedges in the presence of water, and is the black variety.

The thickness of the muck beds range from 2 inches to 2 feet. In the upland the subsoils are similar to those of the Miami black clay loam, while in the bottom lands they resemble the Wabash silt loam.

In this county the muck land, as a soil, seems to rank low in the estimation of the farmers, but the time will come when it will take its place among the best. It is in a stage today, that the Miami black clay loam soils were a few centuries ago. All it lacks is a mixing with other soils, and then it will, if properly handled, grow sixty-five bushels of corn to the acre. Onions, peppermint, celery and potatoes all do exceedingly well on the muck. In northern Indiana, where muck is a common soil, 350 bushels to the acre is considered an average crop for onions, 150 bushels for potatoes, 2,400 dozen for celery and thirty pounds of oil for peppermint.

Miami Loam.

The Miami loam along the East Fork of Whitewater River, Green's Fork and West River of Wayne County follows the valleys of these streams northward into southern Randolph County. Outside of these limited areas, no others of sufficient size to map, were found. For texture, subsoils, colors, occurrences, crops, selling price and other characteristics, these soils are almost identical with the Miami loam of Randolph County.

*Thirty-first Ann. Rep. Geol. Sur. of Indiana, 1906. p. 82.

WAYNE COUNTY.

HISTORY OF SETTLEMENT AND INDUSTRIES.

Wayne County lies in the east central part of the State of Indiana on the Ohio line, and has an area of 409 square miles. It was formed in 1810. The first court was held in 1811, and as early as 1821, a newspaper was published at Richmond. In 1828 an Agricultural Fair was held at Centerville and at the first State Fair, Wayne County took more than half of the high class premiums. A Horticultural Society was organized at Richmond in 1855.

Since these early beginnings, developments in all lines have been very great. With its excellent transportation facilities by both railroad and wagon road, its numerous manufacturies and above all its extensive areas of improved farming land; Wayne County ranks high among the counties of the State.

Although Wayne County has Richmond with its 23,000 people and numerous manufacturies and also Cambridge City and Hagerstown with their varied plants and occupations, yet agriculture, by some odds, remains as its leading industry. In 1908 there were over 30,000 acres of wheat sown, 51,000 acres of corn, 8,600 of oats, 500 of rye, 25 of tomatoes, 24 of tobacco, 150 of potatoes, 13,000 acres of clover cut for seed, 9,000 acres for hay, 9,000 of timothy for hay and 230 of alfalfa. On January 1, 1909, there were in Wayne County about 7,478 horses and colts, 431 mules, 5,893 dairy cattle, 6,814 beef cattle, 29,784 hogs and 7,500 sheep. The township averages for the various crops will be found in the table on a succeeding page. About seventy-one per cent. of the land in Wayne County is being tilled, fifteen is cleared land in pastures, twelve per cent. in woodland pasture and two per cent. in woodland that is not in pasture.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.														Tons Per Acre.						
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Abington	Miami clay loam	Farmers				55	35			16																
	All types occurring	Statistical Report	13,387	7,877	1,726			32			12½			7½			1			1⅒			1⅒			
Boston	Miami clay loam	Farmers				60	40		26	18		50	35													
	Miami black clay loam	Farmers				75	45		20	15																
	All types occurring	Statistical Report	13,344	9,710	2,082			38⅜			16			17			1½			2			1½			2½
Center	Miami clay loam	Farmers				60	40		20	15			30			1			1½							
	Miami loam	Farmers				70	45		20	16																
	All types occurring	Statistical Report	24,153	15,997	3,665			36⅞			14⅕						1¼						1			
Clay	Miami clay loam	Farmers				55	37			15																
	All types occurring	Statistical Report	11,641	8,275	1,961			38			16			13⅔			1⅓			1⅛			1			2
Dalton	Miami clay loam	Farmers					35			14																
	Huntington loam	Farmers				55	40			12																
	All types occurring	Statistical Report	9,947	6,878	1,965			35			12½			11			1⅒			1⅛			1⅒			
Franklin	Miami clay loam	Farmers				50	35		18	12																
	All types occurring	Statistical Report	17,964	14,640	2,806			36½			16½			14¼			1⅕			1¼			1⅕			1⅛
Greene	Miami clay loam	Farmers				45				15																
	All types occurring	Statistical Report	15,318	12,706	2,581			36			16¼			12			¾			2½			1			

Harrison	All types occurring	Statistical Report...	10,490½	7,871½	2,056			33			17¼			16			1⅜			1¼			1¼			1⅛		
Jackson	Miami clay loam	Farmers				50	45		20	18			30			1				1½			1½					
	Miami loam	Farmers				60	50		18	15																		
	All types occurring	Statistical Report...	16,245	13,958	2,049			38¼			17⅝			13⅔						1¼			1¼			1½		
Jefferson	Miami clay loam	Farmers				50	35			12																		
	Miami loam	Farmers				60	45																					
	All types occurring	Statistical Report...	15,659	11,017	2,727			41			16½			16½			1⅞			1⅛			1⅛			2½		
New Garden	Miami clay loam	Farmers				55	40		24	16			35															
	Miami loam	Farmers				60	42		20	14		48	35															
	All types occurring	Statistical Report...	14,632	12,476	1,846			32½			17⅓			10			0 11			1½			1⅜					
Perry	Miami clay loam	Farmers				48	32		15	12			30															
	All types occurring	Statistical Report...	10,613	8,990	1,451			40			14½			17			1⅛			1⅛			1					
Washington	Miami clay loam	Farmers				50	40		18	15																		
	Miami loam	Farmers				70	50		18	14																		
	Huntington loam	Farmers				70	50																					
	All types occurring	Statistical Report...	26,459	22,232	3,327			40			18½			14⅔			1⅛			2¼			1⅛			2		
Wayne	Miami clay loam	Farmers				60	40		20	15		38	30															
	Miami loam	Farmers				60	45		20	15																		
	All types occurring	Statistical Report...	28,697	18,699	9,834			36			21			15			1 7/10			1⅜			1⅜			2		
Webster	Miami clay loam	Farmers					35																					
	All types occurring	Statistical Report...	9,273	6,782	1,195			33½			18			12½			1⅜			1⅛			1⅛					
Totals and averages for Wayne County			237,823½	178,108½	41,271	57	43	36½	20	15	16½	45	32	13		1	1⅛		1½	1½			1⅛			2		

LAND, CROP AND STOCK REPORT—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Abington	Miami clay loam	Farmers											$35 to $125.
	All types occurring	Statistical Report	339	20	276	263	643	1,744	24	1½	2	1½	
oston	Miami clay loam	Farmers							65		4		$50 to $100.
	Miami black clay loam	Farmers							100		4		Av. of $100.
	All types occurring	Statistical Report		24	359	528	413	2,654	34½		2⅔	3	
Center	Miami clay loam	Farmers							35		5		Av. of $80.
	Miami loam	Farmers							40		6		Av. of $100.
	All types occurring	Statistical Report	776	17	584	528	532	2,135	25½	⅓	1	1	
Clay	Miami clay loam	Farmers							50				$50 to $110.
	All types occurring	Statistical Report	248	18	220	181	441	1,833	48	½	1	2	
Dalton	Miami clay loam	Farmers											$30 to $80.
	Huntington loam	Farmers							30		2	5	$70 to $115.
	All types occurring	Statistical Report	310	10	303	195	338	880	29	⅝	3½	3½	
Franklin	Miami clay loam	Farmers							30		2	10	$65 to $100.
	All types occurring	Statistical Report	565	30	536	1,298	292	3,209	28	⅓	1 10/10	⅝	
Greene	Miami clay loam	Farmers							30		1	3	
	All types occurring	Statistical Report	454	19	168	631	584	1,820	37	3⅔	1⅓	2	

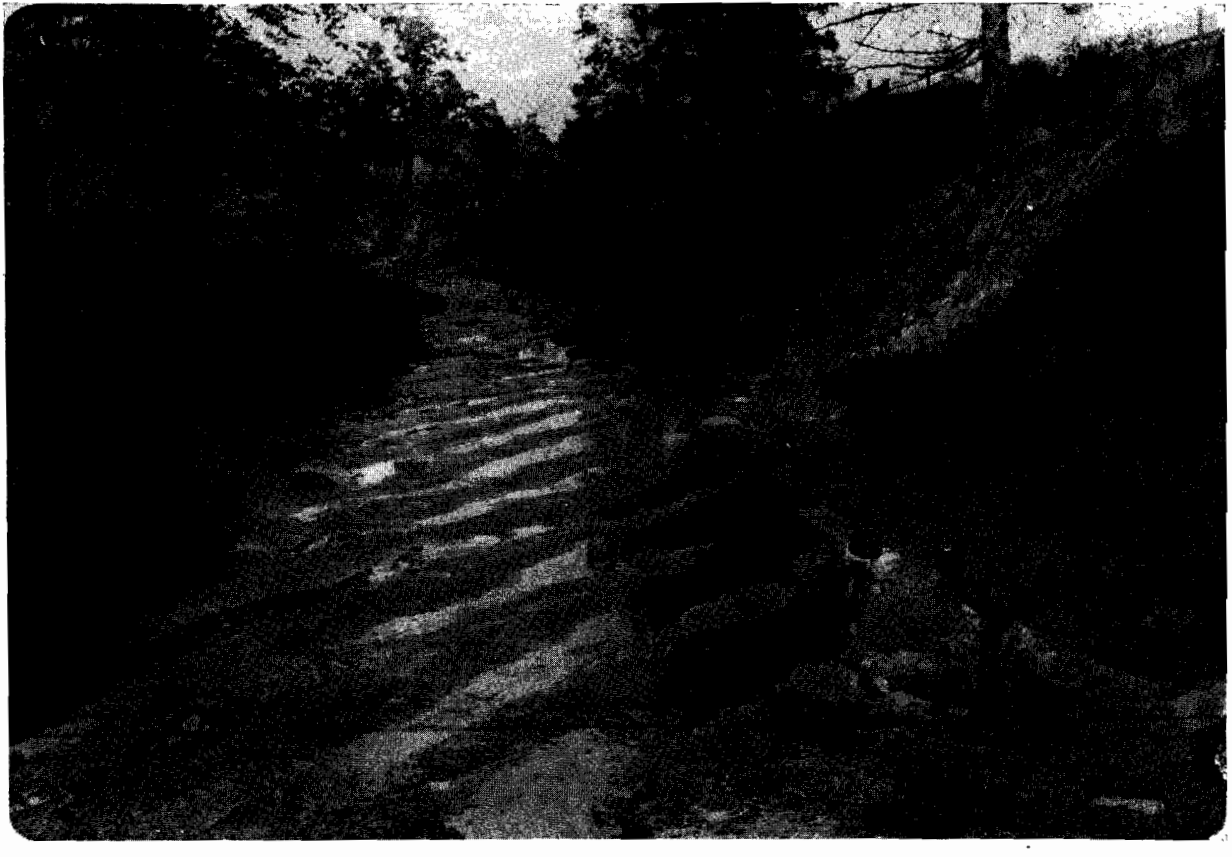
Harrison	All types occurring	Statistical Report	241	14	.....	265	380	1,478	24½	⅕	2	2⅔	.....
Jackson	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	40	.....	4	.....	$70 to $100.
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	60	.....	.....	.....	Av. of $100.
	All types occurring	Statistical Report	521	42	418	434	908	2,277	30⅔	½	1⅔	2½	.....
Jefferson	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	30	.....	2	.....	$60 to $85.
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	40	.....	2	.....	$70 to $175.
	All types occurring	Statistical Report	531	28	484	576	912	2,641	31½	⅔	1⅔	2½	.....
New Garden	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	35	.....	2	.....	$45 to $110.
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	45	.....	3	.....	.....
	All types occurring	Statistical Report	434	18	435	201	487	1,097	34½	⅔	1⅔	2	.....
Perry	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	40	1	4	.....	$60 to $85.
	All types occurring	Statistical Report	247	51	214	55	822	1,153	35	½	½	8½	.....
Washington	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Huntington loam	Farmers	.....	.....	.....	.....	.....	.....	60	.....	.....	.....	Av. of $100.
	All types occurring	Statistical Report	631	84	384	819	68	5,107	.....	½	2¼	1⅛	Av. of $100.
Wayne	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	50	.....	.....	.....	.....
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	45	.....	.....	.....	$80 to $110.
	All types occurring	Statistical Report	1,854	46	1,173	543	274	2,256	18	1⅓	2	¼	$90 to $120.
Webster	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	All types occurring	Statistical Report	327	10	339	297	268	.....	33	¼	1¼	1	.....
Totals and averages for Wayne County			7,478	431	5,893	6,814	7,362	29,784	1,252	1	2½	3	$30 to $125.

PHYSIOGRAPHY AND GEOLOGY.

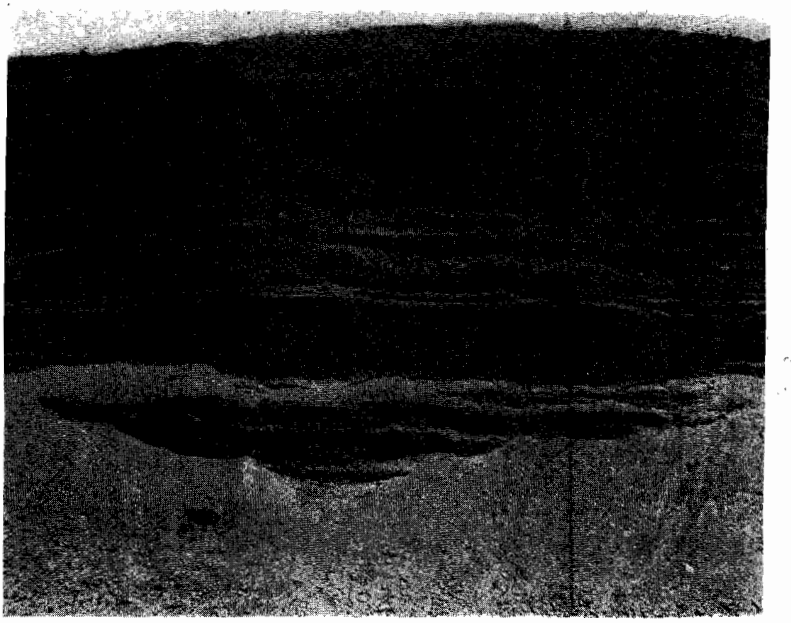
The surface features of Wayne County are controlled largely by several glacial lobes and intervening valleys, all of which have a northeast and southwest direction. Only one of these lobes crosses the county, it entering north of Bethel, passing between Richmond and Centerville and crossing into Union County west of Abington. A difference in elevation ranging from 100 to 150 feet, exists between the summits of the ridges and valley floors; while the general elevation of the county is almost equal to that of Randolph County, the highest county in the State. The maximum elevation, which is in the north part of the county, is about 1,200 feet, and the minimum, in the south portion is a little less than 1,000. The broad valleys, which characterize the various Forks of West Whitewater River, are cut in a sheet of old drift, over which at a subsequent time, the Later Wisconsin moraine was deposited Extensive outwash plains seem to occur along these valleys, between the fluvial terraces and upland, presenting low flat areas underlain largely by either gravel or sand. The East Fork of the Whitewater River has cut its channel into the Cincinnati limestone, while some of the streams close to the Ohio line have cut into the Niagaga limestone.

The geological epochs represented in the formations of this county are the Cincinnati limestone and shales of the Ordovician period, the Niagara limestone of the Silurian, the Later Wisconsin drift and an older drift of the Pleistocene.

A zone of drift extending along the northern third and eastern seventh of the county is underlain by the Niagara limestone; while the drift covering the remaining portion is underlain by the Cincinnati formation. The drift blanket, with exception of that in the southeastern part of the county, ranges from 100 to 150 feet in thickness.



Ripple marks in Richmond limestone, about five miles southwest of Richmond, Indiana. The distance from crest to crest is about two feet to two feet and six inches. (Hole.)



Beds of stratified gravel and sand found in the G. R. and I. gravel pit about one mile northwest of Richmond. Note the cross-bedding at about the center.

A bed of hardpan as it appeared in a cut along the Pennsylvania Railway, one and one-half miles west of Centerville.

SOILS.

There are five soil types found in Wayne County, the Miami clay loam, Miami silt loam, Miami loam and Miami black clay loam occupying the upland, and the Huntington loam the bottom lands. The following table shows the relative extent of each of these types.

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	254	62.0
Miami silt loam	25	6
Miami loam	55	13.4
Miami black clay loam	15	3.5
Huntington loam	60	16.1
Totals	409	100.0

Miami Clay Loam.

Like in Henry and Rush counties the Miami clay loam occurs both as sugar tree and white beech lands, but more frequently as an intermediate between these. The subsoil of the sugar tree variety is a gravelly or sandy clay or clay loam, while that of the white beach is a heavy, tough clay with very little grit. A section of the Miami clay loam taken 3 miles due south of Centerville shows 4 inches of an ash gray soil, with very little organic matter or grit; grading into 5 inches of a pale yellow clay, mottled with yellow spots of iron hydrate. Underlying this are 5 inches of a sandy drab clay with a bluish tinge. The clay is tough and heavy and is penetrated with difficulty. Two feet of a fine sandy loam, with a light yellow color and containing some gravel, occurs at the bottom of this section. Quartzite, quartz, limestone, granite gneiss and other rocks are found in the gravel. Glacial striations are found on much of the limestone. Another section occurring 2 miles northwest of Fountain City, which is about an average for the county, has from 4 to 7 inches of a light medium gray soil, grading into from 2 to 6 inches of a soil with a lighter color and about the same texture. From 8 to 18 inches deeper the subsoil is a heavy, tough dark brown clay, containing some limestone pebbles. It does not crumble readily in the hand, but the light brown subsoil underlying it does. It also contains limestone pebbles and has a very noticeable amount of fine sand.

Although looked upon as a very undesirable soil a few decades ago, a Miami clay loam farm today, if properly improved, is even more desirable than one in the stream bottoms. A careful inquiry from the leading farmers of the county concerning the Miami clay loam reveals the fact that the better farms produce on and average about fifty-three bushels of corn to the acre, while the average farm produces about thirty-five. Fifteen bushels is an average wheat and thirty-three oats crop. Clover yields one bushel of seed and one and one-fourth tons of hay to the acre, timothy one and one-fourth tons of hay and alfalfa two tons.

Among the main needs of the farms of the Miami clay loam are tile, green manure, better cultivation, a careful selection of seed, a systematic crop rotation, the feeding of more stock over the land and a more intelligent utilization of commercial fertilizer.

About every farmer uses all of his stable manure on his farm and is aware of the fact that there is no land in the county that is helped as much and shows the effects as long as the Miami clay loam. It is reported by farmers that the effects of stable manure on this ground can be seen for twelve years. The following table gives the results of the mechanical analyses of typical samples of this type.

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	Locality.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
33a	3 miles south of Centerville.	Clay loam, 0 to 4 inches.	U. S. Bureau of Soils.	.4	2.3	1.7	5.2	5.0	70.7	14.4
33b	Upper subsoil of 33a.	Clay loam, 4 to 9 inches.	U. S. Bureau of Soils.	.2	1.2	1.8	4.6	3.4	67.8	20.6
33c	Second subsoil of 33a.	Sandy clay, 9 to 14 inches.	U. S. Bureau of Soils.	.4	2.3	3.5	10.6	7.6	40.2	35.1
33d	Third subsoil of 33a.	Fine sandy loam 14 to 38 inches.	U. S. Bureau of Soils.	1.9	5.0	5.4	15.9	12.1	38.7	20.7
36a	2 miles northwest of Fountain City.	Clay loam, 0 to 9 inches.	U. S. Bureau of Soils.	.4	2.9	3.3	11.8	14.1	50.5	16.5
36b	Subsoil of 36a.	Sandy clay, 9 to 36 inches.	U. S. Bureau of Soils.	1.2	2.5	2.6	7.7	7.9	50.4	27.5
2	Central part of section 23 (12 E., 15 N.)	Surface clay loam, 0 to 10 inches.	A. E. Taylor....	.5	.4	.8	2.2	2.5	72.1	21.5
50a	2 miles west of Abington.	Soil, 0 to 9 inches.	A. E. Taylor. ..	.8	1.4	2.5	5.3	6.5	68.3	14.0
50b	Subsoil of 50a.	Subsoil, 0 to 36 inches.	A. E. Taylor....	1.2	1.5	3.7	7.2	10.3	53.7	32.1
35a	2 miles south of Hagerstown.	Soil, 0 to 11 inches.	A. E. Taylor....	1.5	3.8	8.2	6.8	18.8	45.6	13.0
57a	2 miles west of Williamsburg.	Soil, 0 to 10 inches.	A. E. Taylor....	1.7	2.1	4.2	10.6	12,6	52.0	15.5
57b	Subsoil to 57a.	Subsoil, 0 to 36 inches.	A. E. Taylor....	1.8	1.5	2.7	7.1	8.2	41.3	40.1

Miami Loam.

The plow soil of the Miami loam varies between a medium and dark brown and has an average thickness of 11 inches. It contains more organic matter and sand, less silt and has a coarser texture than the Miami clay loam. From 1 to 2 feet of the surface the subsoil varies between a dark reddish brown and a light or medium yellow loam, becoming more sandy and gravelly as it is found deeper in the section. Beds of gravel and sand are often found at depths of 4 to 6 feet.

This type in Wayne County occurs between the Huntington loam, which comprises the bottom lands along the stream courses, and the Miami clay loam, which covers the lobate moraines; and beyond the terminals of the lobate moraines. The gravel, sands, rock flour and other material from which the Miami loam has been derived, and which at present comprises largely the lower subsoil, were likely a portion of the outwash from the lobate moraines at the time the ice was melting, thus having the topographical position at present of an outwash plain. The evidence pointing to such an explanation would be (1) the fact that the soil is sandy and becomes more and more so as one goes down, (2) that beds of pure gravel and sand are a rather frequent occurrence at 4 to 6 feet, showing the sorting work of water; (3) that many of the limestone pebbles contain glacial striæ, indicating that they were not carried very far by the water; and (4) that the topographical relations to the lobate moraines are just right for outwash plains. The surface of the Miami loam is generally very level with a slight grade upward toward the ridges and extending up on the side of the ridges for a short distance, but in cases, especially west of the East Fork of the Whitewater River, this soil reaches far up the side of the ridge, with considerable surface slope. In places it is very difficult to tell where the higher terraces leave off and the outwash plains begin, because of the close similarity in color, texture and topography.

The timber growing on this soil is the rock maple, black walnut, red and yellow beech and other trees that do best when they have a loose, warm soil and subsoil, so that their roots can readily penetrate downward. This gravelly and loose condition of the subsoil gives a natural drainage so that very little tiling is needed.

The Miami loam is very early, warm and well aerated. Corn crops average about forty-four bushels to the acre, while the more prosperous farmers get about sixty. Wheat averages sixteen bushels and oats thirty-five. For trucking purposes this land is es-

pecially well adapted and should be more extensively used for this purpose, especially in the vicinity of Richmond, where there is a good market for garden products. Potatoes yield well, one farmer reporting 200 bushels to the acre, and alfalfa grows about the same as on the Huntington loam. Stable manure and commercial fertilizer are applied to this soil and show good effects for a few years, but not for so long a period as where they are put on the Miami clay loam.

On an average, for each 100 acres, forty hogs and two beef cattle are turned off, annually, by the farmers of the Miami loam. Very few sheep, horses or mules are raised for the market.

Owing to the natural underdrainage, high fertility and warm condition of the ground, the farms for value, rank next to the Miami black clay loam, in the vicinity of Boston; ranging from $75 to $150 per acre and having an average selling price of about $115. The results of the mechanical analyses of samples of the Miami loam are given in the table below.

MECHANICAL ANALYSES OF MIAMI LOAM.

Number.	Locality.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sond.	Very Fine Sand.	Silt.	Clay.
30a	2½ miles south of Fountain City.	Surface.....	U. S. Bureau of Soils.	1.0	2.9	4.3	12.3	5.9	57.3	16.2
30b	Subsoil of 30a.	Subsoil.....	U. S. Bureau of Soils.	1.2	3.9	4.5	13.9	4.9	47.8	23.4
34a	3½ miles west of Green's Fork.	Surface.....	U. S. Bureau of Soils.	.4	2.2	2.4	4.4	4.8	72.5	12.9
34b	Subsoil to 34a.	Subsoil.....	U. S. Bureau of Soils.	.8	2.8	3.0	4.9	7.3	62.3	19.0

Huntington Loam.

The predominating type of the first and second bottoms is the Huntington loam. Its occurrence, texture, subsoil and general characteristics are similar to those given for the Huntington loam in the general discussion, page 23.

The principal developments in the bottom lands are along the West Fork of the Whitewater River, Green's and Noland's Forks; while those along the East Fork of the Whitewater River are small and subjected to floods. All other streams of the county have bottoms of some size, but the soils of the smaller of these are generally mingled with the wash from the upland; and cannot be classed as typical Huntington loam.

For agricultural purposes the second bottoms are considered better than the first. This is due to the more sandy or gravelly condition of the latter, which cause them to be affected more seriously by droughts; and also by the high waters which flood them. On account of the floods, corn is often the only grain raised. The average corn yield for the Huntington loam during a period of ten years is thirty-eight bushels to the acre, while the best farmers get about sixty. This average is a little lower than that of the Miami loam, but higher than the Miami clay loam. Wheat does not do as well as on the Miami clay loam, only averaging about twelve bushels to the acre. This soil resembles the Miami loam for holding commercial fertilizers or manure and also as a suitable soil for gardening.

The original timber growing on this soil consisted of sycamore, ash, elm, and water maple on the first bottoms, while rock maple, black walnut, red beech and yellow beech grew on the second bottoms.

The value of the farms of this type range from $10 to $115, but the average selling price is about $100 for the second bottoms and $60 for the first.

The following table shows the results of the mechanical analyses of a sample of this type.

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
45	First bottom south of Milton.	Soil, 0 to 14 inches....	3.7	4.4	7.1	18.3	20.9	36.8	9.8

Miami Black Clay Loam.

The principal occurrence of the Miami black clay loam in Wayne County is found in the southeast corner, where between 8 and 9 square miles of surface are more than half covered by this type. Many other occurrences in the form of basin-like depressions in the Miami clay loam are found in all different parts of the county, but few exceed thirty acres in extent.

The texture is about the same as described in the introduction. In most cases the soil has been cultivated for some time and is tiled, thus having passed beyond that early stage when its cohesiveness and tendency to puddle make plowing very difficult.

With its very high percentage of humus, its richness in other plant foods, its granular and loose texture and warm nature, the Miami black clay loam stands first as a corn producer. The average corn crop for the better class of farmers is about sixty-five bushels, while the general average is forty-five. Wheat averages fifteen bushels and oats forty per acre. Clover ranges from one to two tons to the acre, when the drainage is sufficient to prevent heaving.

Very few farmers having Miami black clay loam farms sell their grain, unless it would be wheat; but instead feed it to stock. An average of one hog to the acre is sold from these farms annually. The average selling price of the type is about $110 per acre, although where well improved it sells for as as much as $150.

The following table gives mechanical analyses of typical samples of the Miami black clay loam.

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
39a	½ mile sout of Economy.	Soil, 0 to 7 inches.	U. S. Bureau of Soils.	1.3	4.8	5.4	14.6	13.2	39.9	20.5
39b	Subsoil to 39a..	Subsoil, 7 to 14 inches.	U. S. Bureau of Soils.	1.0	3.0	4.5	12.9	9.4	46.9	22.1
39c	Second subsoil to 39a.	Subsoil, 14 to 36 inches.	U. S. Bureau of Soils.	.8	2.9	3.7	12.7	14.7	37.1	27.8

Miami Silt Loam.

This type is found in the eastern central and southeastern part of the county, and is an extension of the Miami silt loam area of Union County. The texture, crops and general characteristics of the part lying south of Richmond are about the same as they are in Union City, but northeast of Richmond the soil has a medium brown color and is generally underlain by a sandy clay, which grades into a sandy loam. Sometimes a bed of gravel is found within 4 to 5 feet of the surface.

The topography of the area lying northeast of Richmond is rather broken and the pronounced ridges and hills are decidedly morainic in both their appearance and composition. Gravel and sandpits are numerous near the summits of the ridges. When the gravel is close to the surface the crops are liable to die during a drought. This soil is easy to work, is of a warm nature and often has a good natural underdrainage.

The following table gives mechanical analyses of typical samples of the Miami silt loam.

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	Locality.	Description.	Analyst.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
38a	1 mile north, 3 miles east of Economy.	Surface, 0 to 6 inches.	U. S. Bureau of Soils.	.6	1.9	2.5	8.4	9.2	59.6	17.5
38b	Subsoil to 38a.	Subsoil, 6 to 36 inches.	U. S. Bureau of Soils.	1.2	2.8	3.3	10.0	9.6	47.7	25.2
16a	2 miles southwest of Boston.	Silt loam, 0 to 10 inches.	A. E. Taylor....	.1	.3	.8	2.2	2.5	77.0	17.3

HENRY COUNTY.

Henry County, with an area of 395 square miles, is found in the east central part of the State. It was created in 1821. By autumn of the same year 100 houses had been erected within its confines. From this time up until a few years ago there was a steady growth in population, due largely to agricultural developments, but during the last few years some large plants have been erected at Newcastle, causing it to grow from a place of 3,500 to one of 9,000 and take its rank as the most enterprising town of its size in the State.

The factories located at New Castle are those of the Maxwell-Brisco Automobile Co., furnishing employment for 2,200 men; the Indiana Rolling Mill Co., with 300 workmen; the French & Sons Piano Co., and the Hoosier Kitchen Cabinet Co. Another industry, in which New Castle is said to be without a rival, is the growing of the American Beauty Roses. Four very capacious greenhouses, for growing these particular flowers, have been built.

Henry County has six steam railways, three electric railways and 500 miles of graveled wagon road.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																	
						Bushels Per Acre.												Tons Per Acre.					
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Blue River	All types occurring	Statistical Report	13,169	10,973	1,882	..	..	34	..	..	11¾	..	..	17½	..	..	1⅛	..	..	1⅛	..	..	1⅛	..	..	⅛
Dudley	Miami clay loam	Farmers				55	35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Miami black clay loam	Farmers				65	45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	18,894	16,963	1,838	..	..	40	..	..	18	..	..	19	..	..	⅜	..	..	1¼	..	..	1⅜	..	..	3⅜
Fall Creek	Miami clay loam	Farmers				60	38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Wabash loam	Farmers				70	45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	13,994		1,605	..	..	..	..	..	16½	..	..	26½	..	..	1½	..	..	2	..	..	1¼	..	..	..
Franklin	Miami clay loam	Farmers				50	30	..	18	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Huntington loam	Farmers				60	40	..	20	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	13,826	11,979	1,506	..	..	33	..	..	22½	..	..	35	..	..	1	..	..	1⅓	..	..	1½	..	..	..
Greensboro	All types occurring	Statistical Report	7,652	6,029	755	..	..	47	..	..	17	..	..	16	..	..	1¼	..	..	1⅓	..	..	1⅓	..	..	..
Harrison	Miami clay loam	Farmers				50	33	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Miami black clay loam	Farmers				70	45	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Huntington loam	Farmers				70	40	..	..	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	20,847	16,503		..	..	44½	..	..	15½	..	..	15	..	..	1⅛	..	..	1⅞	..	..	1⅔	..	..	..
Henry	Miami clay loam	Farmers				60	35	..	..	13	..	..	35	..	..	..	..	2	1½	..	..	1½	..	..	..	..
	Miami black clay loam	Farmers				65	45	..	..	12	..	..	35	..	..	..	..	..	..	..	..	..	..	..	..	..
	Huntington loam	Farmers				..	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Wabash loam	Farmers				65	45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	All types occurring	Statistical Report	15,665	13,545	1,681	..	..	44½	..	..	16¾	..	..	17⅔	..	..	1	..	..	1½	..	..	1½	..	..	3

Jefferson	Miami clay loam	Farmers				50	30			13								1½												
	Miami black clay loam	Farmers				70	45			10								1½												
	All types occurring	Statistical Report	17,376	14,631				43½		17		23½		1				1½				1½								
Liberty	Miami clay loam	Farmers							11																					
	All types occurring	Statistical Report	25,316	21,006	4,139			43		16½		20		9/16				1 1/5				1⅛				1½				
Prairie	Miami clay loam	Farmers				55	37			13							2					1½								
	Wabash loam	Farmers				60	40																							
	All types occurring	Statistical Report	24,534	15,670				35½		12		18		1⅓				1⅓				1½								
Spiceland	Huntington loam	Farmers					42																							
	All types occurring	Statistical Report	13,156	10,380	2,848			40		20		20		1⅛				1⅛				1				1¼				
Stoney Creek	Miami clay loam	Farmers				45	32		17	13																				
	All types occurring	Statistical Report	12,791	11,041				35		14		21½		1½				1⅛				⅞								
Wayne	Miami clay loam	Farmers				55	32		14		30																			
	All types occurring	Statistical Report	13,065	11,136	1,836			34½		15		19		1 1/7				1⅛				2½								
Totals and averages for Henry County			210,285			30	38½	40	18	12	13½		32	20			1½			1½	1⅓		1½	1⅔				2		

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Blue River	All types occurring	Statistical Report	432	6	362	302	500	1,701	41	1	2	1⅔	
Dudley	Miami clay loam	Farmers											$75 to $115.
	Miami black clay loam	Farmers											$100 to $150.
	All types occurring	Statistical Report				539	1,067	2,290			2		
Fall Creek	Miami clay loam	Farmers											Av. of $90.
	Wabash loam	Farmers											Av. of $65.
	All types occurring	Statistical Report	505		428	385	403	2,337	33	⅓	2½	2⅔	
Franklin	Miami clay loam	Farmers											$60 to $70.
	Huntington loam	Farmers											Av. $100.
	All types occurring	Statistical Report	628	22	393	2,965	402	3,020	27½	⅓	2	½	
Greensboro	All types occurring	Statistical Report	338	13	197	58	403	1,811	51	1⅓	3	3½	
Harrison	Miami clay loam	Farmers											$65 to $100.
	Miami black clay loam	Farmers											Av. of $100.
	Huntington loam	Farmers											
	All types occurring	Statistical Report	585	10		315	687	3,485	30	2½			
Henry	Miami clay loam	Farmers											Av. of $90.
	Miami black clay loam	Farmers											Av. of $100.
	Huntington loam	Farmers											
	Wabash loam	Farmers											
	All types occurring	Statistical Report	649	32	4,399	440	794	1,906	36⅔	1	2	3	

tured it, conveying the water in a northwesterly direction to the White River. Blue River was left as a small creek which was entirely too small to keep the old river channel open. The result was that the old valley remained as a catchment basin for the numerous intermittent streams along its sides, but had no stream of sufficient size to carry the water away. A marshy condition began to develop, and a large amount of vegetation accumulated in the presence of water, which is seen today in the muck beds and the dark Wabash silt loam and Wabash loam soils that cover the surface. Shortly after Buck Creek captured the upper portion of Blue River, a new tributary of Buck Creek began to work its head southward over the floor of Blue River Valley. It has now succeeded in advancing one mile down the valley, changing the slope of the valley plain from south to north. The divide between this tributary and the one extending up the valley from Blue River is steadily advancing southward.

SOILS.

The soils of the area are divided naturally into two groups—upland and bottom land. The Miami clay loam and the Miami black clay loam are found in the upland division; the Huntington loam, Wabash loam, Wabash silt loam and muck in the bottom land division. The following table shows the extents of these various types:

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	340	86.1
Miami black clay loam	30	7.6
Huntington loam	15	3.8
Wabash loam	6	1.5
Muck	4	1.0
Total	395	100.0

Miami Clay Loam.

Among the soils of every civil township of the county the sugar tree, white beech and intermediate varieties of the Miami clay loam are represented. The former, a medium brown soil of a somewhat gritty nature, is found occupying some of the morainic ridges and outwash plains, but not so much the valley slopes, as is the case in counties where the lobate moraines have had much to do with the present topography. The latter is found associated with the Miami black clay loam and covering gently undulating surfaces.

It has a light to ashy gray color and appears very much like a soil of the Miami clay loam, which is found in the bluffs and brakes of Blue River at various places, but is especially well developed immediately south of Newcastle. It is frequently termed a white oak soil, because the white oak is and has been the predominating timber. Where the soil has been largely carried away by the surface wash, and the subsoil is a stiff, compact clay, a scrubby growth of the white oak occurs, which is pointed to as conclusive evidence for a poor soil. The white oak land covers most of northern Prairie and Stony Creek townships, where the surface is broken by glacial ridges, hills and stream valleys. Taking the county as a whole, the intermediate land extends over a larger area than all other soils combined.

The subsoils of the Miami clay loam are very much like those given in the general discussion. The sugar tree variety is underlain by a clay, which becomes more sandy as it occurs deeper, while the white beech may have for its subsoil a sandy clay, grading into a fine sandy loam, or a very compact clay, with some gravel and sand. The white oak variety has a subsoil much like the white beech. The subsoil of the intermediate phase is generally a brown to yellow, somewhat mottled, stiff, tenacious clay loam, but may grade into a sandy clay.

The sugar tree soil has a depth of 9 to 12 inches, and is the most productive, while the intermediate ranges from 8 to 11 inches and is second in productiveness. The white beech land is from 6 to 10 inches in depth and the white oak from 4 to 10. There is little difference in the fertility of the latter two, except that the white oak soil, because of its topographical position, is more liable to erosion wash and hence loses much of its plant foods. An average corn crop for either the white beech or white oak is thirty bushels, while the intermediate produces about thirty-five bushels and the sugar tree thirty-eight. Tomatoes on the sugar tree and intermediate varieties, after manuring well, produce an average of eight tons to the acre. Wheat, on all the different varieties of the Miami clay loam, range from 11 to 16 bushels, depending on the preparation of the ground and the commercial fertilizer.

The sugar tree variety of the Miami clay loam, as it occurs in portions of Henry County, is particularly adapted to the growing of the American Beauty Rose. Among greenhouse companies it is second to none for this purpose, and it is shipped for hot-house beds as far as New Jersey. Heller Bros., leading stockholders and managers of the South Park Floral Company, at Newcastle, gave

the writer the following description of how they prepare the sugar tree compost for the American Beauty hot-beds:

They select a sugar tree soil that has been in pasture for twenty or more years without having been plowed. From this they strip off the upper 3 or 4 inches with as much of the blue grass and roots as can be gotten. The soil is then taken and stacked up in the open air to a height of 20 or 24 inches. Upon this is put from 6 to 10 inches of cow manure, the amount depending on the organic matter in the soil and the straw in the manure. Another 20 to 24 inches of dirt are added and then from 6 to 10 inches of manure; and so the process is continued until the pile has attained a height of 5 or six feet. After standing for six months, 100 pounds of Armour's Bone Meal is mixed with 10 cubic yards of the contents of this pile, which completes the compost. The roses grown on this compost are expressed by the thousands of dozens to numerous points within a radius of 300 miles, while the slips are shipped to all countries of the world.

Of all the soils in Henry County none are neglected as much as the Miami clay loam. Only a small percentage of farms are in a high state of fertility. These few, through tiling, rotating corn, wheat and clover, green manuring, stock feeding and using commercial fertilizer, have been made to produce, on an average, sixty bushels of corn to the acre, twenty of wheat and forty of oats. Where clover is grown solely to plow under, the big English gives the best general satisfaction. This is due to the great amount of organic matter it supplies the soil with, and the tendency it has to develop a more open texture.

The selling price of the Miami clay loam is from $65 to $125 per acre. Farms for cash, rent from $3 to $5 per acre, but most of them are rented on shares.

The following table gives the mechanical analyses of typical samples of this type of soil:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
28	2 miles southwest of Springport.	Soil, 0 to 12 inches....	.7	1.4	3.1	8.0	9.2	61.0	16.2
29	Subsoil of number 28.....	Subsoil, 12 to 36 inches.	.5	1.1	2.5	7.3	8.6	62.7	17.3
33	1½ miles northeast of Sulphur Spring.	Soil, 0 to 10 inches....	1.2	1.6	3.6	9.4	11.0	50.0	23.2
34	Subsoil of number 33.....	Subsoil, 10 to 36 inches.	1.4	2.8	5.0	11.5	13.5	42.9	21.3
41	½ mile south of Luray...	Soil, 0 to 8 inches.....	1.2	1.9	3.4	8.3	9.1	64.5	11.2
55	1½ miles east of Grant City..	Soil, 0 to 7 inches.....	1.2	1.2	2.3	5.5	6.2	68.5	14.4

Miami Black Clay Loam.

The leading areas of the Miami black clay loam are found in Dudley, Greensboro and Jefferson townships. As in Rush County, these represent the best drained land of the county. The plow soil is from 10 to 18 inches deep and is from a dark brown to a black in color. The texture is a loose, granular clay loam, where it is well underdrained and has been cultivated for several years. Otherwise it may be of a sticky, plastic nature, giving much difficulty in plowing. The subsoil may be a dark brown to a black clay loam, becoming more clayey as the depth increases until 2 or 2½ feet beneath the surface, where it grades into a drab clay that gives place to a brown or yellow clay at 3½ or 4 feet. In other cases the drab, with a bluish tint, may be within 2 feet of the surface, or it may be absent altogether; in which event the brown to yellow clay is found immediately beneath the dark brown soil, except for a few inches of contact material, consisting of black clay loam mottled with brown or yellow clay loam. As one goes downward in that section, the gravel and sand, ordinarily, becomes more and more abundant, but in rare cases, a clay, almost free from grit, may continue to a depth of 2½ or 3 feet. The origin, other textural relations, dffiiculties and methods of correcting the same are discussed under the descriptions given for Randolph and Rush counties and in the general discussion.

The Miami black clay loam of Henry County is generally poor wheat ground, nine to ten bushels per acre being about the average. The heaving of the wheat can be remedied by a better underdrainage. Oats range from twenty-five to forty bushels. Corn, for which the land is especially adapted, will average forty-eight bushels to the acre, while the leading farmers will get from sixty to seventy-five. The quality of the grain and grass raised is inferior to that of the Miami clay loam. This is noted when stock will invariably select the blue grass of the Miami clay loam when given their choice. The selling price of this land ranges from $75 to $150 per acre.

Huntington Loam.

This type is best developed in the second bottoms along Blue River and Big Flat Rock Creek. It is also found in the first bottoms, but most often in an impure form, because of its close association with the Wabash loam. The most common occurrence is 10 to 18 inches of a medium to dark brown loam at the surface, grading

into a slightly light colored sandy clay or heavy loam of 1 to 2 feet, which grades into a bed of sand or gravel at from 3 to 6 feet. The origin and texture are taken up in the general discussion.

The underdrainage of this type is the best of any in the county, which results in its being very early and quick to dry off after a heavy rain. The Miami black clay loam alone excels it in corn, but in no other crop. The average corn crop is about forty-two bushels, while wheat is eleven to thirteen and oats from twenty-five to forty. The value of this type varies from $65 to $150 per acre.

Wabash Loam.

This type is generally found along streams where ponding has occurred in the past. It frequently grades into a silt loam and muck, and almost always is associated with Huntington loam. Its main occurrence is in the first bottoms of Blue River, Flat Rock and Little Fall creeks.

The surface soil is a dark brown to black loam, gravelly loam or silt loam of 10 to 18 inches. It becomes slightly heavier with depth, and the texture appears rather silty, due in part to a very high percentage of organic matter. Below the surface soil the amount of sand and gravel increases and the color becomes lighter as one gets deeper in the section until a bed of either sand or gravel is reached from 4 to 6 feet. In special cases the gravel and sand beds are at the surface, but this happens over very limited areas.

The soils covering the bottoms of the Old Blue River Valley, which is located between the place where Blue River turns from the east to the south and the Delaware County line, are almost as often a silt loam as a loam, and in cases are clay loam and muck. The loam is found occupying the higher portions of the bottoms, while the silt and clay loam seem to be in the lower areas. The silt loam is almost identical with that found in the Dismal Creek bottom of Randolph County, with the exception that it is not so well drained. The tough, sticky nature makes it very hard to plow. In many places the ground water level during a wet season is often within 5 or 6 inches of the surface. As soon as the corn roots get below this level the blades begin to turn yellow. Even where the ground water level is sufficiently low the swampy condition keeps the land too wet for cropping. The corn production of much of this land might be tripled if tiling, dredging and cultivation were properly attended to.

For corn yields the Wabash loam, where not flooded or too wet, is superior to the Huntington loam, but inferior for quality, while the wheat and oats crops are smaller.

For selling price the Wabash loam will not equal the Huntington, except where underdrainage is good, in which case it is as high-priced as any land in the county.

Muck.

No other county in the surveyed area has as extensive beds of muck as Henry, nor is there any other county where the farmers are so well acquainted with the methods of improving it.

The muck beds are best developed in Blue River Valley from two to four miles north of Newcastle and in the old Blue River Valley north of where Blue River turns from the east to the south. These beds in derivation and composition are much like those of Randolph County, except that in the southern area a great deal of iron has been carried in solution from the numerous little springs that dot the valley slopes. This has been precipitated as a hydrate in the muck, which gives it a red color. When a heavy wind blows over the dried surface, great clouds of the light chaffy soil rise into the air. These have a red color which can be detected for several miles.

If the native sod is merely broken up and cultivated scarcely any crop at all can be raised unless it would be onions; but when once mixed with the other ground it becomes a most excellent soil for both corn and onions. One farmer stated that he could not get over ten bushels of corn to the acre and that was exceedingly poor. One year when the blades were turning yellow, about August 1, he put a shovel full of clay loam around each hill. The blades again took on the green color and the corn crop turned out well. After that he made a practice of spreading the clay loam over his muck the same as he would manure on the clay loam ground. The result has been that his muck produces seventy-five bushels of corn to the acre.

W. E. Ferris, a farmer one mile north of Newcastle, built dams on the hillsides adjoining the muck beds and at times of freshets opened them, allowing the water to wash the soil and subsoil from the slopes down onto the muck. This mixture of wash and muck produced seventy-five bushels of corn to the acre and 500 bushels of onions. Muck has been used on the clay loam as a manure with splendid results..

The results obtained by mixing the muck and clay loam or a clay loam subsoil seem to be due to the fact that a typical muck soil of Indiana when dry contains 3-10 per cent. of potash, the same amount of phosphoric acid, and from 3½ to 4 per cent. of nitrogen, while a clay subsoil has about 2 per cent. of potash and 1-10 per cent. each of phosphoric acid and nitrogen. This indicates that the muck runs very low in potash and high in nitrogen, while the clay has a fair amount of potash, but becomes in a few years deficient in nitrogen. This mixture also interferes with the capillary action, which keeps the muck wet, and so permits it to dry out. Various organic acids of the muck break down the complex silicates of the clay loam and subsoil and thus leave the plant food in an available form.

RUSH COUNTY.

Through the St. Mary's treaty of 1818 a large part of the land of central and northern Indiana was acquired from the Pottawattamie, Miami and Delaware tribes of Indians. This extensive tract, which was known as the "New Purchase," was designated by the legislature of 1820 as Delaware County. Out of this tract were formed both Henry, Rush and eighteen other counties. The organization of Rush County became effective in 1822. The county was named in honor of Dr. Benjamin Rush.

Rushville, which was only a rude clearing in the forests eighty-five years ago, is now a thriving town of over 5,000 inhabitants. Its industries are varied, being distributed among a number of shops and small factories. The other towns are small, ranging in population from thirteen to 700.

In the early days Rush County was almost an unbroken forest, but after long months of hard toil by the sturdy pioneers, together with the labor of subsequent generations, these forests have been replaced by some of the best farming land in the State of Indiana. Improvements of all kinds are common, the railway and wagon road facilities being especially good.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																	
						Bushels Per Acre.												Tons Per Acre.					
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Anderson	Miami clay loam	Farmers				60	40		25	18															
	Miami black clay loam	Farmers				65	45			14															
	Al types occurring	Statistical Report	22,190	18,301	2,541						17						1 1/8		1 1/7			1 1/8			1 1/4
Center	Miami clay loam	Farmers				60	40		20	15		35			1 1/2			1 1/2			1 1/4				
	Miami black clay loam	Farmers					50			12															
	All types occurring	Statistical Report	19,610 1/12	15,552 1/2	2,735 7/12						16			15			1 1/8		1 1/10			1 1/10			1
Jackson	Miami clay loam	Farmers				60	40																		
	All types occurring	Statistical Report	14,045 1/2	11,511	1,587			48			19			19			1 1/6		1 1/6			1 1/6			2 1/2
Noble	Miami clay loam	Farmers				60	40		20	15															
	Miami black clay loam	Farmers				65	50			13															
	All types occurring	Statistical Report	20,637	17,207	2,646			45			13			18			3/4		1 1/4			1 1/3			2
Orange	Miami clay loam	Farmers					35		20	15															
	Huntington loam	Farmers					50			13															
	All types occurring	Statistical Report	21,686 1/2	17,678	3,635 1/2			49			18			18					1			1 1/4			
Posey	Miami clay loam	Farmers				50	35		18	15															
	Miami black clay loam	Farmers				70	50			15															
	All types occurring	Statistical Report	21,088	18,498	1,745			38			15			15			1		1 1/6			1 1/3			1 1/4
Ripley	Miami clay loam	Farmers				50	35			15					1 1/2			1 1/2			1 1/2				
	Huntington loam	Farmers				60	45		15																
	All types occurring	Statistical Report	20,438	15,509	3,275			35			17			14			1		1 1/4			1 1/5			1 1/3

Richland	Miami clay loam	Farmers					35			15																						
	Miami black clay loam	Farmers					40			8																						
	All types occurring	Statistical Report	17,933	14,106	2,967			42			15			22½			1½			1⅛			1¼			2⅛					
Rushville	Miami clay loam	Farmers				60	40		18	15																						
	Miami black clay loam	Farmers				65	45			14																						
	Huntington loam	Farmers				60	45		18	15																						
	All types occurring	Statistical Report	26,595	18,644	3,153			47			15			22			1			1⅓			1½			1					
Union	All types occurring	Statistical Report	21,138	14,814	3,529			44			18			18			1½			⅝			1⅛			1⅓					
Washington	Miami clay loam	Farmers				50	35			15			35			1½			1½			1½									
	Miami loam	Farmers				60	50			15			35																		
	Miami black clay loam	Farmers				70	50			15			35																		
	All types occurring	Statistical Report	18,158	14,498	1,577			42			21½			39			1			⅘			1½			1½					
Walker	Miami clay loam	Farmers					40		17	13																						
	All types occurring	Statistical Report	14,444	9,948	1,608			45			18			19			1¼			1¼			1¼			3					
Totals and averages for Rush County			237,963	186,266	30,998	60½	42½	43⅓	19	14¼	17		35	20		1½	1⅓		1½		1⅕	1½		1⅛			1 5/11					

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Anderson	Miami clay loam	Farmers							35		5		Av. of $100.
	Miami black clay loam	Farmers							60		2		Av. of $100.
	All types occurring	Statistical Report	858	77	383	468	546	3,124	35¼	¼	2	1	
Center	Miami clay loam	Farmers							35	1	1	8	$90 to $120.
	Miami black clay loam	Farmers							40				$90 to $125.
	All types occurring	Statistical Report	829	41	392	708	1,279	3,994	23	⅚	4	4	
Jackson	Miami clay loam	Farmers											Av. of $100.
	All types occurring	Statistical Report	492	37	266	579	515	4,196	43	¾	3⅔	2	
Noble	Miami clay loam	Farmers							50				Av. of $90.
	Miami black clay loam	Farmers							80				Av. of $110.
	All types occurring	Statistical Report	534	36	301	320	150	4,025	28	½	1	1½	
Orange	Miami clay loam	Farmers											
	Huntington loam	Farmers											
	All types occurring	Statistical Report	754	60	440	451	439	3,087	24½	½	1¼	1	
Posey	Miami clay loam	Farmers							40				Av. of $90.
	Miami black clay loam	Farmers							40				$100 to $125.
	All types occurring	Statistical Report	791	30	411	584	992	4,266	32	⅔	3½	2	
Ripley	Miami clay loam	Farmers							35	1	1		$60 to $100.
	Huntington loam	Farmers											$75 to $125.
	All types occurring	Statistical Report	851	147	466	686	1,450	4,414	34	⅓	3⅕	3⅕	

Richland	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	35	1	3	.....	Av. of $90.
	Miami black clay loam	Farmers	.....	.....	.....	.....	.....	.....	60	.....	.....	.....	Av. of $100.
	All types occurring	Statistical Report	684	60	285	614	757	3,576	44	1	3	1⅓	.....
Rushville	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$90 to $110.
	Miami black clay loam	Farmers	.....	.....	.....	.....	.....	.....	80	.....	.....	.....	$100 to $125.
	Huntington loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	All types occurring	Statistical Report	1,114	51	686	731	744	4,357	42½	⅓	2⅕	1¼	.....
Union	All types occurring	Statistical Report	711	105	424	455	735	4,960	34	½	2¼	2	.....
Washington	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	35	1	2	2	Av. of $80.
	Miami loam	Farmers	.....	.....	.....	.....	.....	.....	75	1	.....	.....	Av. of $100.
	Miami black clay loam	Farmers	.....	.....	.....	.....	.....	.....	100	1	.....	.....	Av. of $100.
	All types occurring	Statistical Report	678	34	.....	401	341	9,314	36	1⅗	1⅕	1½	.....
Walker	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	All types occurring	Statistical Report	699	8	410	422	611	3,805	44	1½	4	2	.....
Totals and averages for Rush County			8,995	586	4,464	6,419	8,559	53,118	45	⅞	2⅔	2½	$60 to $125.

PHYSIOGRAPHY AND GEOLOGY.

The surface rocks of this county belong to three geological periods. The Laurel limestone and Waldron clay, which are found outcropping 200 yards above the bridge in Big Flatrock River at Moscow, belong to the Niagara and are Silurian in age. Advancing upstream from these outcrops, one soon finds the Laurel limestone passing below drainage and the Devonian limestone appearing in the bed of the creek. The drift, which covers the surface of the entire county, was left by the Later Wisconsin ice invasion. This drift is underlain by the Illinoian drift. Both of these drifts are Pleistocene in age.

A very good idea of the thicknesses of the glacial drift (Illinoian and Pleistocene), the limestone underlying it (Devonian, Niagara and Cincinnati), and the shale (Cincinnati) beneath this limestone, together with the depth to the Trenton limestone, can be gotten from the following well records, which W. A. Mull, a gas well contractor living in Rushville Township, kindly furnished the writer. A study of this table will point out something of the surface topography before the ice invasions. Although the surfaces in many of these cases are almost at the same altitudes, yet the distance to the limestone may vary fifty feet or more, indicating the presence of an old valley filled with glacial drift.

RECORDS OF GAS WELLS IN RUSH COUNTY.

No.	Civil Township.	Locality.	Thickness of Drift in Feet.	Thickness of the Niagara and Devonian Limestones in Feet.	Thickness of the Cincinnati Shale in Feet.	Depth to the Top of the Trenton Limestone in Feet.
1	Jackson	Center of section 18 (14 N., 10 E.)	70	65	715	850
2	Jackson	N. E. corner of section 19 (14 N., 10 E.)	84	....	....	....
3	Jackson	200 feet west of No. 2	169	00	715	884
4	Jackson	Center of section 15 (14 N., 9 E.)	31	104	715	850
5	Posey	S. E. corner of section 30 (14 N., 9 E.)	90	38	737	865
6	Posey	S. E. quarter of section 36 (14 N., 8 E.)	43	72	745	860
7	Posey	At Arlington	65	55	739	859
8	Walker	N. W. corner of section 11 (13 N., 8 E.)	78	57	730	865
9	Walker	N. E. quarter of section 8, (13 N., 9 E.)	78	47	770	895
10	Walker	Just north of Manilla	100	60	730	890
11	Walker	S. E. corner of 28 (13 N., 9 E.)	87	53	746	886
12	Walker	N. W. corner of 20 (13 N., 9 E.)	135	15	717	867
13	Walker	At Manilla	141	11	715	867
14	Walker	At Homer	55	55	745	855
15	Orange	Center of section 20 (12 N., 9 E.)	20	100	750	870
16	Orange	Section 18 (12 N., 9 E.)	19	46	800	865
17	Orange	S. E. quarter of section 5 (12 N., 9 E.)	65	35	780	870
18	Orange	S. E. corner of section 33 (12 N., 9 E.)	11	108	751	870

RECORDS OF GAS WELLS IN RUSH COUNTY—Continued.

No.	Civil Township.	Locality.	Thickness of Drift in Feet.	Thickness of the Niagara and Devonian Limestones in Feet.	Thickness of the Cincinnati Shale in Feet.	Depth to the Top of the Trenton Limestone in Feet.
19	Noble	At New Salem	65	40	813	918
20	Anderson	N. E. corner of section 36 (13 N., 9 E.)	60	40	750	850
21	Anderson	Section 18 (12 N., 10 E.)	None.	100	725	825
22	Anderson	North central part of section 30 (13 N., 10 E.)	40	60	740	840
23	Rushville	At Rushville	47	23	773	843
24	Rushville	Section 27 (13 N., 9 E.)	177	20	673	870
25	Rushville	N. W. quarter of section 23 (13 N., 9 E.)	135	36	694	865
26	Rushville	N. W. quarter of section 18 (13 N., 10 E.)	90	36	714	840
27	Rushville	Section 2 (13 N., 9 E.)	40	60	770	870
28	Center	N. E. quarter of section 29 (15 N., 10E.)	92½	30½	752	875
29	Center	Central part of section 17 (15 N., 10 E.)	84	43	743½	870½
30	Washington	S. E. corner of section 34 (15 N., 10 E.)	90	45	716	851
31	Noble	Central part of section 20 (13 N., 11 E.)	80	..	..	..
32	Noble	S. W. quarter of section 21 (13 N., 11 E.)	97	..	..	..
33	Noble	S. E. quarter of section 20 (13 N., 11 E.)	90	..	..	..
34	Anderson	Section 20 (12 N., 9 E.)	63	..	..	..
35	Walker	Central part of section 17 (13 N., 9 E.)	117	..	..	..

Taken as a whole the surface of Rush County is a gently undulating plain, broken by the valley of the Big Blue River in the northwestern corner, the rather shallow valley of Big Flat Rock traversing the county from the northeastern corner to the southwestern and a few glacial kames and ridges in the vicinities of Mays, Hamilton Station, Homer and the southeast corner. The altitude, which is 1,100 feet in the northeastern part of the county, gradually becomes less in a southwesterly direction until it falls below 900 feet in the southwestern part. The glacial topography yet remains very evident throughout the county, but especially in places where the natural surface drainage did not reach large areas, which were swamps a few decades ago. These, today, are occupied by black land that leads all others for raising corn.

SOILS.

Six types of soil occur in Rush County. Of these, the four of the Miami series are found in the upland, while the Huntington and Wabash loams are bottom land soils. The following table shows the extent of each of the six types.

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami clay loam	279.0	68.6
Miami silt loam	40.0	9.8
Miami black clay oam	40.0	9.8
Miami loam	7.0	1.8
Huntington loam	35.0	8.6
Wabash loam	5.0	1.3
Oak Forest silt loam	0.3	....
Total	406.3	99.9

Miami Clay Loam.

In Rush County are found all variations of the Miami clay loam, from the cold, clammy white beech soil to the loose, warm sugar tree variety, but the intermediate phases are by far the more common. The white beech variety has its principal development in the northwestern half of Ripley Township, where it is popularly termed "the beech." Here it occurs as a thin, ashy gray land, with a very little organic matter and is underlain by a tough drab or brown clay. Often following the course of the larger streams or occupying portions of the glacial ridges is the medium brown sugar tree variety, with a sandy or gravelly clay subsoil. This ground is warm and has a fair amount of organic matter. It is earlier than the lighter colored and is especially well adapted for seed beds. As a rule the Miami clay loam seems to be more silty as it appears farther south. It averages from 7 to 10 inches in depth, the white beech variety being the thinner soil. In the southeastern corner of section 9 (15 N., 9 E.) the writer, in a deep cut, obtained the following section of the formations underlying a typical Miami clay loam soil.

SECTION FROM THE NORTHEASTERN CORNER OF RIPLEY TOWNSHIP.

	Feet.	*Inches.*
Medium brown soil	0	8
Brown clay loam	0	10
Sandy clay	2	0
Gravelly or sandy clay, very compact and having a drab color, but grading into a sandy yellow clay	12	0
Blue to dark gray hardpan, impervious in nature and containing some gravel and sand	12	0
Stratified beds of gravel and sand	6	0
Gravelly blue clay, very compact	10	0

This type is used more for general farming purposes than any of the others. It is not as good for corn yields as the darker colored ground, but will excel in quality of grain, and for wheat and oats it is superior in both yield and quality. To obtain the best results from this soil, great care must be exercised, and the better class of farmers have learned this. Through tiling, green manuring, rotation of crops, careful cultivation and using commercial fertilizer they claim to have doubled their production of corn and to have greatly increased the wheat and oats yields. This class of farmers will average from fifty-five to sixty bushels of corn to the acre, twenty bushels of wheat and forty of oats, while their neighbors, with the same kind of land, average about thirty-five of corn, fourteen of wheat and thirty of oats. Taken as a whole, the Miami clay loam is far from being in a high state of productiveness.

The stock raising industry varies greatly over this type. Where the land is best improved and is most productive, hogs seem to be the leading market product, while on some of the poorer land a good many sheep are raised. It is quite obvious that the best farmers sell scarcely any grain, but feed it to stock, and thus, through the droppings, get considerable of the plant food back into the ground. The less successful farmers are selling their grain and are sorely neglecting the replenishment of the soil.

The results of the mechanical analyses of this soil are found in the table below.

MECHANICAL ANALYSES OF MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14	3 miles southwest of Gowdy.	Soil, 0 to 10 inches.....	1.1	2.2	4.1	8.7	10.3	57.1	16.2
4	1 mile north of Arlington...	Soil, 0 to 11 inches.....	1.7	1.7	2.2	2.6	3.0	67.7	21.1
15	2½ miles northeast of Moscow	Soil, 0 to 12 inches.....	.8	1.4	2.9	6.7	7.9	61.4	18.3
75	2½ miles northwest of Carthage.....	Soil, 0 to 8 inches.....	.3	.9	3.2	11.4	13.4	60.2	11.7
78	Subsoil of number 75.....	Subsoil, 0 to 36.....	.6	1.2	2.5	6.3	7.0	64.2	19.0
60	4 miles south of Glenwood...	Soil, 0 to 10 inches.....	2.6	.9	1.0	1.9	3.8	76.0	18.3

Miami Black Clay Loam.

Probably no square mile in Rush county is without some areas of Miami black clay loam. These may not cover more than a quarter of an acre, yet they occupy the sags, have the black color and contain the proper ingredients to produce some of the banner

corn crops of the State. No other county under consideration in this report has such general distribution of this type, although Randolph alone will surpass it for area. As these dark areas will not average over five acres in extent, and seldom exceed thirty acres, more or less wash from the Miami clay loam, with which they are inclosed, finds its way over the surfaces. This is a great help to the Miami black clay loam, furnishing it with essential food ingredients, giving it more body and enabling it to produce a better class of grain.

A common section of the Miami black clay loam covered by the Miami clay loam wash shows 4 to 6 inches of medium to dark brown clay loam of a loose, warm nature at the surface, underlain by 6 to 10 inches of a black clay loam, running very high in organic matter. Beneath this is a dark brown to black clay or clay loam grading into a drab clay, which at a depth of 2 feet is streaked more or less with yellow. At 3 feet the yellow clay predominates, and below this is a sandy yellow clay. In other cases, such as in the outwash plain in the vicinity of Raleigh, the surface soil may vary from a clay loam to a loam, and this at 1 foot is underlain by a sandy clay that becomes more and more sandy and gravelly until it grades into a bed of gravel, which is found from 4 to 6 feet beneath the surface. A less frequent occurrence is that of a pure Miami black clay loam at the surface, becoming lighter as the depth increases, until at 2 feet it grades either into a bluish drab or a yellow clay. It seems the drab with the bluish tint is most often found where the subsoil has recently been beneath the groundwater level and the yellow color where it has been above for some time, so that the iron has had a chance to oxidize.

More attention has been given to the Miami black clay loam in the way of underdrainage than any other soil. This fact, together with careful cultivation for some years, has put a large acreage of this land into a splendid condition for farming. The water being drained out, the tendency to puddle and stick to the plow are not so prevalent as in the new soil. Taking an average of a number of estimates from leading farmers of the county as to the size of the crops raised on this soil when the ground is well improved and cared for, it was learned that one could expect sixty-five bushels of corn, fifteen of wheat, thirty-five of oats, one and a half to two tons of clover and one and a half of timothy. With exception of the wheat, most of the grain raised on this type never leaves the farms, but is fed mostly to hogs. Where farms

are composed entirely of Miami black clay loam, from seventy-five to 100 hogs to each 100 acres are turned off annually.

Some farmers experience much difficulty in growing wheat and clover on account of the soil heaving, which exposes the roots and kills the plants. A good underdrainage will remedy the trouble.

The selling price of the Miami black clay loam is from $75 to $150 per acre.

The following table gives the results of the mechanical analyses of this type.

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
8a	1½ miles east of Gowdy.....	Soil, 0 to 12 inches.....	.9	1.2	2.2	9.9	5.8	65.5	20.0
8b	First subsoil to 8a.....	Subsoil, 12 to 24 inches	1.3	1.5	3.0	7.0	8.2	58.6	20.7
8c	Second subsoil to 8a.....	Subsoil, 24 to 36 inches	.4	1.4	4.8	16.0	18.8	49.2	10.0

Miami Loam.

A large area composed partly of Miami loam and partly of Miami black clay loam is found in the northeastern quarter of the county, with Middle Fork as its eastern boundary, Shankitank as its western, a well marked moraine as its northern, and Big Flat Rock, where it runs almost east and west in the northern part of Union Township, as its southern. Almost the entire area has a natural underdrainage, being underlain with sand and gravel in from 3 to 7 feet of the surface.

The soil of the Miami loam is a medium to a dark brown loam, silt loam or sandy loam, averaging from 9 to 14 inches in depth. It contains more organic matter than a sugar tree variety of the Miami clay loam and less than a Miami black clay loam, but this decreases with depth, and the color becomes correspondingly lighter. Its close association with the Miami black clay loam necessitates considerable variation in texture.

The subsoil is most commonly a light brown sandy clay in the upper portion. With increase in depth the ground becomes lighter, grading into light medium yellow at about 2½ feet. At this depth the material is a sandy or gravelly clay, with a dark brown mottling of iron stain or concretions and highly decomposed limestone pebbles, which appear like little pockets of very fine sand. As one

goes farther down in the section he finds a rapid increase in sand and gravel.

Like in Wayne County, this type seems to occur as an outwash plain, the source of supply being from the morainic ridges bordering it on the north and west. The surface is very level, but there is a gentle slope upward toward the ridges, especially the one to the north.

This area is spoken of as the garden spot of Rush County. The gravelly subsoil and light character of the Miami loam, together with its high content of organic matter, makes it a very early and productive land. Only portions of it have to be tiled, and then the tile draw the water nicely for fifteen rods, while the Miami clay loam bordering it will not draw well for more than six rods. Corn averages on this type fifty bushels to the acre and wheat fifteen. As a general rule farmers are selling annually seventy-five hogs to the 100 acres, 1 horse, and a few cattle and sheep. Land sells for $100 per acre.

Where commercial fertilizer, green manure or barnyard manure is used on the land the results cannot be noted for more than two or three years. The effect of these on the adjacent Miami clay loam are very evident for ten years or more. Notwithstanding this difference, the farmers of the Miami loam say that it pays them to replenish their soil.

A few very small areas of Miami loam are found covering glacial kames in the vicinity of Homer and Hamilton Station.

The following table shows the results of the mechanical analyses of this soil:

MECHANICAL ANALYSES OF THE MIAMI LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
11	5 miles southeast of Rushville.	Soil, 0 to 13 inches.....	2.5	2.9	4.0	8.2	9.7	59.7	13.7

Miami Silt Loam.

This type, which occurs in the southeastern corner of the county, is similar in texture, color and general characteristics to that found in northern Union County, described on page 110. The boundary

between this type and the Miami clay loam is only an approximate one, based on the mechanical analyses and the silty nature, as noted in the field. The crops and selling price of this land are about the same as for the Miami clay loam of Rush County.

The following table shows the results of the mechanical analyses of this type:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	LOCALITY.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
18	3 miles southeast of Richland	Soil, 0 to 9 inches.....	1.2	1.4	1.9	5.0	5.7	71.0	13.6
20	2½ miles south of Richland..	Soil, 0 to 10 inches.....	1.0	1.6	2.8	5.2	6.2	72.1	10.8

Oak Forest Silt Loam.

The small area of the Oak Forest silt loam in the southeastern corner of the county is an extension of the same type of Franklin County. For a full description of this soil see page 122.

Huntington Loam.

The principal areas of this type are seen in the terraces and flood plains of Big Flat Rock, Little Flat Rock and Big Blue Rivers. For texture and crops the similarity between these and the Huntington loam, as described under the general discussion, is close. A slight difference occurs in that the Wabash loam patches appear very frequently, which necessitates the mapped area of Huntington loam to average somewhat darker in color and a little higher in organic matter than the ordinary run of the seven counties. The common occurrence is that of a medium to dark brown loam, underlain by a fine sandy loam, which grades into a sandy loam and this in turn to a fine sand.

The crops of the Huntington loam approach those of the Miami loam and Miami black clay loam, forty-five to fifty bushels being common for corn and thirteen or fourteen for wheat. The selling price is about $90 to $100 per acre.

The following table shows the results of the mechanical analyses:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
25	1½ miles south of Moscow in the terrace of Big Flat Rock River.	Soil, 0 to 15 inches.....	2.5	4.0	6.3	8.7	10.5	54.2	14.0

Wabash Loam.

The bottoms mapped as Wabash loam contain a predominance of the black loam, but also have areas of silt loam and clay loam. The Huntington loam occurs frequently too, but comprises only a minor portion of the land. For texture, subsoil, crops and the various characteristics of this type see the Wabash loam descriptions of Henry and Randolph counties, where the occurrences are much more extensive.

FAYETTE COUNTY.

Fayette County was established by the General Assembly of the State of Indiana December 28, 1818, and named at the same time in honor of General Lafayette. About fourteen years previous to this time John Conner had started a trading post, at which Connersville, the county seat, was laid out in 1813. From this time until the present the growth of the county has been steady and substantial. Today four railroads and one interurban traction line are found within its limits. Out of 386 miles of wagon road, about 290 are improved with gravel.

Fayette County covers 215 square miles, and in 1900 had a population of 13,495. Within its boundaries are about 128,718 acres of soil, 82,732 of which are being tilled, 21,000 are in pasture, 11,000 in woodland pasture, and 8,500 are in woodland that is not pasture. In 1908 about 19,000 acres were in wheat, 24,000 in corn, 6,000 in oats, 4,300 in timothy, 1,100 in clover, and 100 in alfalfa. On January 1, 1909, there were in the county 3,554 horses and colts, 301 mules, 2,366 dairy cattle, 2,978 beef cattle, 19,901 hogs, and 4,355 sheep. There were sold during 1908 about 30,500 hogs.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.												Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Columbia	Miami clay loam	Farmers					40			10															
	Oak Forest silt loam	Farmers					25			10															
	Huntington loam	Farmers					40			15															
	All types occurring	Statistical Report	14,092 1/10	6,003	2,027			34			13						1½			1 1/5			1			2
Connersville	Miami clay loam	Farmers				47	35		22	15																
	All types occurring	Statistical Report	15,713	11,156	2,096			38½			14½			19			1			1 1/5			⅔			
Fairview	Miami clay loam	Farmers				50	37		20	18																
	All types occurring	Statistical Report	11,607	9,614	1,933			49			17½						⅔			1⅔			1½			
Harrison	Miami clay loam	Farmers				45	34		20	12																
	Huntington loam	Farmers				60	45		20																	
	All types occurring	Statistical Report	16,667	8,750	974			23½			13			16⅓						1 1/4			1½			2 2/3
Jackson	Miami silt loam	Farmers				50	30		20	14			30													
	Huntington loam	Farmers					35			13																
	All types occurring	Statistical Report	17,159	7,776	3,017½			30½			13¼			11			1 1/7			1 1/5			⅔			1 1/5
Jennings	Miami clay loam	Farmers				60	30		20																	
	All types occurring	Statistical Report	11,838	10,118	1,721			32			12⅕			9			1 1/8			1 1/8			1 1/10			

Orange	Miami clay loam	Farmers				42	30			11								2	1½			1½				
	Oak Forest silt loam	Farmers					20		20	13																
	Huntington loam	Farmers					37		20	12																
	All types occurring	Statistical Report	13,433	8,828	3,411			31			11½					1½				1 1/7			1⅕			1¼
Posey	Miami clay loam	Farmers				52	38		25	12					1½											
	All types occurring	Statistical Report	17,415	9,834	2,466			40			15			13		⅜				1 1/9			1⅛			2¼
Waterloo	Miami clay loam	Farmers				52	33		20	14																
	Huntington loam	Farmers				60	40																			
	All types occurring	Statistical Report	10,794	8,653¼	2,000			41⅔			14⅙			6		1				1⅙			1⅓			
Totals and averages for Fayette County			28,718 1/10	82,732¼	19,645½	52	38	35½	20½	13	14		30	12½		1½	1⅛	2	1½	1⅛		1½	1			1⅘

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Report for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Columbia	Miami clay loam	Farmers											
	Oak Forest silt loam	Farmers							15	2		8	$10 to $25.
	Huntington loam	Farmers							35				
	All types occurring	Statistical Report	344	14	222	161	492	1,242	12	½	⅓	1	
Connersville	Miami clay loam	Farmers											$45 to $50.
	All types occurring	Statistical Report	457	62	395	313	353	2,784	24½		1		
Fairview	Miami clay loam	Farmers							30			10	Av. of $45.
	All types occurring	Statistical Report	384	15	211	242	663	1,737	25	⅔	2	4½	
Harrison	Miami clay loam	Farmers							35				$20 to $110.
	Huntington loam	Farmers											
	All types occurring	Statistical Report	584	27	326	518	452	3,157		½	⅔	1⅓	
Jackson	Miami silt loam	Farmers							15–30		1	5	$8 to $75.
	Huntington loam	Farmers							15		1		$15 to $50.
	All types occurring	Statistical Report	405	55	355	373	416	2,363	17	⅓	1⅛	2⅕	
Jennings	Miami clay loam	Farmers											
	All types occurring	Statistical Report	382	18	14	259	476	1,838	36¾	½	1⅕	3	

Orange	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	30	1	3	10	$60 to $80.
	Oak Forest silt loam	Farmers	.....	.....	.....	.....	.....	.....	15	.....	.....	.....	$12 to $30.
	Huntington loam	Farmers	.....	.....	.....	.....	.....	.....	20	.....	.....	.....	$30 to $40.
	All types occurring	Statistical Report	369	24	285	452	608	1,401	21½	½	2⅓	2½	.....
Posey	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$60 to $80.
	All types occurring	Statistical Report	374	31	327	270	575	3,283	38	½	1⅔	2	.....
Waterloo	Miami clay loam	Farmers	.....	.....	.....	.....	.....	.....	40	.....	.....	.....	$65 to $90.
	Huntington loam	Farmers	.....	.....	.....	.....	.....	.....	35	.....	.....	.....	$75 to $100.
	All types occurring	Statistical Report	255	55	231	389	328	2,096	31¾	⅛	2⅝	1¼	.....
Totals and averages for Fayette County			3,554	301	2,366	2,978	4,355	19,901	30	⅛	1½	4⅓	$8 to $100.

PHYSIOGRAPHY AND GEOLOGY.

Traversing the county almost centrally from north to south is the large valley of the West Fork of Whitewater River. Its width varies from one to two miles and its lower bottom is from 100 to 200 feet below the adjacent uplands. This valley, together with the valleys of many tributary streams, has developed a deeply dissected surface over the greater part of the county. In the eastern part of the county what areas have escaped the eroding power of streams have generally been found by the tributaries of the East Fork of the Whitewater River, which occurs in Union County about one mile east of the eastern boundary of Fayette County. The only gently rolling surface is found in Posey and Fairview townships and the western half of Orange.

With the exception of a small district in the southern part of the county, situated on either side of the Whitewater, where the Illinoisan drift appears as the surface formation, the Later Wisconsin drift covers the entire county. The southern boundary of this drift on the west side of Whitewater is marked by a morainic ridge entering Fayette County from northwestern Franklin County and continuing north in a northeasterly direction to a point along the Whitewater about four miles south of Connersville. Here it meets a morainic ridge on the east side, which extends south into Franklin County, also marking the southern limit of the Wisconsin drift. From the point four miles south of Connersville, along Whitewater, an interlobate moraine was formed, which extends northward into Wayne and Henry Counties. In the upland the moraine is seldom less than 50 feet in thickness and is generally 100 or more.

In addition to these drifts, which belong to the Pleistocene period, are outcrops of the Laurel limestone of the Silurian in the southwestern part of the county and of the Cincinnati limestone and shales of the Ordovician in the western portion.

SOILS.

There are eight soil types found in Fayette County, six of which are upland and two bottom. The Miami series, which is by far the most extensive, occurs as the Miami clay loam, Miami silt loam, Miami loam and Miami black clay loam, and has had its derivation from the Later Wisconsin drift. With the exception of some small spots of Miami black clay loam in the western and northwestern

portions of the county, some very limited areas of the Miami loam along the slopes of Whitewater and the Miami silt loam of the southeastern quarter of the county; the Miami clay loam covers all of the area except Jackson and Columbia townships. The southern half of Columbia and a small area in southwestern Jackson have the Oak Forest silt loam as the surface soil. The first and second terraces along the West Fork of Whitewater are mantled with the Huntington loam, while the bottoms of the smaller valleys contain an impure form of the same type. On a very few narrow valley floors in Columbia and Jackson Townships, where the limestone talus has accumulated extensively, the bottom land soils would be more properly termed Hamburg loam.

The following table shows the extent of each of the types:

AREAS OF DIFFERENT SOILS.

SOIL.	Square Miles.	Per Cent.
Miami clay loam	149.5	69.5
Miami silt loam	34.0	15.8
Miami black clay loam	1.0	.5
Miami loam	1.0	.5
Oak Forest silt loam	12.0	5.5
Huntington loam	16.0	7.4
Hamburg loam	1.0	.5
Limestone slope clay loam	.5	.2
Total	215.0	99.9

MIAMI CLAY LOAM.

The type is very closely allied to its occurrences in Union, southern Rush and southern Wayne Counties. It is a light brown or ash-gray clay loam or silt loam, with a depth of 6 to 11 inches. When rubbed between the fingers it imparts a smooth feeling, which is indicative of a high percentage of silt.

The subsoil is a brown or yellow clay loam, becoming a sandy clay at a depth of 2½ feet. This subsoil, because of the hillside wash, often appears as the plow soil. In such cases the crops yield poorly and the land may be classed as untillable. Many farmers remember when these hillsides produced as well as any of the upland, but through careless plowing and cropping, so as to leave the land bare, the soil has been carried down into the bottoms. A few suggestions from successful farmers as to how to improve a soil of this character have been taken up in the general discussion. Blue grass and crops that hold the soil should be grown on the slopes instead of corn.

There are a number of farmers on the Miami clay loam who hold that tiling is not necessary where there is sufficient slope for the water to run off from the surface, but those who have experimented along this line are of an entirely different opinion. They find that it not only makes a decided difference in the surface wash, but that it drains the water from the little intervening spaces between the grains of dirt and so permits the air to circulate more readily. This facilitates the conveying of the nitrogenous foods to the roots of the leguminous plants, which results in a richer soil and better yields. In one case in the northeastern part of Waterloo Township the corn crop was more than tripled by tiling a rolling surface which would ordinarily be said to drain itself.

An average corn crop for this type is about thirty-three bushels to the acre, while the leading farmers are getting fifty-five and sixty. Wheat averages fourteen and oats thirty. Clover ranges between one and two tons and timothy from one to one and a half tons. The selling price of land is from $10 to $110 per acre.

The following table gives the mechanical analyses of typical samples of this type:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14a	3 miles east of Falmouth....	Soil, 0 to 10 inches.....	1.2	1.8	3.4	5.5	1.0	65.5	16.3
14b	Subsoil to 14a.....	Subsoil, 10 to 30 inches	.6	.8	1.3	2.4	2.2	65.7	27.3
21	2 miles southwest of Columbia.	Soil, 0 to 7 inches.....	.6	.8	1.2	2.4	2.6	78.6	16.0
26	1½ miles east of Connersville.	Soil, 0 to 10 inches.....	.3	.7	1.4	2.1	2.4	78.3	18.1
28	2½ miles north of Springerville.	Soil, 0 to 11 inches.....	1.1	2.4	2.1	2.7	3.6	68.1	19.2
23	Just east of Fayetteville....	Soil, 0 to 10 inches.....	2.9	.6	.4	2.5	2.9	77.1	18.1
10	6 miles west of Connersville..	Soil, 0 to 11 inches.....	1.8	1.2	1.7	3.3	3.9	68.4	20.0
45	3 miles southeast of Fayetteville.	Soil, 0 to 10 inches.....	.6	.6	.7	1.2	.1	79.5	18.0

Miami Silt Loam.

This type is an extension of the Miami silt loam areas of Union and Franklin Counties. It has a similar texture, color and subsoil, and bears about the same relation to the Miami clay loam. It differs, however, from the Union County soil in that a larger percentage of its area occurs on a decidedly rolling surface, thus permitting a large amount of wash, which has left either a very

thin soil or has uncovered the subsoil. This results in smaller crops and cheaper land. The average farmer is getting about thirty-two bushels of corn and fourteen of wheat to the acre, while the best farmers get fifty of corn and seventeen of wheat.

The mechanical analyses of the Miami silt loam is found in the following table:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
35a	2 miles northwest of Everton	Soil, 0 to 8 inches.....	.7	.6	.6	.9	1.1	81.4	14.3
35b	Subsoil of 36a.....	Subsoil, 8 to 36 inches..	.05	.05	.1	.4	.4	72.8	28.1
30	2½ miles northeast of Everton.	Soil, 0 to 9 inches.....	.8	.7	.9	1.9	2.3	79.8	14.3

Miami Loam.

This soil occupies a very limited area along the Whitewater in the northern portion of the county. It is similar in texture and general characteristics to the same type in Wayne County, except that it is found on steeper slopes and has been subjected to greater surface wash.

Miami Black Clay Loam.

Since stream erosion has been the prevalent factor in shaping the topography of Fayette County, most of the old marshes, lakes and ponds, remnants of the glacial epoch, have long since been drained, and the organic matter which accumulated in them has been thoroughly decomposed or dissolved out of the soil. A very few of these basins have yet left traces in the scattered, isolated and small spots of black land occupying the sags in Orange, Fairview and Posey Townships. These spots are known as the best corn land in the county.

For a description of the texture, derivation and crops raised on the Miami black clay loam, see the description under the general discussion in Henry and Wayne counties.

Oak Forest Silt Loam.

The Oak Forest silt loam is a type having its main development in Franklin County, in the report of which it is described more fully. The limited areas in southern Fayette County are

found on the ridge summits. Owing to the ridges being narrow and high the soil is badly washed and is as likely to have been replaced by the silt loam subsoil as it is to be present. The soil is considered the poorest of the county, being an ashy gray silt loam that is cold, sour and very deficient in organic matter and lime.

The improvements of this soil are very poor, tiling, green manuring and crop rotation being almost entirely neglected. Very little stock is raised, the grain being sold. Corn crops range from seventeen to twenty-five bushels to the acre and wheat from ten to eighteen. The selling price of this land is from $10 to $25 per acre.

The Oak Forest silt loam, with tile, green manure, lime, stable manure, stock fed over it, crops rotated and care taken in the cultivation of crops and the selection of seeds, has been made to more than double its production.

Limestone Slope Clay Loam.

This type, because of its location on the hillsides, is cultivated but little, and should not be on account of wash. It should be kept in blue grass, alfalfa or some crop that will hold the soil, instead of tobacco or corn, which some farmers seem to be inclined to grow.

A more complete description of this soil, as to its texture, crops and cultivation, will be found in the Franklin County report.

Huntington Loam.

A few rather impure areas of Huntington loam are found in the smaller valleys of the county, but by far the more important occurrences are in the first and second terraces of the broad Whitewater Valley. The farms situated on these terraces are considered superior to those of the upland. With their natural underdrainage through the gravel beds, which are generally within from 3 to 5 feet of the surface, and the loose open brown loam or sandy loam, this soil is the earliest of all the types. Corn is planted two weeks earlier than on the upland and can be tended several days sooner after a heavy rain. The result is that the average farmer is getting forty bushels of corn to the acre, while the best farmers get sixty, as against thirty-three for the average farmer and fifty-five to sixty for the best on the upland. Wheat does not do well on the first bottom, but sometimes yields twenty bushels to the acre on the second.

The first bottom is not as desirable land as the second. This is in part due to the damage done by the floods, and partly to a more

sandy and gravelly texture, with beds of sand or gravel near to the surface, which causes it to suffer more from droughts. Often old bars of sand and gravel are encountered on the first bottom which are classed as worthless, but which might make a very good alfalfa soil. The most desirable land of both bottoms is found north from Connersville.

For a more complete discussion of the Huntington loam, see page 23.

The following table shows the results of the mechanical analyses of samples of this type:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
34	First bottom of Whitewater River south of Connersville.	Soil, 0 to 16 inches.....	3.5	4.6	7.4	18.0	21.2	36.1	10.0
16	First bottom west of Waterloo.	Soil, 0 to 16 inches.....	11.8	11.8	6.5	9.3	10.9	38.0	11.8

UNION COUNTY.

HISTORY OF SETTLEMENT AND INDUSTRIES.

Union County, situated on the Ohio State line, south of Wayne and north of Franklin County, with an area of 162 square miles and a population of about 7,000, was originally owned by the Miami Confederacy of Indians. On September 24, 1804, John Templeton and Joseph Hanna entered the first 640 acres along the East Fork of Whitewater River, in what is now New Harmony Township. The county was not established until about 1821.

Besides the Rude Bros. Manufacturing Company's plant at Liberty, there is scarcely any other industry of note in the county other than agriculture. But what the people lack in manufacturing they make up in farming. No other county of the surveyed area averages as well in crops and general farm improvements. Harrison Township has several farmers that are getting more than ninety bushels of corn to the acre, a number of others that are producing more than seventy-five, while the average for the township is about fifty. This gives Harrison first place for corn among the seven counties under consideration.

Out of approximately 102,600 acres, as shown by deeds, 80 per cent. is tillable, 13 per cent. is in woodland pasture and 6½ per cent. in wood land that is not pasture. About 20,500 acres were in wheat in 1908, 24,000 in corn, 4,700 in clover, 1,750 in timothy, and 38 in alfalfa.

There has been a great improvement in railway facilities since two or three years ago, at which time the C., H. & D. alone traversed the county from northwest to southeast. Now the Chicago, Cincinnati and Louisville crosses the western third from north to south. For wagon road transportation the county takes first rank in the area of survey, 90 per cent. of the roads being graveled. For future road building and repairing there is great abundance of gravel in the terraces and flood plains of the East Fork of Whitewater River and fair deposits along Silver and Hannah's Creeks. An examination of the gravel of this county showed the general run to be 85 per cent. limestone, 10 crystallines, 3 shale, 1.5 chert and 1.5 slate.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Section of Township Under Consideration.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
							Bushels Per Acre.												Tons Per Acre.								
							Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
							Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Brownsville	36 (15 N., 13 E.)	Miami clay loam	Farmers				50	40			12			30													
	27 (12 N., 2 W.)	Miami clay loam	Farmers				55	38		20	15			40													
	25 (12 N., 2 W.)	Miami clay loam	Farmers				60	45		25	18																
	Township	All types occurring	Stat. Rept.	18,209	13,990	3,922			30			19			30						$1\frac{3}{8}$			$1\frac{1}{4}$			
Center	16 (11 N., 1 W.)	Miami silt loam	Farmers				60	45			17					$1\frac{1}{4}$			$1\frac{1}{2}$								
	Township	All types occurring	Tp. Assessor				65	48			13																
	13 (11 N., 1 W.)	Miami blk. clay loam	Farmers				70	50		25	18		40	35													
	Township	All types occurring	Stat. Rept.	17,403	14,990	2,353			41			20			$1\frac{7}{8}$						$1\frac{1}{2}$			$1\frac{1}{8}$			$2\frac{1}{2}$
Harrison	13 (12 N., 1 W.)	Miami blk. clay loam	Farmers				80	60																			
	Township	All types occurring	Stat. Rept.	19,063$\frac{3}{4}$	16,006	2,996			$45\frac{1}{2}$			19			30						$1\frac{1}{4}$			$1\frac{1}{2}$			
Harmony	13 (13 N., 13 E.)	Miami silt loam	Farmers					40																			
	Township	All types occurring	Stat. Rept.	14,720	9,120	5,205			$25\frac{1}{2}$			14			$1\frac{1}{2}$						$1\frac{1}{10}$			1			
Liberty	W. half of Twp.	All types occurring	Tp. Assessor				50	40			18			35													
	E. half of Twp.	All types occurring	Tp. Assessor																								
	Township	All types occurring	Stat. Rept.	15,809	11,867	3,689			33			14			16			$1\frac{1}{10}$			$1\frac{1}{2}$			$1\frac{1}{10}$			2
	25 (14 N., 13 E.)	Miami silt loam	Farmers				40	30			10																
	24 (14 N., 13 E.)	Huntington loam	Farmers				50																				
	6 (13 N., 14 E.)	Miami silt loam	Farmers				55																				
	21 (11 N., 2 W.)	Miami loam	Farmers				55	35																			
Union	10 (10 N., 1 W.)	Miami silt loam	Farmers				55	40			18			28											4		
	Township	All types occurring	Stat. Rept.	17,390	15,008	1,989			40			$19\frac{1}{2}$			20			$1\frac{3}{8}$			$1\frac{3}{8}$			$1\frac{1}{10}$			$1\frac{1}{4}$
Totals and averages for Union County				102,594	80,981	20,154	57.3	$42\frac{1}{2}$	36	23.3	16.4	17.2	33.6	24	1.28			1.3			1.1			1.9			

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Section of Township Under Consideration.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Brownsville	36 (15 N., 13 E.)	Miami clay loam	Farmer	.....	.....	.....	.....	.....	.....	20	.....	.....	8	$60 to $125.
	27 (12 N., 2 W.)	Miami clay loam	Farmer	.....	.....	.....	.....	.....	.....	40	.....	.....	.....	.....
	25 (12 N., 2 W.)	Miami clay loam	Farmer	.....	.....	.....	.....	.....	.....	60	.....	.....	.....	$60 to $125.
	Township	All types occurring	Statistical Report	605	65	324	678	744	2,561	22	½	3	3½	.....
Center	16 (11 N., 1 W.)	Miami silt loam	Farmer	.....	.....	.....	.....	.....	.....	50	.....	.....	.....	
	Township	All types occurring	Twp. assessor	.....	.....	.....	.....	.....	.....	65	.....	.....	.....	$120 to $140.
	13 (11 N., 1 W.)	Miami black clay loam	Farmer	.....	.....	.....	.....	.....	.....	100	.....	.....	.....	.....
	Township	All types occurring	Statistical Report	594	49	591	476	601	3,400	35⅓	⅓	1	1¼	.....
Harrison	13 (12 N., 1 W.)	Miami black clay loam	Farmer	.....	.....	.....	.....	.....	.....	100	.....	.....	.....	$125 to $150.
	Township	All types occurring	Statistical Report	459	53	339	772	496	4,347	39	⅓	2½	5	.....
Harmony	13 (13 N., 13 E.)	Miami silt loam	Farmer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Township	All types occurring	Statistical Report	.....	82	369	221	620	1,477	22	⅓	½	2	.....
Liberty	W. half of Twp	All types occurring	Twp. assessor	.....	.....	.....	.....	.....	.....	30	.....	6	.....	$60 to $125.
	E. half of Twp	All types occurring	Twp. assessor	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$20 to $30.
	Township	All types occurring	Statistical Report	387	21	408	245	694	2,067	23	.....	⅓	2½	.....
	25 (14 N., 13 E.)	Miami silt loam	Farmer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	24 (14 N., 13 E.)	Huntington loam	Farmer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	6 (13 N., 14 E.)	Miami silt loam	Farmer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	21 (11 N., 2 W.)	Miami loam	Farmer	.....	.....	.....	.....	.....	.....	20	.....	.....	8	.....
Union	10 (10 N., 1 W.)	Miami silt loam	Farmer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$45 to $65.
	Township	All types occurring	Statistical Report	547	47	445	171	1,287	3,274	35½	½	½	2	.....
Totals and averages for Union County				2,592	317	2,576	2,563	4,442	14,565	43.9	.43	1.9	4.09	.....

PHYSIOGRAPHY AND GEOLOGY.

The topography in the eastern and western halves of Union County varies greatly. Immediately east of a line drawn due north and south through Liberty is a slightly rolling surface, becoming more and more level farther east until a distance of three miles is reached. East of this we find a gently undulating plain containing rather extensive areas of the dark colored soils. This topography is due largely to glaciation. Although the surface west of this line, which passes through Liberty, is also covered by the Later Wisconsin drift, yet the surface features are mainly due to erosion. The valley of the East Fork of the Whitewater River, which traverses the western quarter of the county from north to south, has a depth of more than 100 feet, while the valleys of Hannah's, Silver and Richland Creeks, which join it on the west, and Ellis, Turkey and Simpson, on the east, are 50 feet below the adjacent uplands. In preglacial times the valley of the East Fork was 200 feet deeper than today. This has been learned by borings which have gone down through 200 feet of fluvial material before reaching the bed rock.

An older drift seems to underlie the Later Wisconsin, as was apparent when a well at Liberty, below the till formation at a depth of 35 feet, passed through a bed of swamp muck, containing leaves. A similar experience was met two miles south of Brownsville, where a well passed through swamp muck below gravelly drift at 20 or 30 feet. These indicate a glacial topography overridden by the Later Wisconsin ice sheet. The combined thicknesses of the two drifts are from 20 to 40 feet on the upland.

The Ordovician period is represented by the Cincinnati limestone and shale, which outcrop in the valley of the East Fork of Whitewater River.

SOILS.

Five soil types were recognized in this county. Of these, four were upland and one bottom.

The following table shows the extent of each of these types:

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami silt loam	117.0	72.7
Miami clay loam	19.0	11.7
Miami black clay loam	14.5	8.9
Miami loam	3.5	2.2
Huntington loam	8.0	4.9
Total	162.0	99.9

Miami Clay Loam.

The Miami clay loam as mapped in Union County is almost as frequently a silt loam as a clay loam, especially is this true as it approaches the southern limit. It resembles very closely in texture and color the type, as it is found in Wayne County, but differs in that it runs lower in clay, is more silty and has not so much of the dark brown subsoil. The subsoil nearest the surface is generally a brown clay loam, which grades into a sandy clay or sandy loam deeper down. For sizes and kinds of crops, fertility and value it is about the same as the Miami silt loam bordering it on the south.

The following table shows the results of the mechanical analyses of the Miami clay loam:

MECHANICAL ANALYSES OF THE MIAMI CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
11a	Southeastern corner of section 13 (12 N., 2 W.)	Surface.....	.9	.9	1.4	4.2	4.6	67.0	20.8
11b	Subsoil of 11a.....	Subsoil.....	.7	1.2	1.9	3.2	3.2	67.4	22.3

Miami Silt Loam.

The northern portion of the Miami silt loam area, as mapped, is very closely associated with the Miami clay loam. In fact, these two areas are so closely intermingled that, without a great amount of detail soil boring it would be impossible to tell just where the one begins to predominate over the other. However, the majority of mechanical analyses made of the samples representing soils south of the boundary line as given indicate that the Miami silt loam covers the greater area, while north of it the Miami clay loam is the leading type.

In the northern part of the county the surface soil is from 7 to 11 inches in depth and varies in color from a light gray to a medium brown, according to the amount of organic matter present. The upper part of the subsoil is often a sandy clay, which at about 17 inches grades into a fine sandy loam. In the southern part of the county both soil and subsoil are almost identical with the type as it appears in Franklin County.*

*See p. 120.

The large amount of gently rolling surface, the adaptability to a great diversity of crops, the natural productiveness and ability to withstand drought makes the Miami silt loam a splendid soil for general farming purposes. Corn yields of sixty bushels to the acre and wheat of twenty-two are about the average for the better farmers that have their places well tiled. The average farmer realizes about forty-two bushels of corn and sixteen of wheat. An average crop of oats is about thirty-five bushels, while clover yields one and one-fourth bushels of seed and from one to two tons of hay. Timothy hay crops are about the same. Although a few of the foremost farmers carry on a systematic crop rotation, the common rule is to follow the corn with either wheat or oats, and these in turn by either clover or timothy. When both the clover hay and seed are taken off and the field has been pastured for a year or two, it is again planted to corn. If in the spring the wheat outlook is not promising, corn is likely planted for the second year. There is much room for improvement in systematic cropping.

The principal timber growing in this area has been black walnut, rock maple, red oak, white oak, red beech, white beech and hickory.

Land sells from $30 to $125 per acre, depending upon improvements and location.

Farmers living on this type average annually for the market about thirty-five head of hogs, one or two beef cattle and a few sheep. More live stock would keep the farms better manured and give a larger profit.

The following table shows the results of the mechanical analyses of the soil and subsoil of this type:

MECHANICAL ANALYSES OF MIAMI SILT LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
10a	1½ miles uorth of Billingsville.	Surface	.5	1.1	1.7	3.7	4.5	70.0	18.4
		Subsoil	1.6	2.1	3.2	9.0	11.5	48.0	23.0
13	East central part of section 13 (11 N., 1 W.)	Surface	.2	.2	.7	2.2	2.5	77.6	16.4
		Subsoil	.2	.5	.9	1.8	2.1	71.5	23.3
17	East central part of section 34 (12 N., 1 W.)	Surface	1.3	1.2	1.4	4.0	4.7	72.7	14.4
		Subsoil	.2	.5	1.0	2.1	2.8	65.2	28.4
18	2 miles north of Liberty	Surface	1.8	1.8	2.9	5.6	6.4	66.6	14.7
		Subsoil	2.2	1.5	2.6	4.7	5.0	60.0	25.5
25	2 miles northwest of Beechy Mire.	Surface	1.0	.1	.6	1.2	3.5	76.0	17.1

Miami Black Clay Loam.

The Miami black clay loam areas occurring all along the eastern border of the county, start about five miles north of the Wayne County border and extend southward to the southeastern corner of Franklin County. The most extensive developments are in the northeastern quarter of Harrison Township. Here it is that corn crops of over a hundred bushels to the acre have been grown and a hog turned off, each year, for every acre of land.

When well drained this land is a dark brown to black granular clay loam. It runs very high in organic matter and occupies the sags or lower areas. It is generally, at a depth of two feet, underlain by a brown to yellow clay or clay loam, but in cases the subsoil is a drab clay with a bluish tint. In all other textural relations, whether the occurrence is in a drained or undrained area, it is very similar to the general type as taken up in the opening discussion of this report.

Wheat by the advanced farmers is grown successfully in this county, which is rather exceptional for this type. This class averages about twenty-five bushels to the acre, while the ordinary run get about twelve. This better class of farmers are practicing a three years' rotation of corn, wheat and clover, and claim that it is very beneficial to their soil. Tiling to some extent has been done on about all of this kind of land.

Farms situated on this type are selling at $100 to $150 per acre.

The following table gives a mechanical analysis of the soil of this type:

MECHANICAL ANALYSIS OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
14a	In the north central part of section 13 (12 N., 1 W.)	Soil.....	.8	1.2	2.0	4.6	5.6	72.0	13.4

Miami Loam.

This occurrence in Union County is only an extension of the Miami loam found on either side of the East Fork of Whitewater River in Wayne County. Its texture and characteristics are taken up in detail under the Miami loam for Wayne County.

HUNTINGTON LOAM.

The Huntington loam is found for the most part along the East Fork of Whitewater River, and to a lesser extent in the bottom of Dubois, Hannah's, Silver and Richland Creeks. The texture is about the average run for the seven counties, which is treated in the general discussion. However, the wash from the hillsides in the smaller valleys has produced an impure type.

On account of numerous floods much of the first bottom along the East Fork has become undesirable and is selling in cases as low as $10 per acre where it would be worth $75 if it were not for the overflows. The old settlers say that years ago when the stock grazed along the river and would not permit the growing of the heavy heath now occurring on either side that crops were damaged very little by floods. The heath is a barrier that slackens the velocity of the currents and holds the water back.

Where the land is free from floods corn crops of forty to fifty bushels to the acre are grown, while wheat will run about fifteen. Land of this kind will bring $75 and $100 per acre.

FRANKLIN COUNTY.

The first settler of Franklin County erected his cabin at New Trenton in 1803. Eight years later the county was organized, and in 1819 a newspaper, known as the Brookville Enquirer and Indiana Gazette, was started at Brookville. Advancements have been slow in a large portion of Franklin County. The railway facilities are poor, only 15 per cent. of the wagon roads are improved, and agricultural methods and conditions are not as good as those of the other counties of the area of survey.

Brookville, a town of about 3,000 inhabitants, is the county seat and the leading manufacturing center. Among the chief manufacturers is the Thompson & Norris Paper Co., which employs ninety-eight men; the Brookville Furniture Co., with sixty-five employes; the Brookville Buggy Co. and the Freis & Sons Tiling and Brick Co. Oldenburg, with a somewhat smaller population than Brookville, is noted for its large Catholic school. The other towns of the area are small country villages. Southwest of Laurel are several stone quarries, and another is situated east of Peppertown.

Franklin County has a population of 17,000 and covers an area of 394 square miles. There are about 210,000 acres of land in farms. In 1908 nearly 30,000 acres were in wheat, 31,000 in corn, 3,000 in oats, 12,000 in clover, 9,000 in timothy, 5,000 in potatoes, 41 in tobacco and 140 in alfalfa. In the orchards of the county there were over 20,000 apple trees, 7,000 peach, 2,000 cherry, 1,000 pear and 1,000 plum. There were approximately 5,000 head of horses on hand January 1, 1909, 400 mules, 5,000 dairy cattle, 4,000 beef cattle and 19,000 hogs. About 31,000 hogs and 3,500 sheep were sold during 1908.

Franklin County probably has more standing timber than any of the six others. Among the trees still standing can be seen the black walnut, white oak, red oak, burr oak, chestnut oak, black oak, sycamore, red elm, white elm, slippery elm, hickory, pignut, shellbark, white beech, yellow beech, red beech, white ash, blue ash, black ash, hoop ash, hackberry, yellow poplar, white poplar, rock maple, white maple, red or swamp maple, butternut, wild cherry, honey locust, buckeye, blue gum, mulberry, red cedar, sweet gum, linden and cottonwood.

LAND, CROP AND STOCK TABLE.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																				
						Bushels Per Acre.														Tons Per Acre.								
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Bath	Miami black clay loam	Farmers				60	45																			
	All types occurring	Statistical Report.	11,694	8,769				52			21			16			1½			1½			1½			
Blooming Grove	Miami silt loam	Farmers				55	30		15	12																
	All types occurring	Statistical Report.	13,884	7,503				19⅓			13⅔			2			1			1						
Butler	Oak Forest silt loam	Farmers				35	22		15	12			25													
	All types occurring	Statistical Report.	19,029½	13,036¼				26½			8½			9½			1½			1			1			2¼
Brookville	Miami silt loam	Farmers				55	35				15			30												
	Oak Forest silt loam	Farmers				35	23				14															
	Huntington loam	Farmers				60	35																		4½	
	All types occurring	Statistical Report.						35			16			12			1½			1¼			1¼			2
Fairfield	Miami silt loam	Farmers				40	27		20	14																
	Huntington loam	Farmers					35		15	12																
	All types occurring	Statistical Report.	9,857	4,700				24			14			1¼			1½			1½						2½
Highland	Oak Forest silt loam	Farmers				30	20		20	13		25	15						¾			¾				
	Huntington loam	Farmers				70	35		15	10																
	All types occurring	Statistical Report.						25			14			10			1½			1			1			1
Laurel	Oak Forest silt loam	Farmers				40	22			12			18													
	All types occurring	Statistical Report.	18,349	5,084				22			14			10			1¼			1⅓			1			2

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Total Acreage in Farms of Township.	Acres of Tillable Land in Township.	Acres of Woodland in Township.	Estimates of Well-Informed Farmers as to the Annual Average Crops Through a Series of 10 Years, Together With Some Statistical Averages for 1908.																							
						Bushels Per Acre.															Tons Per Acre.							
						Corn.			Wheat.			Oats.			Clover Seed.			Clover Hay.			Timothy.			Alfalfa.		
						Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.	Better Farmers.	Average Farmers.	Statistical Average.
Metamora	Oak Forest silt loam	Farmers				30	20	....	..	12	....	..	25	....	..	..	....	..	..	....	..	..	....	..	..	....
	All types occurring	Statistical Report	12,552	6,609	.....	..	..	38	..	....	11	..	..	....	..	..	2	..	..	....	..	..	1	..	..	3
Posey	Oak Forest silt loam	Farmers				40	22	....	20	14	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	Hamburg loam	Farmers				50	35	....	20	14	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	All types occurring	Statistical Report	10,737	4,675	.....	..	..	25	..	....	11½	..	..	....	..	..	1½	..	..	1⅛	..	..	1	..	..	....
Ray	Oak Forest silt loam	Farmers				40	20	....	..	14	....	..	20	....	..	..	....	..	..	....	..	..	....	..	..	....
	Hamburg loam	Farmers				45	30	....	..	12	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	All types occurring	Statistical Report	25,012	16,177	.....	..	..	17	..	....	12	..	..	....	..	..	1½	..	..	⅝	..	..	⅝	..	..	....
Salt Creek	Oak Forest silt loam	Farmers				35	18	....	..	14	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	Hamburg loam	Farmers				45	37	....	..	11	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	All types occurring	Statistical Report	17,355	11,833	.....	..	..	23⅔	..	....	12	..	..	11	..	..	1⅓	..	..	1	..	..	1	..	..	1½
Springfield	Miami silt loam	Farmers				55	35	....	17	14	....	..	..	....	1½	..	....	..	..	....	..	..	....	..	..	....
	Hamburg loam	Farmers				45	35	....	..	12	....	..	..	....	..	..	....	..	..	....	..	..	....	..	4	....
	All types occurring	Statistical Report	21,633	15,925	.....	..	..	36½	..	....	17	..	..	9	..	..	1½	..	..	1⅕	..	..	1	..	..	....
Whitewater	Miami silt loam	Farmers				45	30	....	15	13	....	..	..	....	..	..	....	..	..	....	..	..	....	..	4	....
	Hamburg loam	Farmers				50	40	....	..	....	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	Limestone slope clay loam	Farmers				55	35	....	..	....	....	..	..	....	..	..	....	..	..	....	..	..	....	..	..	....
	All types occurring	Statistical Report				..	..	32	..	....	12	..	..	....	..	..	1½	..	..	1	..	..	1	..	..	2
Totals and averages						55	29	29	18	11½	13	25	22	11	..	1½	1½	..	½	1⅛	..	½	1⅛	..	4	2

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909.						Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land.				Estimates of Farmers as to the Selling Price of Land per Acre.
			Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	
Bath	Miami black clay loam	Farmers							60				Av. of $100.
	All types occurring	Statistical Report	335	17	257	133		2,635	35½	½		3½	
Blooming Grove	Miami silt loam	Farmers							15			10	$2 to $60.
	All types occurring	Statistical Report	396	14	396	361		1,081	15½	⅛		5½	
Butler	Oak Forest silt loam	Farmers								1			$4 to $20.
	All types occurring	Statistical Report	361	40	450	379		411	3⅐	⅕		⅘	
Brookville	Miami silt loam	Farmers							30				$15 to $125.
	Oak Forest silt loam	Farmers											$3 to $18.
	Huntington loam	Farmers							30	1	2	4	Av. of $100.
	All types occurring	Statistical Report											
Fairfield	Miami silt loam	Farmers											$10 to $60.
	Huntington loam	Farmers											$20 to $75.
	All types occurring	Statistical Report	209	8	296	219		744	17⅛	½		3	
Highland	Oak Forest silt loam	Farmers							10		2		$15 to $30.
	Huntington loam	Farmers											
	All types occurring	Statistical Report											
Laurel	Oak Forest silt loam	Farmers							15			15	Av. of $10.
	All types occurring	Statistical Report	279	29	28	366		671	2	¼		1½	

LAND, CROP AND STOCK TABLE—Continued.

CIVIL TOWNSHIP.	Soil Type as Determined by Mechanical Analyses.	Authority.	Taken from Statistical Reports for 1908. Stock of Various Kinds on Hand Jan. 1, 1909. Horses and Colts.	Mules.	Dairy Cattle.	Beef and Stock Cattle.	Sheep and Lambs.	Hogs.	Estimates of Farmers and Statistical Reports for 1908. Stock of Various Kinds Turned off Annually for Each 100 Acres of Land. Hogs.	Horses.	Beef and Stock Cattle.	Sheep and Lambs.	Estimates of Farmers as to the Selling Price of Land per Acre.
Metamora	Oak Forest silt loam	Farmers											$10 to $40.
	All types occurring	Statistical Report	182	4	316	424		491	5	⅛		3½	
Posey	Oak Forest silt loam	Farmers							15		2	14	$5 to $25.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	179	12	158	142		551	9	⅛		2	
Ray	Oak Forest silt loam	Farmers											$3 to $60.
	Hamburg loam	Farmers											$20 to $60.
	All types occurring	Statistical Report	604	29		582		512	4½	⅐		¼	
Salt Creek	Oak Forest silt loam	Farmers							12		1½		$3 to $25.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	319	16	219	450		592	2			1	
Springfield	Miami silt loam	Farmers							35		1	8	$30 to $100.
	Hamburg loam	Farmers											
	All types occurring	Statistical Report	688	74	566	225		3,712	29½	¼		1½	
Whitewater	Miami silt loam	Farmers							30		3		$20 to $90.
	Hamburg loam	Farmers											$15 tu $35.
	Limestone slope clay loam	Farmers									1	12	
	All types occurring	Statistical Report											
Totals and averages													$2 to $125.

PHYSIOGRAPHY AND GEOLOGY.

The surface formations of Franklin County are largely made up of two glacial drifts belonging to the Pleistocene period. The older of these is the Illinoian. All of Laurel Township, part of Whitewater and all of the surface lying west of Whitewater River and its West Forks, with the exception of the steep slopes, stream terraces and some later drift in Posey Township, are covered by the Illinoian drift soils.

The surface of the Illinoian drift is that of a gently undulating plain deeply dissected by stream valleys, differences of 300 feet in altitude being common between the floors of the valleys and the tops of the ridges. It seldom exceeds thirty feet in thickness, and generally plays out entirely along a steep slope where washing has been a prominent factor. Its surface appears as a light gray silt deeply oxidized. In fact, decomposition has been so complete that the limestone boulders and gravel are almost entirely absent, having been dissolved. Granite gneisses, diorites, basalts, quartzites and others of the crystalline group are occasionally present, but nowhere in such numbers as in the Later Wisconsin drift. No dark colored land or other indications of undrained depressions occur on this drift, showing that complete oxidation of the vegetal accumulations has taken place subsequent to the drainage of all kettle basins, sloughs and marshes.

The Later Wisconsin drift varies from 10 to 60 feet in thickness. The undrained swamp areas and Miami black clay loam dottings are present in the northeast quarter of the county, and also a great variety of boulders. A few kames occur two or three miles south of Blooming Grove. Like the older drift, it is a gently undulating surface considerably cut up by stream valleys in the eastern part, while in the western and northwestern portions of the county it is comparatively level.

The limestone outcropping in the hilltops west of Laurel and north of Brookville belongs to the Silurian period, while the blue limestone and shale appearing at the surface on almost all of the steep slopes south of the Laurel outcrops, are the Cincinnati formations of the Ordovician period. An oil well drilled one mile north of Buena Vista passed through 34 feet of Illinoian drift, 105 feet of Niagara and Cincinnati limestones and 706 feet of Cincinnati shale before reaching the Trenton limestone.

SOILS.

On account of the Illinoian drift being the surface formation over the large part of Franklin County instead of the Later Wisconsin, as in the case in the other six counties of the survey, and the Cincinnati limestone being the formation from which the limestone slope soil has been derived, we meet some quite different types than those mapped in the other counties. The land derived from the Illinoian drift is known as the Oak Forest silt loam, while that from the Later Wisconsin is the Miami silt loam or Miami black clay loam. The Huntington loam is the main bottom land, 95 per cent of which occurs in the terraces and flood plains of Whitewater River and its forks. The bottom land soils of the many narrow valleys along the smaller streams will be known as Hamburg loam, owing to their typical development in the vicinity of the village of Hamburg.

The following table shows the extent of each of these soils:

AREAS OF DIFFERENT SOILS.

Soil.	Square Miles.	Per Cent.
Miami silt loam	140	35.5
Miami black clay loam	10	2.5
Oak Forest silt loam	195	49.5
Limestone slope clay loam	24	6.1
Huntington loam	20	5.1
Hamburg loam	5	1.3
Total	394	100.0

Miami Silt Loam.

This soil as it appears at the surface is a light brown or dark gray to almost white silt loam extending to a depth of 6 to 11 inches. It generally has a loose, flour-like feel, and the content of organic matter is very small, but in some localities where it is associated with the Miami black clay loam the color is dark and the amount of organic matter high. Where there is considerable wash the soil is frequently more sandy than when found in the gently undulating plains.

Below the plow soil, and continuing to a depth of 2 or 3 feet, a mottling of white and yellow frequently occurs, the white color often being a residual matter left when the limestone pebbles are, or have been, in the process of decomposition. At a depth of 13 inches the subsoil takes on a light brown color. It is more clayey

than the surface soil and becomes more so at a depth of 16 inches, where it is a clay loam. Below this the clayey character plays out, and at 18 inches a silt loam or a sandy clay is found, which continues to a depth of 3 feet.

Twenty-five years ago much of this land was considered to be fit for little more than grazing purposes. Corn crops of twenty bushels to the acre were as good as could be expected, but since tiling, crop rotation and green manuring have been put into practice the corn yields have more than doubled. A very progressive farmer in Whitewater Township says that some years ago his farm would not produce over twenty-five bushels of corn to the acre, but since tiling his land to a depth of 4 feet in the Miami black clay loam and 3½ feet in the Miami silt loam he can be reasonably certain of at least sixty bushels of corn to the acre. He keeps up a careful rotation of corn, wheat and clover, plows under crops of clover, and cultivates his corn to a depth of 2 inches every few weeks until it is silked out. By a careful selection of seed he will be able to continue to increase his yields.

By using commercial fertilizer farmers realize an average wheat production of fifteen bushel to the acre. Oats average about thirty bushels and clover or timothy one ton.

The following table shows the results of the analyses of the Miami silt loam:

MECHANICAL ANALYSES OF THE MIAMI SILT LOAM.

Number.	Locality.	Description.	Fine Gravel.	Coarse Sand	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
25a	½ mile southwest of Springfield.	Soil, 0 to 10 inches....	.9	1.3	2.1	7.0	8.3	68.0	12.6
25b	First subsoil of 25a.....	Subsoil, 10 to 22 inches.	.2	.3	.6	1.4	1.7	67.2	29.0
25c	Second subsoil of 25a.....	Subsoil, 22 to 36 inches.	.1	.3	1.5	6.0	7.0	69.2	16.2
80a	2½ miles southeast of Blooming Grove.	Soil.....	1.4	1.1	1.6	2.1	2.5	74.9	16.4
80b	First subsoil of 80a	Subsoil.....	.4	.5	1.0	2.4	2.8	75.4	18.9
80c	Second subsoil of 80a.....	Subsoil.....	.3	.3	.5	1.6	1.9	72.3	23.8

Miami Black Clay Loam.

Many of the Miami black clay loam areas have, only in the last two decades, been reclaimed from the marshes. By careful tiling this soil has become the best for corn and most valuable of any in the county. A corn crop of sixty bushels to the acre is about an average for the better class of agriculturists, but wheat does not do as well as on the light-colored soils.

The soil occurs as a heavy loam or clay loam, with a depth varying between 11 and 16 inches. The color to a depth of 1½ feet is black, but below this grades rapidly into a heavy clay loam, which at 2 feet or a little deeper often grades into a sandy clay or loam. In other textural properties it bears a close resemblance to the Miami black clay loam soil treated in the general discussion.

The surface of the Miami black clay loam is practically level. Its occurrence is found in all parts of the Miami silt loam area, but most especially in Bath, the eastern half of Springfield and the eastern quarter of Whitewater townships. The average selling price of the land is about $100 per acre.

The following table gives the results of the mechanical analyses of typical samples of this soil:

MECHANICAL ANALYSES OF THE MIAMI BLACK CLAY LOAM.

Number.	Locality.	Description.	Fine Gravel	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
66a	1½ miles northwest of Bath..	Soil, 0 to 14 inches....	.5	2.0	4.2	8.0	9.8	72.9	25.2
66b	Subsoil, of 66a.	Subsoil, 14 to 36 inches.	.5	.8	.1	3.4	4.0	62.1	27.8

Oak Forest Silt Loam.

A casual observer might pass from the Miami silt loam to the Oak Forest silt loam without noting the change, but upon more careful examination the latter would be found to be a shade lighter in color, to contain less organic matter, less crystalline rocks, to have very few limestone pebbles or boulders, and to be underlain by a light colored subsoil, which has more segregations of yellow iron stains and iron concretions.

The average surface soil of the Oak Forest silt loam is a light ashy gray silt loam, with a depth varying between 4 and 8 inches, but on slopes the pale yellow mottled silt loam subsoil occurs at the surface over large areas. By tasting the soil or subsoil almost invariably one detects a very tart taste, which indicates sourness. This soil and subsoil resemble very closely the Scottsburg silt loam of Scott County, Indiana.

No land in the seven counties under consideration has been so sadly neglected. Rarely is it tiled and very seldom is green manuring practiced. There is no systematic cropping. Corn is planted about the 1st of June, the land not being sufficiently dry earlier.

Often the corn has not time to ripen before the autumn frosts. More care should be exercised in the selection of seed and cultivation. Judging by the results that a few progressive farmers have realized by using up-to-date methods in carrying on their farming, there remains no doubt but that this land can be made to yield fifty bushels of corn to the acre. Oats average about twenty-five bushels to the acre and wheat, by using commercial fertilizer, fifteen.

Many farmers say they cannot build their soil up by plowing under clover, because they cannot get a stand. Upon examining a number of clover fields the writer found that where manure had been stacked in little piles over the fields the clover grew heavy and the soil was not sour. The same held true wherever the manure had been heavily applied, but where thinly or not at all the acid had not been neutralized and the soil was sour. Tiling or an application of lime will also sweeten the soil. As a hay, timothy is grown more than clover.

Small fruit orchards are found on most of the farms and a few extensive fruit farms. One of these, which is owned by D. O. Secrest, is situated three miles east of Andersonville. Fifteen years ago ninety acres of this farm were set out to apple trees, which were planted thirty feet apart. They yield 25,000 bushels in a good year. Peach trees were set out between the apple trees over twenty-two acres of the ninety. These in 1906 produced 2,000 bushels. One acre set out to pear trees thirty feet apart yields 600 bushels in an average year.

The following table shows the results of mechanical analyses of typical samples of this soil:

MECHANICAL ANALYSES OF THE OAK FOREST SILT LOAM.

Number.	Locality.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
57a	1½ miles southwest of Oak Forest.	Soil, 0 to 4 inches.	U. S. Bureau of Soils.	.4	2.0	2.1	5.1	2.3	69.8	17.7
57b	First subsoil to 57a.	Subsoil, 4 to 10 inches.	U. S. Bureau of Soils.	.6	2.3	2.6	5.3	3.1	70.3	15.6
57c	Second subsoil to 57a.	Subsoil, 10 to36 inches.	U. S. Bureau of Soils.	.5	1.6	1.6	4.1	2.3	68.6	21.0
55	1½ miles west of Huntersville.	Soil, 0 to 10 inches.	A. E. Taylor....	1.2	2.0	3.1	6.7	7.7	62.0	17.5
71	2 miles northeast of Heimond.	Soil, 0 to 6 inches.	A. E. Taylor....	1.5	1.6	2.8	5.2	6.0	70.0	14.0

Limestone Slope Clay Loam.

This is the only residual soil of the area. It occurs as a dark brown to black silt loam, averaging from 8 to 16 inches in thickness. It contains a high percentage of organic matter, and to this may be attributed the dark color. With increased depth the color becomes lighter, the subsoil at 20 inches having a light to medium brown color, while at 2 feet it is a light brown with a reddish cast. The subsoil from 18 to 30 inches is more clayey than that at the surface, but below this may become rather sandy.

Although the above section is the most common, yet where the limestone is very close to the surface we find a black clay, changing very little in texture until the bed-rock is reached. In this case the soil has had its derivation wholly from the decomposition and disintegration of the limestone.

Owing to the topographical position on the main valley slopes, limestone slope clay loam grades into the Miami silt loam or Oak Forest silt loam at the upper portion of the slopes, while at the base it borders the Huntington loam or Hamburg loam. The origin of an average section seems to be mostly from the weathering of the Cincinnati limestone, to some extent from the wash of the silt loam above it, and in a few cases from the decomposition and disintegration of the underlying Cincinnati shales or the Laurel limestone. The effect that slumping, freezing, thawing, chemical reaction between the calcium carbonate of the limestone and the organic acids of the soil and other processes of disintegration are having upon the Cincinnati limestone can be partly determined by the fact that Mr. E. R. Quick, living one and a half miles south of Brookville, in 1883 gathered a large amount of limestone talus from a hillside where today there is fully as much as then.

This type seems to be especially rich in plant foods, and is known, locally, as the tobacco soil, 1,000 pounds to an acre often being realized. No soil in the county is as well adapted to blue grass. Corn also does well and alfalfa gives as good yields as on the bottom land. Probably the first alfalfa grown in the county was sown by Herman Muller, living a few miles east of Cedar Grove, about twenty-four years ago. It yielded from four to five tons per acre. Where the limestone is close to the surface and the soil is so full of the fragments that it is considered untillable, and would be classed as a stony clay or stony clay loam, alfalfa has grown well.

Owing to the very steep slopes upon which the limestone slope clay loam occurs the soil wash is very great, and a decade will leave the fields almost bare and worthless unless great precaution is taken. More care should be given when plowing so that the water cannot run in the furrows. Crops like tobacco and corn are dangerous to the preservation of the soil, because they leave the ground bare for a considerable interval. In the long run blue grass and alfalfa would be more profitable, since they would hold the soil in place.

The following table gives the results of the mechanical analyses of typical samples of the limestone slope clay loam:

MECHANICAL ANALYSES OF THE LIMESTONE SLOPE CLAY LOAM.

Number.	Locality.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
61a	1 mile southeast of Brookville.	Clay loam, 0 to 8 inches.	U. S. Bureau of Soils.	.0	.8	.8	2.3	3.7	65.4	26.8
61b	First subsoil of 61a.	Clay loam, 8 to 15 inches.	U. S. Bureau of Soils.	.1	.6	.6	1.7	1.2	64.5	31.1
61c	Second subsoil of 61a.	Clay loam, 15 to 29 inches.	U. S. Bureau of Soils.	.0	.5	.6	1.5	2.1	64.0	31.1
61d	Third subsoil of 61a.	Clay, 29 to 39 inches.	U. S. Bureau of Soils.	.0	.5	1.0	3.0	5.6	62.7	27.2
61aa	3 miles northwest of New Trenton.	Clay, 0 to 16 inches.	U. S. Bureau of Soils.	.0	.5	.7	2.4	.7	49.8	45.6
82	3 miles north of Cedar Grove.	Soil, 0 to 12 inches.	A. E. Taylor....	.2	.2	.4	2.8	4.2	67.4	24.4

Huntington Loam.

For texture and colors of the Huntington loam and its subsoils the occurrences in Franklin County are much like those described on page 23 of the general discussion, but the topographical* occurrence differs somewhat from the other counties in that the upper terraces are so much higher above the flood-plains than in the other six counties. The fourth terrace, which has its development on the east side of Whitewater Valley, south of Brookville, is 100 feet above the bed of the river. At the surface it is a rich farming loam of 7 to 17 inches, grading into a fine sandy loam and at 2 feet into a sandy loam. At 2½ feet it is a fine sand. Underlying this is 10 to 20 inches of a tough yellow clay containing gravel, and lower down occurs boulder clay of a bluish gray color. The third ter-

*E. R. Quick 3d Bull. of the Brookville Nat. Hist. Soc. pp. 26–29.

race is about 75 feet above the stream bed and is more sandy than the fourth, while the second is the most extensive and furnishes a splendid grade of farming land. The first terrace averages about 20 feet above low water mark and also takes its rank, in many places, as a most excellent farm land. Four miles south of Brookville a well was drilled in this terrace to a depth of 150 feet before bed-rock was reached.

The best farmers of the Huntington loam raise an average corn crop of sixty bushels, wheat fourteen, and alfalfa four and a half tons. This soil is well adapted to tobacco, but it is not considered equal to the limestone slope clay loam. Although the land is very porous, and manures will leach away rapidly, yet the application of stable manure, green manures and commercial fertilizer is reported to pay well for increasing the production.

The selling price of this type varies from $50 to $125 per acre.

The following table gives mechanical analyses of this type:

MECHANICAL ANALYSES OF THE HUNTINGTON LOAM.

Number.	Locality.	Description.	Authority.	Fine Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt.	Clay.
65a	1½ miles southeast of Brookville.	Loam, 0 to 7 inches.	U. S. Bureau of Soils.	2.3	18.9	11.8	10.0	1.1	45.4	9.7
65b	First subsoil of 65a.	Fine sandy loam, 7 to 17 inches.	U. S. Bureau of Soils.	1.2	18.1	12.9	9.8	1.4	41.5	14.6
65c	Second subsoil of 65a.	Sandy loam, 17 to 28 inches.	U. S. Bureau of Soils.	1.2	18.5	12.6	9.2	1.1	39.3	17.2
65d	Third subsoil of 65a.	Fine sand, 28 to 40 inches.	U. S. Bureau of Soils.	1.4	27.1	21.2	14.0	1.1	15.9	18.8
71	Near Laurel in Whitewater bottoms.	Soil, 0 to 11 inches.	Taylor.....	10.2	13.4	7.5	8.3	9.7	39.5	10.1

Hamburg Loam.

Found in the bottoms of the narrow valleys of the smaller streams on the west side of Whitewater River and its West Fork; is a mixture of limestone talus, which has washed down from the valley sides, with the wash from the Oak Forest silt loam. On the east side of Whitewater the limestone talus is mingled with the wash from the Miami silt loam. The texture varies from a loam to a stony loam.

Where there is a widening of the bottoms, so that agriculture can be carried on, crops equal to those produced on the Huntington

loam are obtained, but these areas are very limited and comprise only small portions of farms.

* * *

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