Soil Survey of Benton County, Indiana

BY

GROVE B. JONES, of the U. S. Department of Agriculture, In Charge, and J. BAYARD BRILL, of the Indiana Department of Geology.

W. E. MCLENDON, Inspector.

SOILS.

The soils of Benton County like those of other glaciated regions are derived from the drift brought down from the north. This drift material which consists of sand, gravel, clay and boulders, was deposited by the late Wisconsin ice sheet upon the uneven surface of the bed rocks. This mantle ranges in thickness from a few feet to 262 feet or more. This greater depth as shown by well borings, is found along the eastern border of the county, following approximately the present course of Pine Creek to within three miles of the southern boundary. There it turns and crosses to the southwest corner. This was evidently at one time a deeply eroded valley now filled with glacial debris to a level with the surrounding country.

According to the Indiana Geological Survey, the basal formations underlying the glacial drift consist of shales, sandstones and very little limestone. The New Albany Shale of the Devonian Period occurs beneath the till in the northeast corner of the county, and is the oldest of the underlying rock formations. Above this are the Knobstone shales of the lower Carboniferous period which underlies a large proportion of the eastern half of the county. The only rock exposure in the area is found along the dredged channel of Pine Creek in Pine Township, section 24, and is of this formation.

The rocks underlying the western half of the county belong to the Coal Measures and consist mainly of Meron Sansdtone with a very little Coking coal and Mansfield Sandstone in the southwest corner.

These formations, however, are so deeply covered by the

unconsolidated glacial drift as to have no direct influence upon the soils. The surface soil throughout the county is of a silty texture and is the result of the weathering of the underlying till. The different types of soil recognized are due to the different conditions to which this till has been subjected.

Almost the entire county formerly existed under very poorly drained and even swampy conditions, giving rise to a great extent of dark colored soils. Only along the natural drainage ways is found the light colored, timbered soil. Even the ridges throughout the prairie lands, which have the external appearance of moraines, have a dark surface soil due to inadequate natural drainage.

The Carrington soils are the result of the weathering of the glacial till under prairie conditions. The surface soils are dark-brown to black and the subsoils are of lighter color, usually light-brown to yellowish. The topography is undulating to gently rolling. The silt loam is the only member of the series mapped in Benton County.

Brookston Series.

The surface soils are dark-brown or dark brownish-gray and the subsoils are yellow and gray mottled with yellow as the dominant color. The upper subsoils may be dull drab in color, but as a rule the color brightens with depth until at from 18 to 24 inches it becomes almost a solid yellow or yellowish-brown. Partially weathered very friable and loose calcareous till is encountered at a depth of 27 to 36 inches. The topography is level to very gently undulating. The natural drainage is poor. Nearly all areas have been drained artificially and are now under a high state of development, producing heavy yields of corn, oats, hay crops, sugar beets, etc.

The Clyde series is characterized by dark-brown to black surface soils with subsoils of gray, drab or mottled gray and yellow. They have been formed in glacial lakes and ponds through the reworking of the soil material and the accumulation of a great quantity of decayed organic matter. The series is represented in Benton County by a single type, the Clyde silty clay loam.

The soils of the Miami series are brown, light-brown or grayish, underlain by heavier textured subsoils of yellowish-brown sometimes with mottlings of brown and light gray. The topography is gently undulating to rolling and the drainage is usually good. The soils are derived through weathering of glacial till

of a generally calcareous nature. The Miami silt loam is the only type of this series found in Benton County.

The Wabash soils are dark-brown to black and contain a high per cent of organic matter. The subsoils are drab to gray. This series is typically developed in the first bottoms of streams of the Central Prairie States and the material is derived mainly from the associated soils. Very little is found in Benton County and only of the silt loam type.

Muck was formed by the accumulation and decay of vegetable matter in undrained depressions.

Carrington Silt Loam.

The surface soil on the Carrington silt loam is a brown or dark-brown to black, mellow silt loam, 10 to 15 inches deep. The subsoil is a brown silt loam, passing at about 16 to 20 inches into a brown to yellowish-brown heavier silt loam, which in turn is underlain by a yellowish brown silty clay loam, which becomes gritty below thirty inches. Below the 3 foot section boulder till containing sand and gravel is encountered.

The usual variations in shades of brown and yellow of both the soil and subsoil are due to the difference in elevation and natural drainage. On the crests of the higher ridges the organic matter content in the soil is lower than in the typical soil and the color approaches that of the Miami types. These areas, however, as well as some few supporting a timber growth have been included with the Carrington silt loam because the organic matter content is higher than the average for the Miami soils. This condition obtains chiefly in the vicinity of Oxford and in sections 34, 35 and 36. Parish Grove Township.

In a few small areas, notably in the northern part of the county, the top soil is more sandy or loamy but on account of their small extent such areas could not be shown on the soil map.

A few large boulders were originally scattered over the surface of the type, but most of these have been removed.

The Carrington silt loam embraces the greater part of the better drained prairie land of Indiana and Illinois and with its flat phase constitutes a large per cent of the total area of Benton County. The topography varies from undulating to moderately rolling. The drainage conditions of the type vary in different localities depending largely upon the topographic features. On the more rolling areas natural drainage is fairly well established. It is not perfect, however, and tile drains are found to be highly

beneficial. Over the more level areas artificial drainage is necessary in order to insure the production of good crops.

Practically all of this type is under cultivation, the exceptions being farm woodlots and a few natural groves used for pastures.

The Carrington silt loam is well adapted to the production of corn and oats and has been devoted almost exclusively to the cultivation of these crops for a number of years. The yields vary considerably but the average for each is about 40 bushels per acre. Much of the type has been subjected to the almost continuous production of these two grains for a considerable period and the yields at present are said to be lower than formerly.

Clover and timothy are grown to some extent and their acreage is being extended, especially on farms where the amount of livestock is being increased. Clover is commonly sown with oats, but it is claimed that a better and more certain stand is obtained when it is sown alone in July or August.

Alfalfa is being successfully grown, but the acreage is limited at present. Three cuttings, are secured and the yield for the season ranges from 4 to 5 tons per acre. About 2 tons of crushed limestone per acre together with careful preparation of the soil and care in eliminating weeds are essential factors in securing a good stand.

Soy beans and sweet clover do well on this soil, wheat and rye are rarely grown. Potatoes are grown successfully, but not on a commercial scale. Fruit and vegetables are grown only for home use.

Commercial fertilizer is not commonly used. It is sometimes applied to corn with increased yields. All available stable manure is applied to the soil, but the supply is usually insufficient.

The most common rotation practiced consists of corn one year, oats one year, sometimes followed by clover one year.

Farm values on this type range from $200 to $250 or more an acre.

The organic matter which this type naturally contains should be maintained by the addition of manure. More livestock should be raised. By growing clover, soy beans and alfalfa, the nitrogen content of the soil can be increased through their ability to collect this constituent from the air.

Brookston Silt Loam.

The soil of the Brookston silt loam, consists of a very dark brown or black silt loam having an average depth of about 14

inches. From 14 to 28 inches the material is a grayish-brown silty clay loam, with faint mottlings of yellow which become more pronounced with depth. The remainder of the 3-foot section is a mottled brown, gray and yellow silty clay loam or clay which becomes decidely gritty at about 30 inches. Glacial drift material containing sand, gravel and stones forms the substratum and continues to an indeterminate depth. Small, well decomposed, iron concretions are found throughout the subsoil. Small areas of both the Carrington silt loam and the Clyde silty clay loam have been included in this type since it is impossible to draw a definite boundary line in many instances.

The topography is flat to gently undulating. On this account and also on account of the impervious subsoil, the natural drainage is anadequate. Tile drains and open ditches are common and practically all of this soil is now under cultivation.

This type is the most important soil in the county and practically its entire acreage is devoted to the growing of corn and oats. The yields for each average 40 bushels per acre. Clover does well and in locations when the water table is at least 2½ feet below the surface alfalfa thrives.

Many of the larger farms are located on this phase and it is not uncommon to see fields of corn or oats embracing several hundred acres.

Fall plowing is extensively practiced when oats ground is to be planted to corn. The average depth is about 6 inches. Commercial fertilizers are not used except in a few instances where 75 to 100 pounds of a mixture containing phosphoric acid and potash in varying amounts are applied to corn land. Owing to the present prohibitive price of potash, very little of this element is used.

A few farmers grow soy beans along with corn for ensilage and also for fattening hogs, thus securing a more balanced ration. Soy beans are meeting with favor and their acreage is being gradually increased. Some rape is sown with oats for sheep pasture.

Legumes and manure should be used more extensively in order to maintain the organic matter originally possessed by this soil. Ground limestone at the rate of 3 to 5 tons per acre has proved highly beneficial to land of this nature in other sections and it is believed that this practice will soon be followed in Benton County.

Farm values range from $200 to $250 an acre, but at present very little of this land is on the market. In 1915, one farm near Fowler sold for $266 an acre.

Miami Silt Loam.

The soil of the Miami silt loam to a depth of 6 to 10 inches is a gray or brownish-gray, friable silt loam. The soil is usually free from stone and gravel and contains a considerable percentage of very fine sand.

The subsoil is a yellow or yellow and gray mottled, slightly heavier silt loam, which at a depth of 15 to 20 inches grades into a yellowish-brown slightly mottled, silty clay loam. Below this the underlying material consists of a brownish sandy silt or clay, in which the percentage of coarse sand and gravel increases with depth. Mottlings and gray streaks are not uncommon throughout the subsoil.

This type of soil closely resembles the typical Carrington silt loam in texture, but it is easily distinguished and has been separated from that in this survey on account of its lighter color and because of the fact that it supports a timber growth. The type as a whole is deficient in organic matter. Where closely associated with the typical Carrington silt loam, the surface soil is rather higher in organic matter and more productive than the typical soil. This condition is found in the northern part of the areas along Pine and Mud Creeks and the soil becomes gradually darker as it extends away from the stream channel.

The surface of most of this type is undulating and the natural drainage is good. Along Mud Pine Creek the surface is more rolling and the slopes steeper. It is in this area that the type is found more typically developed.

The Miami silt loam is not an extensive type in Benton County, but to the south it occupies nearly 30 per cent of Warren County.

The type owes its origin to the weathering of calcareous till. It embraces the greater part of the original timbered areas of the county and at present hickory, bur oak, red oak and some white oak and walnut are found growing upon it.

The Miami silt loam is easily tilled and requires the least artificial drainage of any of the soils in the county. However, tile draining frequently improves its physical condition. It is devoted to the same crops as the Carrington silt loam, but the yields are somewhat smaller. Yields are largest during wet seasons as the crops grown are frequently injured by drought.

Corn and oats average about 40 bushels per acre. This type is generally recognized as the best soil for wheat and where good

cultural methods are practiced, yields of 18 to 35 bushels are obtained. Clover does well and some rye is grown for pasture. While the yields of crops are usually somewhat lower than on the more fertile prairie soils, farmers generally state that the quality is superior.

Practically the same cultural methods are practiced as upon the prairie soils with the exception of fall plowing. This practice is not followed because of the tendency to wash.

Liberal applications of stable manure increase the productiveness of this type. It not only adds humus, but also improves the physical condition of the soil and increases its moisture holding capacity. Nitrate of soda with either sulphate of potash or acid phosphate will usually give increased yields. Applications of finely ground limestone at the rate of 1 to 3 tons per acre are also beneficial.

The price of land of this type ranges from $135 to $150 an acre.

Clyde Silty Clay Loam.

The Clyde silty clay loam consists of a dark gray or black silty clay loam, about 10 inches deep, underlain by a drab or gray plastic silty clay, becoming mottled pale gray and yellow. Some variations in the type are found which are due largely to the different degrees of drainage. In the more poorly drained areas there has been a greater accumulation of organic matter and the surface soil is more friable and in places approaches muck.

This type is scattered throughout the county, the largest bodies being found in the vicinity of Boswell, Earl Park and Wadena. It is derived from reworked glacial material and occupies the depressions and low-lying flat areas along the minor drainage ways. The natural drainage is poor, but practically all of the type has been reclaimed.

This soil is well adapted to corn and the greater part of it is devoted to this crop. In acreage yields it is the leading corn soil of the county. The average is about 45 to 50 bushels per acre. In exceptionally wet seasons even the artificial drainage maybe insufficient and the corn may be drowned out. Millet is then sown in its place and later cut for feed. Oats do fairly well, but have a tendency to lodge. A heavy growth of blue grass offers excellent pasturage.

Methods of cultivation are the same as on the Carrington soils, but care must be taken not to work the ground when too wet. Fertilizers are not used.

The price of farms containing much of this type is high, ranging from $200 to $250 per acre.

Wabash Silt Loam.

The Wabash silt loam is not typically developed in Benton County and is of limited extent. As mapped it includes a mixture of soils of alluvial origin, ranging from a fine sandy loam to clay or silty clay loam. The color is dark-brown to black to a depth of 8 to 16 inches.

The subsoil is quite variable in depth and character. It consists for the most part of a dark colored or drab, mottled with yellow, loam to clay loam or clay. The lower subsoil may consist of a hetrogeneous mixture of clay, sand and gravel. This condition obtains principally along Pine, Mud Pine and Sugar Creeks shortly before they leave the county. In their upper reaches as well as along the smaller streams, the soil is frequently poorly drained material similar to Clyde silty clay loam. In this phase, the soil contains a high percentage of organic material, is subject to more frequent overflows and in origin is not wholly alluvial. It constitutes material that has been formerly classed as meadow.

With the exception of a very few spots, this soil is used for pasturage. The native growth consists of wild grasses, iron weed, elm and willow.

Muck is composed of decayed and decaying vegetable material mixed with a small quantity of mineral matter washed in from the adjoining higher lands. The soil is very black with a characteristic looseness and fluffiness when dry. This is underlain by a brown fibrous peat which in turn rests upon a brown or yellowish-brown, light textured loam. Occasionally, however, the lower subsoil is a yellow to drab silt loam or clay.

This soil occupies slight depressions and varies in depth from a few inches in the small areas to over 3 feet in the larger bodies. On the soil map a few small areas of shallow muck or chaffy land are included in the Clyde silty clay loam.

Natural drainage being very poor, tiling and ditching have been resorted to in order to bring this soil into productiveness. It is an unimportant soil type in Benton County, as its total acerage

is only about 1 square mile. It is confined to a few small areas in the northern and eastern parts. Some of it is planted to corn which makes a good yield if not injured by early frosts, and the remainder is used as pasture. Blue grass thrives well.

No specialization of crops has been attempted because of the small acreage. Celery, onions, lettuce and cabbage might be profitably raised for local markets if the soil were thoroughly drained and properly fertilized. A complete mixture of 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash is generally used to fertilize muck soils, potash proving the most effective element. Applications of ground limestone are often necessary to reduce the soils acidity.

Summary.

Benton County is situated on the western boundary of Indiana, the third county south of Lake Michigan. It embraces 414 square miles, or 264,960 acres.

The topography varies from level to gently rolling with the greatest elevations in the north-central portion, the drainage flowing out of the county in all directions. The streams are all small and tile drains and open ditches have been constructed, forming an excellent drainage system.

The first settlement was made about 1800 and the county was organized in 1840. It now has a population of 12,688. Fowler, the largest town and county seat, has a population of 1,600.

Good transportation and shipping facilities are furnished by five railroads and there are 425 miles of improved roads.

The mean temperature for the summer months is 72.6 degrees and for the winter 27.1 degrees with an average growing season of 165 days. The average annual precipitation is 38.59 inches.

Agriculture consists almost entirely of grain farming. Over 75 per cent of the acreage is devoted to corn and oats alone. The remainder is given over to forage crops and a little wheat. Corn averages about 37 bushels per acre and oats about 33 bushels.

Hog raising is the principal branch of the live-stock industry. The county produces from 35,000 to 37,000 head each year. Some cattle and sheep are fed for the market.

Much of the land is in large holdings, making the average size of the farms about 200 acres, 53.7 per cent of these are operated by tenants.

Land values are high. The Miami type sells at about $150 per acre and prairie land at from $200 to $250 or more.

Benton County is a part of the "Grand Prairie" which extends westward over Illinois and the soils are characteristic of prairie lands. Besides muck, four series of soils, each represented by one type were recognized and mapped.

The Brookston silt loam is the most important soil in the county. It is a dark brown to black silt loam with a mottled yellow subsoil. Nearly all of the type is under cultivation, corn and oats are the principal crops grown.

The Carrington silt loam occupies a large per cent of the entire acreage. This is a dark-brown prairie soil, well suited to the production of corn, oats, clover and grass. The topography is gently rolling to nearly level.

The Miami silt loam is next in extent and is locally known as clay land. It is light colored, timbered and well drained and was the first of the soils to be brought under cultivation. It is well suited to general farming and is an especially good grass soil.

The Clyde silty clay loam is the heaviest soil of the area and occupies the depressions or more poorly drained portions of the prairie lands. With thorough artificial drainage it is a strong corn and oats soil.

The Wabash silt loam embraces all the alluvium or first bottom lands along the larger natural drainage ways. Only small areas of their type are under cultivation to corn. The remainder is used as pasture.

Muck is mainly decayed vegetable matter. Only a few small areas were mapped. Corn is the only crop grown and yields are good. It supports a good growth of blue grass.

Soil Survey of Benton County, Indiana

By GROVE B. JONES, of the U. S. Department of Agriculture, In Charge, and J. BAYARD BRILL, of the Indiana Department of Geology.

DESCRIPTION OF THE AREA.

Benton County, Indiana, adjoins the Illinois State line and is the third county south of Lake Michigan. It is bounded on the north by Newton and Jasper Counties, on the east by White and Tippecanoe, on the South by Warren County, and on the west by the State of Illinois. It is rectangular in shape, 23 miles long and 18 miles wide, and embraces 414 square miles, or 264,960 acres.

The surface is high and gently rolling with three ridges extending in an easterly and westerly direction which determine the direction of the surface drainage. Gravel Hill, 3½ miles northwest of Fowler, is the highest point in the county, having an elevation of 857 feet above sea level, while the lowest portions are along the eastern, southern and western borders with altitude varying from 700 to 765 feet above ocean level. The slopes are broad and gentle, expanding into great stretches of undulating prairie land.

The natural drainage of the county is through small streams which have their rise within its boundaries. Pine Creek, the largest, drains the eastern part, Sugar Creek, the northern, Mud Pine Creek, the southern and Mud Creek the western. Natural drainage is immature and overflow or bottom lands are of small extent. A system of surface ditches has been constructed throughout the county, the largest of which are from 4 to 8 feet deep and from 7 to 12 feet wide, giving an adequate outlet to the numerous smaller ditches and underground drains.

The first settlements in Benton County were made about 1830 and the county organization was effected in 1840. The population of the county is small, 12,688, because of the large land holdings

in the western and northwestern parts. In the southern and eastern parts the lands are divided into smaller farms and the population is accordingly greater. Here too, are located more of the smaller towns. Fowler, situated in the center of the county, is the largest town and the county seat and has a population of about 1,600. Next in size are Oxford, Boswell, Otterbein, Ambia, Talbot and Swannington in the southern part and Earl Park, Freeland Park, Raub and Wadena in the northwestern quarter. These with many sidings and grain elevators furnish shipping points for their respective localities. In the northeastern part of the county there are no towns or villages and trading is carried on through Remington and Goodland to the north.

All portions of the county except the northeastern are well supplied with steam lines. The Cleveland, Cincinnati, Chicago and St. Louis Railroad, main line of the Big Four, crosses the county diagonally southeast and northwest. The Chicago and Eastern Illinois crosses the center and the Chicago, Indiana and Southern, the western part, both in a north and south direction. These three railroads furnish direct service with Chicago. A branch of the Chicago and Eastern Illinois connects Freeland Park with Milford, Illinois. The Lake Erie and Western Railroad runs east and west through the southern part of the county, about 2 miles north of the Warren County line. Unlike most portions of Indiana, Benton County has no electric lines.

Chicago, Indianapolis and Lafayette are the principal markets and of late many farmers have found it more profitable to haul their products, especially hogs, to Lafayette, than to ship them.

The county has an unusual mileage of improved roads and no one part has been favored. There are over 425 miles surfaced with crushed limestone and gravel and further improvement is added each year.

The towns and villages have excellent high schools and some of the rural districts have been combined into union schools.

The county is one of the most prosperous in the State and each year finds better farm buildings and a greater use of labor-saving machinery. Telephone service and rural mail routes reach all parts of the county.

Climate.

Wide variations in temperature are characteristic of the climate of Benton County. The precipitation is fairly well distributed

throughout the year, but lack of rainfall is sometimes detrimental to crops unless care is taken to employ proper methods of cultivation. The mean annual precipitation is 38.59 inches and the average snowfall is 22.8 inches. The average date of the last killing frost in spring is April 26, and of the first in fall is October 8th, which gives an average of 165 days for the growing season.

Agriculture.

Benton County has as large a proportion of productive soils as any county in the State, the only portions unsuited to agriculture being the narrow strips of overflow land along the larger streams.

Settlement was first made about 1831, along Pine Creek in the southeastern part and later spread to the other wooded sections of the county. Small fields were planted to corn and potatoes and a little later wheat and broom corn were added to their products, but cattle raising became the principal industry, the vast stretches of prairie furnishing excellent pasturage. About 1845 settlers began to encroach upon the higher portions of the unsettled prairies, making use of small open and "mole" ditches, but it was not until about 1875 that tile draining was resorted to and the reclamation of the wettest lands was begun.

At the present time the predominate type of agriculture is grain farming. Corn and oats have always been the leading crops. The following table compiled from census data shows the trend of agriculture during a period of 30 years:

Average

Year	Corn	Oats	Wheat
1880	98,455	12,962	3,528
1890	84,305	52,400	717
1900	110,057	73,343	67
1910	109,864	83,897	681

Corn and oats are the main money crops and in 1910 these two grains occupied about 75 per cent of the total acreage in the

county. Grain dealers give 6,150,000 bushels as a conservative estimate of the amount of these grains delivered at the elevators annually. To this must be added the amount fed on the farms, giving a total which shows the great productiveness of the soils, all of which grow these grains profitably. Some farmers claim that corn yields are greater on the darker soils but the quality better on the lighter or Miami type. The average yield throughout the county is about 37 bushels per acre, though the yields range from 20 to 75 bushels.

Benton County grows more oats than any other county in Indiana, and produces one-fourteenth of the total oats crop of the State. In 1915, about 5,000,000 bushels were produced on 87,385 acres. The yield was unusually high, averaging 60 bushels over the entire county, because of the very wet season. From year to year the yields range from 20 to 60 bushels per acre with an average of about 33 bushels.

While it is possible to grow wheat on the better drained soils of the county, its production has declined until very little is grown. According to the census of 1910, there were 681 acres which produced 11,299 bushels. Few attempts are made to grow wheat on the prairie soils because of the loss through winter killing by heaving.

The growing of clover is increasing. The best stand is secured when the ground has been prepared thoroughly and the clover is sown by itself in July or August. This method is little followed, however, the general practice being to sow or drill the clover with the oats and to let it stand a year before again planting the land to corn. Where grown for seed the average yield is about one bushel per acre. Some few grow mammoth clover to plow under to enrich the land.

Little rye is grown. Millet is often planted where the corn has been drowned out and is later cut for feed. Rape is sometimes sown with oats for pasturage.

Alfalfa was first grown in the county about 10 years ago, but it is only within the last 3 or 4 years that much interest has been shown in this crop. As little livestock is raised, alfalfa is not essential as a feed and the soil has not yet been sufficiently robbed of its fertility by continuous planting to grain to cause the owner to think of alfalfa growing as anything but allowing the ground to lie idle for a year.

To grow alfalfa successfully most of the soils in the county require applications of barnyard manure, and about 2 tons of crushed limestone per acre to reduce their acidity. The land is plowed in the early spring and worked down to a good seed bed and the seed is sown about the middle of July or the first of August. If the weeds are carefully kept out and the alfalfa let alone the first year, there will be 3 cuttings the second year with a yield of 4 to 5 tons per acre. It is recognized that a more extensive growth of this crop would prove of great benefit to the soils.

Hay is an unimportant crop. In 1910, 12,191 acres were given over to tame and cultivated grasses and produced a little over one ton to the acre. This is fed on the farm, but is not sufficient to supply the local need, many farmers feeding oats straw in its stead.

Potatoes and other vegetables are grown by all farmers for home use, but not for shipping. Nearly every farm has a small orchard of apples and a few pear, peach and cherry trees.

In the cultivation of corn, when it follows clover or oats, the prevailing method is to plow the ground in the fall, but if it follows corn, the plowing is left until spring. The ground is then worked down with disc and spike-toothed harrows until the seed bed is in a firm mellow condition. If the season permits, corn planting is begun the first of May and the crop is given from 3 to 6 or more cultivations, with the common corn cultivator. Most of the corn is husked from the standing stalk, shelled and hauled to the elevators. Very little is shocked and consequently the stover or portion remaining after the ear has been removed is a total loss, making a waste of one-third the crop. If more livestock were raised and the stover used as feed this loss could be eliminated. During the last few years there has been an increase in the number of silos and a corresponding increase in the percentage of the corn cut for ensilage. Later methods are being followed along this line and where formerly the corn was put into the silos while still green, it is now allowed to ripen until the kernels are rather hard and the husks are partially dry. Soy beans are often sown with the corn, making the ensilage a more balanced ration. A good practice sometimes followed, called "hogging it," is the turning of hogs into the corn, for not only is the soil enriched, but the labor of husking is saved. Soy beans planted with the corn serve as excellent feed and increase the fertility of the soil.

Reid's yellow dent, Leaming and Boone County white are the leading varieties of corn planted.

Different methods are used in the cultivation of the oats crop. Some disc the stubble land once, sow the oats broadcast with an end gate seeder, 3 to 3½ bushels per acre, and then disc again, following this with the spike-toothed harrow. Others sow the oats and then double disc but this has proved to be inadvisable, as some of the seed gets too deeply covered. The best method seems to be to double disc the stubble land first, then harrow and drill in the oats, using about 2½ bushels of clean seed to the acre. In 1915, smut reduced the yield of oats about 10.6 per cent, but farmers are learning to treat their seed with formaldehyde and the loss should be less each year.

The common rotation is corn and oats, clover is sometimes sown with the oats and allowed to stand a year, making a three year rotation.

Very little commercial fertilizer is used, not over 15 carloads a year. All manure available is put upon the soils, but because of the large acreage under cultivation and the scarcity of stock, especially on rented farms, the supply falls far short of the need. The lighter colored type of soils or "clay" lands are much benefitted by the application of 1 per cent nitrogen, and 10 to 12 per cent phosphoric acid and the black prairie soils, by the use of as high as 8 per cent potash with from 10 to 16 per cent phosphoric acid. When used on corn, about 75 to 150 pounds per acre are applied, but this practice is little followed. When the growing of alfalfa is attempted it is necessary to use 2 tons of crushed limestone per acre along with barnyard manure. The growing of clover, soy beans and other leguminous plants for fertilizers should be more extensive.

Hog raising and feeding is the most important branch of the livestock interests and the industry is increasing. Oak Grove Township leads in the number raised and in 1915 reported 4,075 head. The entire county produces between 35,000 and 37,000 each year.

Cattle raising was formerly the main industry of the county, but is now relatively unimportant. A few farmers buy feeders in the Chicago and Kansas City markets in the early fall and place them on the market in the spring or following fall.

There are three small commercial dairies which supply the needs of the larger towns. Some cream is shipped out of the county but the industry is insignificant. There are no creameries.

Some sheep are shipped in from the northwest and fattened for the market. On the large holdings where the farming is done by tenants little livestock of any kind is raised. The breeding of pure bred cattle mainly Herefords and Shorthorns has been undertaken by a few farmers. In general the class of stock kept is improving. The county is noted for its fast horses, Dan Patch and William being some of its products.

The numerous large holdings make the average size of farms in Benton County, comparatively large. About 200 acres is the average. There are several estates containing from 1,000 to 6,000 acres or more.

In 1910, 53.7 per cent of the farms were operated by tenants, renting mainly on the share basis. The owner receives one-half of all grains delivered to the elevator. $6 per acre is the usual price paid in addition for privilege of pasture and hay land. Cash rent varies from $5 to $12 an acre, but about $8 is the average.

Quite a contrast is evident in the buildings on farms operated by the owners and on those farmed by tenants. On the latter, the buildings are few and very small, usually only a house and barn. A lack of hay capacity is noted everywhere.

Machinery of late design is quite generally found. A number of tractors are in use.

Farm labor which is mainly American is scarce and generally inexperienced. Monthly wages vary from $25 to $30 with board for single men, while married men receive $30 to $40 and the use of a tenant house. During corn husking the pay is per bushel, the single man receiving 3 to 3½ cents together with board and the married man 1 cent more without board.