U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE PENNSYLVANIA STATE COLLEGE SCHOOL OF AGRICULTURE AND EXPERIMENT STATION, R. L. WATTS, DEAN AND DIRECTOR.

SOIL SURVEY OF CAMBRIA COUNTY, PENNSYLVANIA.

BY

B. B. DERRICK, IN CHARGE, AND A. L. PATRICK, OF THE U. S. DEPARTMENT OF AGRICULTURE, AND DAVID C. WIMER, OF THE PENNSYLVANIA STATE COLLEGE.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1915.]

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1917.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., June 29, 1916.

SIR: In the extension of the soil survey in the State of Pennsylvania a survey was made of Cambria County during the field season of 1915. This work was done in cooperation with the State of Pennsylvania, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1915, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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SOIL SURVEY OF CAMBRIA COUNTY, PENNSYLVANIA.

By B. B. DERRICK, In Charge, and A. L. PATRICK, of the U. S. Department of Agriculture, and DAVID C. WIMER, of the Pennsylvania State College.—Area inspected by HUGH H. BENNETT.

DESCRIPTION OF THE AREA.

Cambria County, Pennsylvania, lies just southwest of the center of the State. It is bounded on the north by Clearfield County, on the east by Blair and Bedford Counties, on the south by Somerset County, and on the west by Westmoreland and Indiana Counties. It is approximately rectangular in shape and has an area of 696 square miles, or 445,440 acres.

The county lies in the Allegheny Plateau, the eastern boundary marking approximately the eastern limit and highest part of that extensive physiographic feature. Immediately east of the eastern boundary of the county the plateau drops abruptly in the Allegheny escarpment or front to the most westerly member of a series of intermountain valleys. The plateau slopes westward from an average elevation of about 2,500 feet at the eastern to about 2,000 feet on the western boundary. The slope is not uniform, however, being interrupted by the well-defined Laurel Ridge, which crosses the western boundary from Indiana County west of Johnstown, trends northeastward, decreasing gradually in elevation, and crosses into Clearfield County north of the village of St. Lawrence. The low belt between the high eastern boundary and Laurel Ridge has an elevation along its low axis, running through the towns of Adams, Summerhill, Allegheny, and White, of about 2,000 feet.

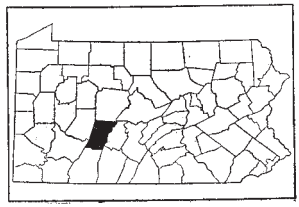

FIG. 1.—Sketch map showing location of the Cambria County area, Pennsylvania.

Laurel Ridge where it crosses the western boundary of the county has an elevation of about 2,700 feet. Northeastward from this it decreases rather uniformly in elevation to about 2,100 feet where it crosses the northern boundary into Clearfield County, lying but little above the country on both sides of it and having lost its ridge features to such an extent that it no longer receives the recognition of a name. The elevation of the plateau in the northwestern part of the county is about 1,850 feet.

The broad lowland belt between Laurel Ridge and the plateau crest on the eastern boundary of the county may be designated as the Ebensburg Valley, while the narrower one lying west of Laurel Ridge, only the eastern part of which lies in the county, is known as the Ligonier Valley.

The whole area of the plateau is thoroughly dissected, the depth varying with the size of the stream and the elevation of the upland. In general the dissection is less deep in the lowland belts and deepest where streams of considerable size cross Laurel Ridge. No streams cross the Allegheny crest, that being a drainage divide, and because of this the dissection is shallow.

The Conemaugh River, South Branch of Blacklick Creek, and Chest Creek cross Laurel Ridge, the first below Johnstown, the second between Nanty Glo and Twin Rocks, and the last between Patton and the county line. In all these localities the stream valleys are deep, narrow mountain gorges. Within the lowland belts streams larger than mere wet weather drainage ways, except where local hard ledges have prevented, have developed flood plains, usually narrow. The Little Conemaugh above South Fork, the Conemaugh in Johnstown, Stony Creek, Clearfield Creek and its branches, Chest Creek above Patton, Blacklick above Nanty Glo, and the West Branch of the Susquehanna River all have developed narrow flood plains. These flood plains occur along their courses in the lowland belts.

The depth of the dissection in the Ebensburg belt ranges up to about 1,000 feet. In the Ligonier Valley it is a little less, while the gorge of the Conemaugh through Laurel Ridge is nearly 2,000 feet deep. The dissection is thorough but mature, the slopes therefore being rounded rather than angular. While there are no areas of flat upland half a square mile in area there are large areas of smooth, rounded, tillable slopes.

The principal drainage divide is the sinuous ridge extending along the Blair and Cambria County line north to Blairs Gap, thence west to Munster, north to Winterset, and northwest to Nicktown and the Indiana County line.

To the east and north of this divide the drainage enters the Susquehanna River and eventually reaches the Atlantic Ocean; to the west and south the drainage enters the Allegheny River, to find its way by the Ohio River to the Mississippi. There are other subordinate divides reaching out between streams, as arms from the main divide. All parts of the county are reached by drainage ways.

Cambria County was established in 1804. There seems to have been no permanent settlement in this area prior to 1774,[1] when a few white settlers located at Moxhom. Johnstown was settled by the

[1] Storey, Henry Wilson, History of Cambria County.

Dutch in 1790, Beulah by Welsh in 1797, Loretto by Irish in 1800, Ebensburg by Welsh in 1807, and Munster by Irish in 1808; later many Scotch-Irish, German, Welsh, and some English settlers entered the county. The Germans became most numerous in the southern part of the county and at Carrolltown. The present population consists largely of descendants of the early settlers, although there has been a steady influx of foreigners in recent years.

The 1910 census reports the total population of Cambria County as 166,131. This includes a total of 44,687 foreign-born persons. These are mainly from Austria-Hungary, Italy, Germany, England, Russia, Wales, and France, in the order named, and nearly all of them are employed in the mines and factories. The total rural population is given as 84,411 and the total urban population as 81,720. The density of the rural population is reported as 117.7 per square mile. The growth in both rural and urban population has been rapid.

Of the many towns in the county the largest is Johnstown, an important manufacturing city, with a population reported in the 1910 census as 55,482, and East Conemaugh, the next largest town, with a population of 5,046. South Fork, Gallitzin, Portage, Dale, Lilly, and Cresson are mining towns of considerable importance, located along the main line of the Pennsylvania Railroad. Some of the most important mining towns located on the branch lines of railroads are Patton, Barnesboro, Spangler, Hastings, Scalp Level, Beaverdale, and Colver. Ebensburg and Carrolltown are centers of important agricultural sections; the former is a popular summer resort and the county seat. Creameries are located at Patton and Johnstown, and ice-cream factories are located at Barnesboro and Portage. The towns consume the greater part of the agricultural products of the county, and in addition considerable farm produce is shipped in.

The main line of the Pennsylvania Railroad, together with numerous branches and spurs, reaches all parts of the county. In addition some of the mining companies own roads which connect with the New York Central and other railways. Trolley lines connect many of the important towns. There are good wagon roads throughout the county, many of which are under the supervision of the State highway department. There are about 1,140 miles of public roads, including about 170 miles of State highway.

CLIMATE.

The climate of the county is characterized by rather short, cool summers and comparatively long, cold winters. The only Weather Bureau station in the county is located at Johnstown, which is situated in one of the lowest valleys, having an elevation of only 1,777 feet above sea level. The temperature is slightly lower and the precipitation slightly less for the county as a whole than the Weather Bureau figures indicate.

The mean annual temperature is reported at the Johnstown station as 51.4° F. The mean summer temperature is 71.3° and the mean winter temperature 30.4° F. July is the hottest month and February the coldest. The lowest temperature ever recorded is −17° and the highest 102° F. The ground is covered with snow most of the time from the latter part of November to the last of March. The roads in the higher parts of the county frequently are made impassable by the drifting of snow during this period.

The mean annual precipitation is reported as 48.06 inches. The rainfall is heaviest during the summer months, averaging 14.41 inches, and lightest during the fall, averaging 9.33 inches. For the spring months the precipitation averages 12.74 inches, and for the winter months 11.58 inches. The total rainfall for the driest year recorded is given as 37.55 inches, and for the wettest year 57.39. The mean annual snowfall is reported as about 50 inches. The records indicate that October is the driest month and June the wettest. The rainfall is well distributed throughout the growing season, and crops seldom suffer from drought.

At the Johnstown station the average date of the first killing frost in the fall is reported as October 11 and of the last in the spring as May 5. This gives a normal growing season of 159 days. The date of the earliest recorded killing frost in the fall is September 23 and of the latest in the spring, May 16. The growing season is of sufficient duration to mature the crops common to this latitude, though occasionally corn and buckwheat are damaged to some extent by exceptionally early fall frosts. Sometimes the crops planted early in the spring are killed by late frosts or freezes. Stock can be pastured for at least six months of the year.

The following table is compiled from the records of the Weather Bureau station at Johnstown:

Normal monthly, seasonal, and annual temperature and precipitation at Johnstown.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1895).	Total amount for the wettest year (1905).	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	32.7	67	− 4	3.62	3.22	4.42	9.1
January	29.8	78	−15	4.06	4.91	4.21	14.1
February	28.8	73	−17	3.90	0.98	2.23	14.8
Winter	30.4	78	−17	11.58	9.11	10.86	38.0
March	39.9	86	− 4	4.08	2.49	5.06	7.5
April	49.5	91	16	3.95	4.38	3.63	1.2
May	61.3	94	28	4.71	2.83	4.08	T.
Spring	50.2	91	− 4	12.74	9.70	12.77	8.7

Normal monthly, seasonal, and annual temperature and precipitation at Johnstown—Continued.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1895).	Total amount for the wettest year (1905).	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
June	69.5	102	37	5.19	4.59	6.78	0
July	73.3	100	42	4.69	3.02	8.88	0
August	71.2	98	41	4.53	3.39	5.73	0
Summer	71.3	102	37	14.41	11.00	21.39	0
September	65.4	96	31	3.52	3.75	3.90	0
October	53.3	89	21	2.65	1.24	4.82	0.1
November	41.6	80	7	3.16	2.75	3.65	3.1
Fall	53.4	96	7	9.33	7.74	12.37	3.2
Year	51.4	102	−17	48.06	37.55	57.39	49.9

AGRICULTURE.

The early settlers found the soil well adapted to corn, wheat, oats, barley, buckwheat, rye, flax, hay, and potatoes. The first farmers produced nearly everything needed for home use. The growing of flax and wool from which to make homespun was early an important industry. The opening of State roads, the growth of local markets, and the improvement of transportation facilities brought about a number of agricultural changes, but the crops that were important in 1850 have increased in importance, as is shown by the following table:

Agricultural statistics, Cambria County, Pa.—Censuses of 1850, 1870, 1890, and 1910.

Land in farms and principal crops.	1850	1870	1890	1910
Land in farms:				
Improved.....acres..	51,021	93,438	128,534	130,410
Unimproved.....do....	107,749	136,459	96,462	97,594
Crops produced:				
Wheat.....bushels..	42,898	56,938	74,840	48,996
Rye.....do....	18,947	47,385	35,386	49,722
Indian corn.....do....	58,947	153,252	212,467	273,346
Oats.....do....	193,082	346,991	329,189	357,203
Irish potatoes.....do....	20,784	89,368	81,120	381,424
Buckwheat.....do....	21,653	21,852	51,309	118,515
Hay.....tons..	10,326	25,801	45,096	30,757

Barley, clover and grass seed, flax, and hops were formerly grown to some extent, but now receive little attention. Orchard and truck crops are becoming more important, and gradually more intensive methods are taking the place of the older system of farming. Small fruits, raspberries, blackberries and dewberries, and strawberries are of growing importance. Formerly many sheep were raised in the county, but changes in economic conditions, including the development of western ranching, coupled with the losses occasioned by dogs, have caused less interest to be taken in this industry, and now, even with the ruling high prices of mutton and wool, sheep raising is decreasing. Dairy and poultry products have increased in importance and seem to be still on the increase. In late years milk to supply the towns and cities, especially has assumed importance in the market products of the county. Another reason why agriculture has received increasing attention in the county during the last 35 years is the fact that lumbering, which formerly was the principal occupation, has declined, owing to the diminishing supply of timber. The mineral rights on many of the farms have been sold, and the money received from this source has improved the financial condition of the farmers.

The prevailing type of farming consists of the production of general farm crops in conjunction with dairying and the growing of Irish potatoes. Locally, truck and orchard crops are important. The chief crops sold are hay, oats, buckwheat, rye, cabbage, tomatoes, apples, and peaches, though a small proportion of each of these is used on the farm, as subsistence for the farmers' families as well as for the work stock. Practically all the corn produced is cut green and used as ensilage for the feeding of dairy cows. The greater part of the Irish potatoes and wheat grown is used on the farm. Dairying is an important industry throughout the county. There were 8,017 dairy cows on farms reporting in 1910. In the vicinities of Johnstown, Salix, and Scalp Level large herds are kept for the production of milk. Near Patton milk is sold to a cooperative creamery for butter production. Butter commonly is made on the farms. Poultry raising is an industry of growing importance throughout the county. All the farmers fatten a few hogs, mainly for home use. A few sheep are kept in rough, untilled areas, the lambs and wool being sold at local markets.

The following tables give the acreage and yield per acre of each of the important crops grown in Cambria County and the number of domestic animals sold or slaughtered, as reported in the census of 1910:

Acreage and yield per acre of principal crops, and animals sold and slaughtered, census of 1910.

Crop.	Area planted, 1909.	Yield per acre.	Crop.	Area planted, 1909.	Yield per acre.
	Acres.	*Bushels.*		*Acres.*	*Bushels.*
Corn	7,897	35	Buckwheat	6,294	19
Oats	14,800	24	Potatoes	3,572	106
Wheat	3,252	15	All other vegetables	1,477	.....
Rye	3,933	13			*Ton.*
			All tame or cultivated grasses	34,873	1

Domestic animals sold or slaughtered.	Number.	Domestic animals sold or slaughtered.	Number.
Calves	4,032	Swine	10,026
Other cattle	3,684	Sheep and goats	1,937
Horses and mules	861		

A total of 21,680 maple trees is reported, with 114,816 apple trees, 18,448 peach trees, and 9,910 grapevines. The census gives 37 acres in strawberries, 12 acres in blackberries and dewberries, and 23 acres in raspberries and loganberries.

The value of the various classes of farm products is given in the following table:

Value of farm products of Cambria County, census of 1910.

Product.	Value.	Product.	Value.
	Dollars.		*Dollars.*
Cereals	528,574	Livestock and products—Continued.	
Other grains and seeds	1,949	Dairy products, excluding home use	411,441
Hay and forage	514,369	Poultry and eggs	222,795
Vegetables	418,264	Wool, mohair, and goat hair	3,395
Fruits and nuts	100,786		
All other crops	212,912	Total value	2,830,332
Livestock and products:			
Animals sold and slaughtered	415,847		

These figures, from the 1910 census, represent the products sold, but do not take into account that part of the various crops and products used on the farm.

The influence of soil and topography upon the distribution of crops, character of industries, methods of farming, and size of farms is more or less marked. In the vicinities of Dunlo, Onnalinda, Mountaindale, Frugality, Blandburg, and other smaller communities where the presence of rock fragments makes tillage operations impracticable, agriculture is of little importance, except for the pasturing of live stock. The greater part of these soils (the Dekalb

stony sandy loam and stony loam) is covered with second-growth forest. The poorly drained soils (Lickdale clay and Atkins clay), where utilized at all, are devoted mainly to pasturing dairy cows. The agriculture on the well-developed soils of the county is influenced more by the proximity to markets and transportation facilities than by the adaptation of individual types. Near Johnstown, Geistown, Scalp Level, and Wilmore trucking and the production of milk, together with some general farming, constitute the prevailing type of agriculture, while on the same soil types (Dekalb loam, gravelly loam, and silt loam) farther from the towns the production of hay, corn, and small grains, in conjunction with butter making, is of primary importance. On the precipitous slopes along the Conemaugh River and its branches and near Dunlo, Walsall, Ferndale, Vintondale, and in a few other isolated areas throughout the county, agriculture is of no importance on account of the steep character of the topography or the rough, stony nature of the surface. These sections are thinly covered with hardwood forest. The cheaper lands, of little value for the production of crops, are held as a rule in larger tracts than are the more productive soils of the county.

Little attention is given to the adaptation of the various soils of Cambria County to particular crops. The Dekalb stony loam, Lickdale clay, and Atkins clay are utilized mainly for pasture where cleared. This is due to the large quantities of rock fragments in the stony loam and to the wet, poorly drained nature of the Lickdale and Atkins types.

The Dekalb shale loam and gravelly loam, because of their comparatively loose structure, are peculiarly associated with the production of Irish potatoes, string beans, green peas, corn, oats, alfalfa, and orchard products, mainly apples and peaches. The heavier Dekalb soils, the loam and silt loam, because of their rather cold and compact nature, are recognized by many of the farmers as being well adapted to grass, small grains, strawberries, cucumbers, cabbage, and tomatoes. The earliest truck soil in the county is the Pope loam.

In preparing land for corn the sod usually is broken in the fall with two-horse turning plows or three-horse sulky plows and the land left in furrows, so that the soil may be pulverized by freezing and thawing during the winter. The sod (clover or timothy) is broken to depths varying from 7 to 10 inches. Early in the spring the plowed land is disked by driving across the furrows and is gone over with spring-tooth and smoothing harrows. Corn, which generally follows grass, usually is planted with a two-horse planter in the latter part of May or early in June. It is planted in rows 36 to 42 inches apart, and is drilled 12 to 16 inches apart in the row. The corn land is given frequent level cultivations, the first two being deeper, and is laid by about the middle of July. When grown for ensilage corn

is planted closer together in the rows, and frequently soy beans are drilled in with the corn at the rate of 20 to 25 pounds per acre. About 4 quarts of corn per acre are planted. The ensilage is cut with a corn binder when the grain is in the dough stage and put in the silo immediately after cutting. Where grown for grain the corn usually is cut by hand and allowed to stand in the shock until dry, when it is husked in the field, the fodder being tied in bundles, stacked, and fed to the dairy cows during the winter. The dent varieties of corn, mainly Reids Yellow Dent, are commonly grown for ensilage purposes, while for grain the dent varieties with some flint and local varieties of mixed flint and dent generally are used.

Oat land usually is plowed as soon as the ground is dry in the spring, to a depth of about 5 to 7 inches. In order to secure a firm seed bed the plowed land is frequently disked, rolled, harrowed, and dragged before drilling. The common varieties of oats are Longs White Tartar, Swedish Select, Sixty Days, and Kherson. The oats are drilled at the rate of 2 to 2½ bushels per acre as early as the season will permit. Where clover follows oats, 5 or 6 quarts are drilled with the oats. Oats are harvested about the middle of August with a reaper and binder, and are thrashed in the barn during rainy weather after they have stood in the fields in shocks until well cured.

After oats are removed from the field the land is plowed from 7 to 10 inches deep and harrowed, and wheat, at the rate of about 2 bushels per acre, is drilled in, usually the latter part of August. The common practice is to drill timothy and clover in the wheat field early the following spring, the drill being set just deep enough to cover the grass seed. Wheat is harvested with a 3-horse reaper and binder about the middle of July. Fulcaster, Red Wave, Red Russian, and Pennsylvania Bluestem are the most popular varieties of wheat.

Grass-clover sod is cut two years. The first year clover constitutes the greater part of the crop.

Buckwheat usually is grown in old pasture land or on "new ground." About 1 to 1½ bushels per acre are sown, usually between June 25 and July 4. The land is plowed at odd times when other work is not pressing. It usually is harrowed once a week until time of sowing. The crop is harvested between the middle and last of September with a self-rake reaper, and shocked. It stands in the fields until cured. The varieties commonly grown are the Japanese and Silver Hull.

Rye as a rule is drilled on land from which buckwheat has just been removed. The buckwheat stubble is usually disked and the rye drilled at the rate of 1½ to 2 bushels per acre. Rye is sowed ordinarily between September 20 and October 15. When grass fol-

lows rye, as it usually does, it is sown in the spring, as on the wheat fields.

The Rural New Yorker, Sir Walter Raleigh, Green Mountain, and Carman No. 3 are the popular varieties of Irish potatoes. These are grown chiefly for the late market. Irish potatoes are planted with two-horse planters, 2 to 3 inches deep, at the rate of 12 to 15 bushels per acre. They are planted 12 to 15 inches apart in the row, the rows being 3 to 3½ feet apart. Potatoes are planted the last of May or early in June on land which is plowed deep early in the spring and cultivated several times with spring-tooth harrows. The aim is to prepare a good, loose seed bed. During the growing season frequent level, shallow cultivations are given, and in the last two cultivations a small ridge is thrown up on the rows. The crop is laid by about the last of July and the potatoes are dug by hand during October. Most of them are stored in potato cellars. Many of the farmers spray with Bordeaux mixture to prevent blight. Some put lead arsenate in the spray mixture to kill the potato bug. The potato scab is controlled by treating the prepared seed with a formalin mixture or by dusting the seed with flour of sulphur.

The truck crops are planted on well-prepared seed beds as soon as the ground is thoroughly warmed in the spring. Throughout the growing season these crops receive frequent shallow, level cultivations.

The principal varieties of cabbage grown for the early market are Jersey Wakefield, Charleston Wakefield, Extra Early Express, and Way Ahead. Those grown for the late market are the Early Summer, Flat Dutch, Sure Head, Danish Baldhead, and Copenhagen Market. The cabbage is harvested and sold at local markets during the latter part of October and early November. The common varieties of tomatoes, named in order of their ripening, are the Earliana, Chalks Early Jewel, Matchless, Beauty, Stone, and Red Rock. The most popular varieties of sweet corn are Golden Bantam and Stowells Evergreen.

Strawberries are grown in matted rows, the rows being 4 feet apart and the plants set about 18 inches apart. They are planted from about April 25 to the last of May on land on which cover crops of rye or rye and vetch have been plowed down earlier in the spring, and which has received a number of cultivations until a firm seed bed is formed. Twenty to thirty tons of manure is applied per acre on the land the fall before sowing the cover crop. Late each year after the ground freezes the plants are heavily mulched with straw and manure. Early in the spring, about the middle of March to the first of April, the mulch is raked between the rows, where it is left to keep down the weeds and to keep the berries clean. The most popular varieties are the Sample and William Belt.

Apples and peaches are cultivated from early spring until about July 15, when a cover crop of hairy vetch and rye, crimson clover, mammoth clover, buckwheat, millet or rape is sown, to be plowed under early in the spring. Crops requiring cultivation are often grown between the trees for a few years after setting. The trees are generally sprayed and pruned regularly. These practices are followed in the commercial orchards; the small orchards, on nearly every farm in which fruit is grown only for home use, receive but little care. The principal varieties of apples, in order of their ripening, are the Red Astrachan, Yellow Transparent, Summer Rambo, McIntosh, Wealthy, Wagener, Rome Beauty, Northern Spy, Hubbardston, Stayman Winesap, and York Imperial, with some Rhode Island Greening and Baldwin. The varieties of peaches commonly grown in the county are the Greenboro, Carman, Mountain Rose, Niagara, Champion, Belle of Georgia, Elberta, and Solway. A few pears are grown, the Seckel and Bartlett being the common varieties. The sweet cherries grown are mainly the Windsor, and the sour cherries mainly the Richmond and Montmorency, German prunes and the Japan varieties of plums are most popular.

Stable manure as a fertilizer is in common use, and in addition many farmers use commercial fertilizers. Where available 8 to 10 tons of manure per acre are applied for corn. When the land is plowed in the fall the manure is applied as a top dressing and when broken in the spring it is broadcasted on the sod and plowed under. Some use 25 to 30 pounds of phosphoric acid per acre in the rows at planting time, in addition to the manure. Wheat, where fertilized, usually receives an acreage application of about 25 pounds of nitrogen, 50 pounds of phosphoric acid, and 50 pounds of potash. This is drilled in at seeding time. Buckwheat is often fertilized with 30 to 35 pounds of phosphoric acid, which is drilled in at seeding time.

The common method of fertilizing truck crops is to disk in about 15 tons per acre of stable manure, which has been broadcasted on the plowed field, and to apply 400 to 500 pounds of a 4–8–10 [1] mixture, either broadcasted on or drilled in the prepared seed bed before planting. Some farmers drill one-half the commercial fertilizer in the prepared seed bed before planting and add the remainder two or three weeks later, applying it along the row. The manure used is supplied mainly from the farms, though a considerable quantity is obtained from near-by towns.

The majority of the farmers use lime. The lime is purchased in carload lots in lump form, and is placed in piles until slaked, when it is broadcasted either by hand or with lime distributers. It is commonly applied at the rate of about 1 ton per acre every four to six

[1] 4 per cent nitrogen, 8 per cent phosphoric acid, and 10 per cent potash.

years. The census of 1910 reports the expenditure for fertilizer in the county as $78,148.

The laborers employed on the farms in Cambria County during the entire year or by the month, are mainly native-born white. Extra labor used during the harvest season is easily obtained from the ranks of the unemployed miners. The regular laborers are paid about $25 a month, with board, while the harvest labor is paid from $1.25 to $2 per day. The census for 1910 reports an expenditure of $209,458 for labor.

According to the 1910 census, 49.7 per cent of the county is in farms. Of the farm land, 57.2 per cent is reported improved. The average size of the farms is given as 82.6 acres. The census reports 84.4 per cent of the farms operated by the owners. Practically all the remainder are operated by tenants. Farms are rented on both the share and cash basis, most of them for cash. Where rented on shares, the owner commonly furnishes one-half the fertilizers and seed and pays one-half the taxes and insurance, the operator furnishing all the stock, other materials, and labor. Each receives one-half of all the products of the farm, corn stover and straw from grain being used by the operator without cost. This system is not used where dairying is practiced. Cash rents range from 4 per cent to 5 per cent of the original investment, the owner paying all or a part of the taxes and insurance.

The average value of farm land in Cambria County is given in the 1910 census as $32.59 an acre. However, the value varies greatly throughout the county, depending upon improvements and locations. Some of the land near Johnstown has a high value, due to prospective suburban development.

SOILS.

Cambria County lies mainly within the Allegheny Plateau, the southeastern corner only extending beyond it into the western part of the Appalachian Valley. The upland soils are residual, having been developed through the action of climate and vegetation from sands, silts, and clays derived through weathering from a series of sandstones, shales, and clays. The alluvial soils consist of material derived from the upland soils of the area and from identical soils in adjacent areas, deposited from the water of streams. It has suffered very little change since deposition other than has resulted from the accumulation of moderate quantities of organic matter. Some of this soil consists of alluvium laid down by perennial streams and the rest by intermittent streams. That laid down by the smallest of the latter is often referred to as colluvial material.

The rocks from which the soil materials have been derived consist predominantly of sandstones and shales. The sandstones range

from massive to thin bedded, from coarse to fine grained, and from gray to brown in color. The shales range from sandy to argillaceous in texture and from gray to red in color. There are a few beds of limestone, some of them carrying chert, but they are so thin that their effect upon the soil is negligible.

This series of rocks lies horizontal, or nearly so, and belongs to several periods of geologic history. There is, however, no recognized lithologic relationship among the rocks of the several periods other than that they all have about the same range in characteristics. The soil characteristics do not show any recognizable and persistent relation to the rocks of the several periods. Practically all the soil materials have been derived from rocks of Carboniferous age. There are no rocks that are younger, and older rocks outcrop only in small areas in some of the deep valleys.

The alluvial soils, mapped as the Pope loam and the Atkins clay, consist of wash from the upland soils of the drainage basins of the streams along which they occur. Most of this alluvium has been washed from the Dekalb soils. The poorly drained bottoms are mapped as the Atkins clay, while those which have fairly well established drainage are classified as the Pope loam.

The colluvial soil consists of material which has been carried down the slopes and has accumulated in fanlike areas at the base. It is mapped as the Lickdale clay. Much of this soil in its original position would have been classed with the Dekalb series, but is separated chiefly because of its poor drainage.

The Dekalb soils are characterized by their light-brown to grayish-brown color and the mellow to loose structure of the surface soils, and by the yellow to yellowish-brown color and friable to compact nature of the clay subsoils. They are derived from the decomposition of the underlying sandstones and shales of the Carboniferous and Devonian beds. The surface features consist of gently rolling table lands, hills, and mountains, and the soils for the most part have good drainage.

The Upshur soil is marked by the reddish-brown or Indian-red color of both the surface soil and subsoil, by the loamy character of the surface soil, and by the moderately friable to rather brittle nature of the subsoil. It is derived from the underlying Indian-red shales and sandstones. It has a rolling to mountainous topography, and the drainage is well established.

The Lickdale soil has a pale-yellow to grayish clay surface soil, with a mottled yellow and gray or bluish-gray, plastic subsoil. In places the lower subsoil contains varying quantities of dark concretionary material, probably iron oxide, forming compact layers,

locally termed "hardpan." This soil occupies lower slopes and represents material removed from the sides and crests of the adjoining higher areas. Drainage is poorly established, owing to seepage.

The Pope soil is characterized by the brown color and mellow structure of the surface soil and the yellowish-brown or brownish-yellow color and friable nature of the subsoil. In places pockets or strata of coarse material are encountered in the subsoil. This soil occupies the first bottoms of streams, and is subject to overflow, but is fairly well drained between overflows. The material consists largely of wash from the Dekalb soils.

The surface soil of the Atkins series is mottled gray and yellow or rusty brown, while the subsoil is mottled gray, drab, yellowish brown, and sometimes reddish brown. The material throughout is heavy and compact, the subsoil being especially plastic and impervious. The Atkins soil occupies the first bottoms of streams, and is poorly drained. The material consists largely of wash from the Dekalb soils.

The following table gives the names and the relative and actual extent of the soils mapped in Cambria County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb gravelly loam	185,600	41.7	Dekalb stony sandy loam	11,008	2.5
Dekalb stony loam	91,840	20.6	Rough stony land	10,240	2.3
Dekalb silt loam	62,656	14.1	Pope loam	9,984	2.2
Dekalb shale loam	31,872	7.1	Atkins clay	6,144	1.4
Dekalb loam	21,376	4.8	Upshur loam	2,048	.5
Lickdale clay	12,672	2.8	Total	445,440	

DEKALB STONY SANDY LOAM.

The Dekalb stony sandy loam consists of a grayish sandy loam which passes at 1 or 2 inches into a yellowish sandy loam, and this at 8 to 10 inches into a yellowish sandy clay loam to sandy clay. Large fragments of sandstone are scattered throughout the type. There are some comparatively smooth areas occupying high elevations and upper slopes where the rock fragments are small and consist of platy sandstone. If these areas were of sufficient extent to warrant separation, they would be mapped as the Dekalb gravelly sandy loam. The gravelly areas occur chiefly in the locality south of New Germany Church, east of Bens Creek, east of Cresson, and north of Ebensburg.

The typical Dekalb stony sandy loam occurs chiefly near Big Spring Gap, Summit, east of Frugality, and northeast of Blandburg, the latter being the largest area of this soil in the county. The type occupies high rolling areas. The drainage is good to excessive.

The type is relatively unimportant, both in extent and in agricultural value. Not over 15 per cent of the soil is under cultivation, the land being for the most part forested with a growth of chestnut, maple, jackpine, oak, and hemlock, with an undergrowth of laurel, sassafras, huckleberry, sweet fern, and woods fern.

The principal crops grown, in order of their importance, together with the average yields per acre, are as follows: Corn 25 bushels, oats 30 bushels, potatoes 75 to 125 bushels, buckwheat 15 to 20 bushels, and clover hay 1 ton, while wheat and rye give only fair returns. Fruit and truck crops are not important, but are grown for home consumption. The value of this land ranges from $5 to $20 an acre.

This is a good soil for the production of early truck crops and peaches. It requires the addition of large quantities of organic matter, which can be economically supplied in the manner suggested in the description of the Dekalb silt loam type.

DEKALB STONY LOAM.

The Dekalb stony loam is a brown to yellowish-brown, mellow loam or silt loam, about 5 to 8 inches deep, overlying yellow, friable clay. The immediate surface material of typical areas is often light gray, and is underlain by yellowish material which extends to a depth of 3 feet or more. Large sandstone fragments are scattered over the type, while small chips of sandstone and some shale frequently are present.

Small areas included with this type as mapped range from a silt loam to a stony sandy loam. Many fields in which the soil formerly was sufficiently stony to be classed as a stony loam have been cleared of the stones, and are more properly classed with the Dekalb gravelly loam or other types.

The dominant areas of this type occur east of Portage, north of Thomas Mills, east of Frugality, near Mineral Point, and extending from Coopersdale in an irregular but unbroken body to Vintondale and Twin Rocks, to the northeast and southeast of Nanty Glo, around Allendale and Dunlo, and east of Lilly. Other small and isolated areas are scattered over the county.

The type occupies steep to moderately steep slopes and gentle slopes near drainage ways. For the most part the drainage is well established.

The Dekalb stony loam is a fairly extensive soil, but is of little agricultural value, only about 10 per cent of it being under cultivation. The greater part of it is cut-over timber land. The native vegetation consists of chestnut, locust, and a rather dense undergrowth. The cleared areas are devoted to permanent pastures for cattle, sheep, and some horses.

Much of this type could be brought into cultivation, and in time it probably will be utilized for farming, but owing to the cost of removing the large fragments its utilization might not prove profitable under present economic conditions. The best use of most of this type is for forestry and pasture.

DEKALB SHALE LOAM.

The typical Dekalb shale loam is a light-brown or grayish-brown silt loam, commonly underlain at 5 to 8 inches by a pale-yellow silty clay loam. This passes into yellow or pale-yellow silt loam which is rather compact, except where the high content of shale fragments or partially decomposed shale gives it a looser or more friable structure. Fragments of argillaceous shale are plentiful on the surface and throughout the soil section, and a mass of broken or bedded shale is encountered at 12 to 30 inches. The type includes areas in which small to moderately large sandstone fragments and fragments of thicker arenaceous shale are present. The steeper slopes, such as those that approach the character of Rough broken land, have a very thin surface soil, a compact silty clay loam being encountered near the surface. The boundary between this soil and the Dekalb silt loam is not everywhere easily determined. Near Bakers Crossroads the shale fragments are for the most part black in color.

The principal areas of this type occur around Hastings, Spangler, Westover School, and Bradley Junction, along Kibler Run, and near Gallitzin and Loretto, with small areas in other parts of the county. The type occupies steep to moderately steep slopes and knolls. The drainage usually is well established to excessive.

The Dekalb shale loam is an important soil both in extent and in the agriculture of the county. About 60 per cent of it is under cultivation. The undeveloped areas consist chiefly of cut-over land or are forested with a light growth of beech and locust. The soil is not so productive as the Dekalb gravelly and silt loams, mainly because of its steeper slope and compact structure. The principal crops grown are oats, potatoes, corn, wheat, rye, buckwheat, and hay (clover and timothy). Most farmers consider this a good fruit soil, mainly for the growing of peaches, plums, pears, and apples, as well as a fairly good soil for the truck crops common to the region, especially tomatoes and cabbage.

Dairying is carried on to a considerable extent on this type in the northern part of the county, butter being the chief product. Hogs and poultry are raised, chiefly for use on the farm. Some sheep are raised on this type, but the sheep industry is of little importance and is gradually decreasing.

The truck crops grown mature in the early fall. Yields of the crops grown on this soil, according to estimates given by the farmers,

are as follows: Mixed timothy and clover hay 1 ton per acre, timothy alone about three-fourths ton per acre, oats about 30 bushels per acre, corn 30 to 35 bushels per acre, and buckwheat about 25 bushels per acre. Wheat and rye give good yields in seasons of moderate rainfall. Potatoes average about 125 bushels per acre. During dry seasons crops suffer from lack of moisture, and yields are much lower than those given above. This soil is not so difficult to handle as many of the heavier types, and can be plowed under a wide range of moisture conditions, owing to the high percentage of shale present, which seems to prevent excessive baking or clodding.

This land is valued at $15 to $60 an acre, depending upon improvements and location with respect to topography, transportation facilities, and markets.

The Dekalb shale loam is deficient in vegetable matter, and the incorporation of this would increase the productiveness and the moisture-holding capacity of the soil. The plowing under of cover crops such as rye or vetch, together with the growing of alfalfa and clover in the rotation, is the quickest and most economical method of supplying the soil with the needed organic matter.

The effects of barnyard manure or incorporated vegetable matter are beneficial and lasting. The application of 1,000 to 2,000 pounds of burnt lime per acre about every 4 to 6 years is highly beneficial. The lime improves the physical character of the soil and corrects the acidity resulting from the turning under of green-manure crops. The Dekalb shale loam under proper and careful management is an excellent fruit and truck soil.

DEKALB GRAVELLY LOAM.

The Dekalb gravelly loam is a brown, mellow silty loam to light loam, underlain at about 6 to 8 inches by yellowish-brown to yellow, friable silty clay loam to silty clay. In forested areas the immediate surface soil is generally grayish, and yellow material is encountered at about 1 to 3 inches. The prevailing color of the surface in cultivated areas is in part the result of the incorporation of organic matter. Where the soil is somewhat sandy, as it frequently is on the higher knolls and flats, it is a deeper brown, and the subsoil is more sandy and friable, consisting in many places of sandy clay or sandy clay loam. Fragments of sandstone, mainly flattish, and of shaly sandstone or arenaceous shale, are plentiful over the surface and throughout the soil section. Some areas are so thickly covered with these fragments that there is little soil material visible, except when freshly plowed. In many places thin shale of an argillaceous nature is present; in fact, the type as mapped includes patches of Dekalb shale loam, and often grades into that type, so that it is difficult to establish definite boundaries. Large sandstone fragments are scattered

through some areas, and the type approaches the character of a stony loam. Bedrock usually is reached at depths of about 18 to 40 inches. Small patches of clay loam and clay are included with this type; these occur on a few of the slopes and in some of the ravines, being especially prominent near Coupon, on the Blair County line.

The type is extensively distributed throughout the county. It occupies slopes and nearly level areas, the slopes being usually not so steep as those occupied by the Dekalb stony loam. A small part of the type is too steep for cultivation, and some of the steep slopes are subject to erosion under cultivation. Between elevations of 1,500 and 1,800 feet the type frequently occurs on knolls, ridges, and upper slopes, with the Dekalb shale loam and silt loam occupying the lower steeper slopes. Above 1,800 feet the greater part of the type occurs on the slopes. The drainage is good, and the type is retentive of moisture.

This is the most important agricultural soil in the county. About 50 per cent of it is under cultivation, the remainder being forested chiefly with chestnut, maple, locust, witch hazel, several varieties of oak, some hemlock, and a few jack pine. The undergrowth consists mainly of raspberry, blackberry, and huckleberry.

The principal crops are hay (timothy and clover mixed and timothy alone), oats, corn, buckwheat, and rye. Some hay and oats are sold at local markets, but the greater part is used on the farm. The buckwheat is sold. Corn is largely used for ensilage for dairy cows. Rye is grown for use on the farm as grain for hogs. Some farmers grow Irish potatoes for the local market, and on almost every farm the crop is grown for home consumption. Wheat is grown for use on the farm. Many farmers grow apples and peaches for home use. There is one commercial apple orchard in the vicinity of Hastings and two peach orchards near Lovett.

Dairying is of considerable importance throughout the type, the milk and butter being disposed of at local markets. The only creameries are at Patton and Johnstown, and the butter for the most part is made on the farm. A few farms are devoted almost exclusively to dairying, and on each of these 25 or more cows are kept. Most of the farmers keep 3 to 12 cows and practice general farming in connection with dairying. Cows are pastured from the first of May to the middle of November; during the winter they are fed ensilage, hay, and corn stover. A good many farmers raise a few hogs for their own use. No beef cattle are raised. The dairymen sell some veal calves.

Crops mature a little earlier on this type than on the silt loam. Vegetables, which are grown to some extent along the main line of the Pennsylvania Railroad and near the mining towns, are rather late in reaching maturity. These vegetables are grown in market gar-

dens, and consist of cabbage, tomatoes, peppers, celery, and other small truck.

According to observations and the statements of farmers, timothy and clover mixed yield from 1 to 1½ tons of hay per acre; oats average about 35 bushels, buckwheat about 25 bushels, and corn about 35 bushels per acre.

In the breaking of land heavy two-horse turning plows are used, the land being plowed to a depth of about 8 inches. The breaking is usually done in the fall preceding the planting of corn. The fields are given frequent shallow cultivations, as a rule, and light cultivators and weeders are used for this work. The general farmers and dairymen use the manure produced on the farm with small quantities of commercial fertilizer, while the market gardeners obtain considerable manure from Johnstown and the mining towns. Some farmers use burnt lime, applying it at the rate of about 2,000 pounds per acre.

The present value of this land ranges from $5 in the rough, undeveloped sections in the vicinity of Blandburg to as high as $300 in the vicinity of Johnstown and Scalp Level.

The principal needs of the soil, according to the results obtained by the best farmers, are an increase in the organic-matter supply and the more general use of lime. Rotations, including legumes such as red clover, sweet clover, and alfalfa, should be more generally practiced. These legumes supply needed organic matter and otherwise improve the soil. Alfalfa, particularly, might be more generally grown to good advantage. It has proved successful in the northern part of the county, where three cuttings a season are obtained, giving a total yield of 3 to 5 tons per acre. Sweet clover has been successfully grown. In addition to being a valuable soil improver, this clover has some value as a hay crop if cut when young, before the stems become woody.

The fertilization for apple orchards, as recommended by the Pennsylvania State College of Agriculture [1] for this and similar soils, is as follows: Eight tons of stable manure per acre annually, used either on sod or in connection with tillage. Where this material is not available equally satisfactory results can usually be had by applying 500 pounds of a 6–10–5 commercial fertilizer per acre. For young trees these amounts may be reduced.

DEKALB LOAM.

The surface soil of the Dekalb loam is a yellowish-brown, mellow loam, underlain at about 6 to 8 inches by yellowish-brown clay loam or silty clay loam, which quickly grades into yellow or brownish-yellow, friable clay. In places the subsoil, especially in the lower part,

[1] Stewart, John P. The Apple in Pennsylvania. Bul. No. 128, Pennsylvania State College Agricultural Experiment Station, p. 122. This bulletin also contains a list of varieties of apples recommended for planting in Pennsylvania.

consists of a sandy clay. Frequently from 5 to 20 per cent of small platy and angular sandstone fragments are strewn over the surface and distributed through the soil and subsoil, the quantity usually increasing with depth. These fragments do not materially affect cultivation. In the vicinity of Nicktown this type is imperfectly drained and frequently carries slight mottlings of gray and rusty brown in the lower part of the 3-foot section. A number of areas of Dekalb gravelly loam, shale loam, and stony loam, too small to be mapped separately, are included with this type as mapped. The stony areas are indicated on the map by stone symbols. Disintegrated and broken sandstone rock occasionally is encountered within 24 to 40 inches of the surface, beneath which occurs the bedrock.

The largest areas of this type are mapped in the vicinities of Elton, Geistown, and Nicktown, west and northwest of Colver, and in the vicinity and southwest of Ebensburg. Other bodies of small extent are scattered throughout the county.

The type occupies comparatively smooth to gently rolling uplands, the topography varying from deeply dissected areas to broad and gently rolling plateaus. The drainage is good, except near Nicktown.

The Dekalb loam has a rather limited development in Cambria County, although it is of local importance. Approximately 70 per cent of it is cultivated. The undeveloped areas mainly support a second growth of chestnut, oak, maple, and beech, with an undergrowth of laurel, brambles, sassafras, witch hazel, and wild cherry, with sweet fern and huckleberry on the sandy spots. The Dekalb loam is comparable with the Dekalb gravelly loam in crop adaptation, fertilization, and methods of handling, differing chiefly in being easier to till and in producing somewhat heavier yields of hay and small grains. A few horses are raised each year by some farmers on this type.

The recommendations for the use and improvement of this soil are the same as those made for the Dekalb loam.

DEKALB SILT LOAM.

The Dekalb silt loam is a light-brown or grayish-brown silt loam, 5 to 8 inches deep, overlying pale-yellow silty clay loam which passes below into yellow silty clay of a rather stiff, compact nature, although crumbling readily under pressure. On drying the surface becomes grayish. As a result of the addition of vegetable matter the soil usually is a deeper brown in cultivated fields than in forested areas. Fragments of shale and often of sandstone are present throughout the material, but in much smaller quantities than in the gravelly and shale members of the series. Small particles of these rocks frequently give the soil a gritty feel, although the greater part of the soil has a high silt content. In the vicinity of St. Bonifacius this type

carries 15 to 25 per cent of iron concretions and accretions, which give the surface a brownish color. Frequently small irregular-shaped areas are encountered in which the rotten shaly bedrock lies within 18 to 30 inches of the surface. There are some included eroded areas in which the surface soil is a silty clay loam, and also included patches of shale loam or gravelly loam.

The most prominent areas of the Dekalb silt loam occur north and south of St. Augustine, east of Bradley Junction, in the vicinity of Loretto, and on the general slope from Ebensburg to Cresson and Wilmore, extending southeast to the vicinity of Elton; also in the two ridges running north of Johnstown. Inextensive areas are scattered throughout the county.

The elevation of the type is approximately 1,500 to 2,000 feet above sea level. This soil occupies flat to undulating and gently rolling areas over the higher and smoother parts of the county, and comparatively low slopes and benchlike situations at lower levels. North of Johnstown the surface configuration is rough and the type is characterized by knolls and steep-sided ravines. The drainage for the most part is well established, but small, imperfectly drained bodies occasionally occur along the first bottoms of streams.

The Dekalb silt loam is an important soil both in extent and in the agriculture of the county. Approximately 85 per cent of it is under cultivation. The undeveloped areas are mainly forested with beech, maple, oak (red, white, and rock), and wild cherry, with an undergrowth of mountain laurel, witch-hazel, sassafras, red raspberry, and ferns.

The most important crops grown on the Dekalb silt loam, in order of their importance, are hay (timothy and clover and timothy alone), oats, wheat, rye, buckwheat, and corn. These crops are disposed of in a similar manner to those grown on the Dekalb gravelly loam. Much of the dairying of the county is carried on on this type. In the vicinities of Johnstown, Scalp Level, Wilmore, and Salix the main object of dairying is the production of milk for sale in the towns and cities, while near Patton and St. Augustine the milk is sent to a cooperative creamery. Elsewhere it is made into butter on the farms where produced. In connection with dairying general farming is practiced in the regions where milk is produced for sale, and usually some trucking is carried on in conjunction with the dairying and general farming. A few farmers in these regions devote the greater part of their time to the production of market-garden crops, such as cabbage, tomatoes (early and late), cucumbers, peas, beans, beets, and lettuce. The growing of strawberries, brier berries, peaches, pears, plums, and some apples is receiving increasing attention. Bees and poultry are also kept to some extent by the truck and fruit

growers. Owing to the cold, compact nature of this soil, the truck crops are grown for the late market, being harvested in the early fall.

According to estimates of farmers and observation in the field, clover and timothy hay yields from 1 to 1½ tons, timothy hay about 1 ton, oats 35 to 40 bushels, wheat about 20 bushels, rye 15 to 18 bushels, buckwheat about 25 bushels, and corn, which is grown principally for ensilage on this type, an average of 8 to 10 tons per acre, although yields of 18 to 20 tons per acre are reported by many of the farmers. Cabbage yields about 10 tons per acre. Early tomatoes yield about 250 bushels per acre, and late tomatoes somewhat less.

This soil is generally plowed in the spring, except where the land is to be used for corn, in which case it is commonly plowed the fall before. Heavy two-horse turning plows are used, and the land is broken from 8 to 10 inches deep. The tilled crops receive frequent shallow cultivations, light two-horse and one-horse cultivators being used. The seed bed is prepared by the use of disk, spring tooth, and smoothing harrows, and in some cases of the roller and drag.

A large part of the manure used is obtained from the manufacturing and mining towns of the county, usually without cost, while farther from the towns only the manure produced on the farm is used. For the general farm crops 5 to 8 tons per acre are used, while the truck farmers apply 10 to 20 tons per acre. Small quantities of commercial fertilizer are used by many of the farmers. Lime, at the rate of 1,000 to 2,000 pounds per acre, is applied as a rule at regular intervals.

Land values range from $15 an acre in the uncleared or cut-over areas to $250 on the highly developed market-garden soils near markets. The general farm land farther from the towns sells for about $40 to $50 an acre.

Deep plowing and the use of such cover crops as rye or winter vetch and rye have proved beneficial on this type. The cover crops may be sown at the last cultivation of corn and should be thoroughly disked into the soil before plowing down to avoid having a mass of vegetation in one place to hinder the proper capillary movement of water during the growing season. Cover crops are of value in maintaining the organic-matter content of the soil as well as in preventing erosion during the winter and early spring months. Rotations, including legumes such as red clover, sweet clover, and alfalfa, should be more generally used. The legumes add nitrogen and improve the physical condition of the soil. Alfalfa does well on this soil as a hay crop, yielding 3 or 4 tons per acre from three cuttings a year. Hog raising can be profitably extended by maintaining pastures, supplemented with such grains as rye, oats, and corn. A succession of pastures adapted to this soil consists of rye, oats, and Canada

field peas, rape, sowed corn, and soy beans, allowing the hogs to forage on field corn later in the fall. Poultry raising could be extended to advantage, as at present the poultry products are insufficient to meet the home demand.

One of the rotations practiced by a few farmers, and which may be recommended for combined truck and general farm use is as follows: Corn 1 year, sowing a cover crop of rye or rye and vetch at the last cultivation, to be plowed under in the spring; the second year Irish potatoes and other truck, followed by a cover crop to be plowed down the next spring, when oats may be sowed, and the following year clover seeded with oats to be cut for hay. Stable manure should be applied on the clover sod for corn. By the use of this or a similar rotation and the liberal application of lime, the soil will continue to improve from year to year. The lime, which when applied should follow the truck crops, will counteract the sourness which develops as a result of turning under so much vegetation. This rotation will also improve the structure of the soil and will result in better drainage and aeration. In a somewhat similar rotation oats are grown one year, clover and timothy are sown with the oats and cut two years, and the sod is then plowed down. Truck crops are then planted, cover crops being sown at the last cultivation to be plowed under in the spring. Stable manure may be applied to the truck as a top dressing and disked in on the prepared seed bed.

UPSHUR LOAM.

The Upshur loam is a reddish-brown loam to silt loam, grading at a depth of 5 or 6 inches into light Indian-red, friable clay which in turn passes into deeper Indian-red, stiffer clay. Some large sandstone fragments are scattered over the type. In local areas delicate mottlings are seen in the lower part of the 3-foot section. Frequently the soil carries about 20 per cent of small sandstone chips.

Prominent areas of this type are located southeast of Lilly, east of Dunlo, and west of Coopersdale. A few small bodies occur in other parts of the county. It occupies gentle to rather steep slopes. Drainage is well established.

The Upshur loam is unimportant both in extent and in agriculture. Only about 5 per cent of it is under cultivation. The remainder supports a thin growth of chestnut, maple, and oak, some beech and locust, and a rather heavy undergrowth of raspberry and fern. In the cultivated areas the staple crops common to the region are grown with varying results.

The improvements and practices recommended for the Dekalb loam are applicable to the Upshur loam.

LICKDALE CLAY.

The Lickdale clay is a pale-yellow clay which passes below into mottled yellow and gray or drab, plastic clay. In the poorer drained situations the surface soil is gray, with comparatively little yellow; also there are places where the lower subsoil is rather compact and yellowish brown in color, carrying a considerable amount of dark concretionary material, probably iron oxide. In many places the soil as mapped is a silty clay loam or even a loam, and occasionally large sandstone fragments are present. Some of the better drained situations, if of sufficient size to warrant separation, would be classed as the Jefferson clay. The largest of such areas occur near Lilly.

The type is mapped as rather small areas occurring around the heads of streams and along the lower fan-shaped slopes adjoining the streams. The surface is level or gently sloping. The drainage as a rule is not well established.

The type has a small total area in Cambria County, and is unimportant from an agricultural standpoint in its present poorly drained condition. About 35 per cent of it is cleared, the uncleared areas being covered with hemlock, beech, birch, oak, and occasionally some gum and hickory, with a scant undergrowth of hanging briers, rhododendron, and laurel. The cleared areas are devoted almost exclusively to pasture.

This type with drainage, liming, and the addition of organic matter, would probably make an excellent soil for the production of hay and permanent pasture, as well as for growing celery.

POPE LOAM.

The typical Pope loam is a brown, mellow loam which passes below into a yellowish-brown or brownish-yellow, friable silty clay loam to clay. In places pockets or strata of loam, sandy loam or sandy clay are encountered in the subsoil. The type includes patches of Pope fine sandy loam and silt loam and small bodies of Atkins clay, too small to be shown separately on the soil map. The Pope fine sandy loam is found chiefly near Cherrytree and Johnstown. In the vicinity of Beaverdale, Allendale, and Lloydell the type carries a high percentage of rock fragments and bowlders; in a few places the surface is completely covered with such material.

This type occurs in the first bottoms of many of the streams of the county, mainly the Conemaugh River and the West Branch of the Susquehanna and their tributaries. It is subject to overflows, but has good drainage between overflows.

The Pope loam is an inextensive type, and is of little importance agriculturally, not over 10 per cent of it being cultivated. The

greater part of the type is covered with a rather dense growth of birch (black and water), maple, and some pine and hemlock, with an undergrowth of witch hazel, laurel, rhododendron, brier berries, wintergreen, and woods fern.

Irish potatoes, cabbage, tomatoes, melons, celery, cantaloupes, cucumbers, lettuce, small fruits, and some general farm crops, principally hay and small grains are the important crops grown, though large areas are devoted to pasture. This is one of the earliest soils in the county; truck crops mature from 2 to 3 weeks earlier than on the upland soils. The type is utilized for trucking mainly near Cherrytree and along the Conemaugh River.

The yields of crops on this type compare favorably with those obtained on the upland soils. The soil is plowed in the fall or spring, depending largely upon the extent of overflows. It is an easy soil to keep in good tilth.

This could be made a more valuable soil by straightening the drainage ways and establishing drainage systems by laying tile and constructing open ditches. The liberal application of stable manure is needed.

ATKINS CLAY.

The Atkins clay is a mottled gray and yellow or rusty-brown silty clay, passing below into plastic, compact clay, mottled with gray, drab, yellowish brown, and sometimes reddish brown. In places the subsoil is a mottled sandy clay. In the poorer drained areas the soil is gray, with very little yellow mottling. In places the texture ranges to a silty clay loam.

This type occurs as first bottoms along streams. It is subject to overflows, at least in part, and is poorly drained between overflows.

The Atkins clay has a comparatively small total area, and is of little agricultural value in its present condition. It is nearly all forested with hemlock, beech, birch, maple, hawthorn, and haw, with a dense growth of hanging briers, witch-hazel, laurel, and water-loving vegetation common to this region. The cleared areas are devoted to pasture for dairy cattle. Grade Jersey, Guernsey, and Brown Swiss seem to be the most popular breeds of dairy cows kept on the farms.

The type could be made a valuable soil by straightening the stream courses, diking, and by installing complete drainage systems. Heavy applications of lime and organic matter are needed. With such improvement the type should prove well suited to celery and hay production, and should make good permanent pasture land.

ROUGH STONY LAND.

In the areas mapped as Rough stony land many large rock fragments occur, in many places completely covering the surface. The soil varies widely in texture and color.

Prominent areas of Rough stony land occur southeast of Dunlo, northwest of Morrellville along the Conemaugh River, near Twin Rocks, and near Ehrenfeld. Smaller areas are mapped in other sections of the county. The topography is varied, ranging from rough and precipitous to nearly level and flat. In the more nearly level areas drainage usually is poor.

The Rough stony land is unsuited to agriculture. Some returns may be obtained from the sale of stone for building purposes.

This land, wherever possible, is best used for forestry. Chestnut, oak, beech, hickory, and birch make a good growth, and although at present the timber is in generally poor condition, there is every reason to believe that with careful management a valuable growth could be produced on the greater part of these areas.

The Rough stony land as mapped includes areas of Steep broken land. These areas consist of precipitous slopes which are too steep for successful cultivation. The material apparently is composed largely of Dekalb shale loam and shale outcrop. In places the soil is so thin that vegetation either is absent or makes a very sparse growth. Most of this land, however, is occupied by hemlock, locust, oak, chestnut, and a thin undergrowth.

The more important areas of Steep broken land occur along the Conemaugh River and its branches; smaller areas occur near Vintondale and in other places. Drainage usually is excessive. This land is best used for forestry.

SUMMARY.

Cambria County, Pa., lies a short distance southwest of the center of the State. It has an area of 696 square miles, or 445,440 acres.

The county has two natural physiographic divisions—the Allegheny Plateau and the Allegheny Front. The topography is uneven to hilly and even mountainous in places.

The main watershed of the eastern United States, separating the Atlantic and Mississippi drainage systems, extends through the county. The northeastern and northern sections drain into the Susquehanna River, and the remainder of the county into tributaries of the Mississippi River.

Cambria County was organized in 1804. Early settlements were made in the latter part of the eighteenth century by Welsh, Irish, Dutch, and Germans. Since that time settlement has steadily increased. The density of the rural population is reported in the

1910 census as 117.7 per square mile. The total population is given as 166,131, including an urban population of 81,720. Johnstown, with a population of 55,482, is the largest town in the county and an important manufacturing center. Ebensburg is the county seat.

Excellent local markets are furnished by important manufacturing, mining, and railroad centers. Good transportation facilities are available in all parts of the county.

The mean annual temperature is reported by the Weather Bureau station at Johnstown as 51.4° F., and the mean annual precipitation as 48.06 inches. The winters are long and cold, and the summers short and cool. The snowfall is heavy.

In the early history of the county corn, wheat, oats, barley, buckwheat, rye, flax, hay, and potatoes were grown, mainly as subsistence crops. Sheep raising was an important industry. It receives but little attention at present, however, and is decreasing in importance. The extension of agriculture during the last 35 years is due largely to the decline in lumbering, which formerly was the principal industry of the county. Mining and manufacturing, however, continue as important industries. The prevailing type of farming now consists of general farming in conjunction with dairying and the growing of Irish potatoes. Locally market gardening and orcharding are important. The chief crops marketed are hay, oats, buckwheat, rye, cabbage, tomatoes, apples, and peaches. Practically all the corn is cut for ensilage for dairy cattle. Most of the Irish potatoes and wheat are used on the farm. The raising of poultry and the production of small fruits are receiving increasing attention. A few hogs are raised on all the farms.

Little attention is given to the crop adaptation of the various soils. Land usually is broken in the spring, except corn land, which is plowed in the fall. Considerable stable manure and some commercial fertilizers are used. Lime is applied in most cases at regular intervals. Improved farm machinery is in general use throughout the county.

About 50 per cent of the county is in farms, and of the farm land about 57 per cent is improved, according to the 1910 census. The average size of the farms is given as 82.6 acres. The 1910 census reports 84.4 of the farms operated by the owners and practically all the remainder by tenants, who rent both on the share and on the cash basis, mainly the latter. The average value of farm land is given as $32.59 an acre. Land values vary widely, depending on improvements and mainly on location.

Cambria County lies in the Appalachian Mountain and Plateau Province. The residual soils have been formed from the underlying sandstones and shales and the alluvial and colluvial soils from wash

from the upland soils. Ten soil types, representing five series, are mapped, in addition to Rough stony land.

The soils of Cambria County offer good opportunities for both general and specialized farming. The Dekalb soils, comprising about 90 per cent of the total acreage, are excellent general-farming and trucking soils. Dairying is a very important industry upon them. The Pope loam when thoroughly drained is probably the earliest truck soil in the county. The Upshur, Lickdale, and Atkins soils are poorly drained and little used except for pasture and forestry. Rough stony land is of little value except for forestry and quarrying.

In general the soils are deficient in organic matter and fertilization is needed, especially for corn, small grains, and truck.

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PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

"That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture."

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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