SOIL SURVEY OF THE LEBANON AREA, PENNSYLVANIA.

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LOCATION AND BOUNDARIES OF THE AREA.

During the field season of 1901 four months were devoted to a soil survey of portions of Lancaster, Dauphin, and Lebanon counties, Pa., north of and adjacent to the area surveyed in Lancaster County in 1900. The area mapped in this later survey comprises about 190 square miles of the northern part of Lancaster County and all of Lebanon and Dauphin counties south of the Blue Mountain (about 479 square miles), the entire area approximating 669 square miles. The area lies between parallels 40° 5′ and 40° 29′ north and longitude 76° 5′ and 76° 54′ west from Greenwich. (See fig. 5.)

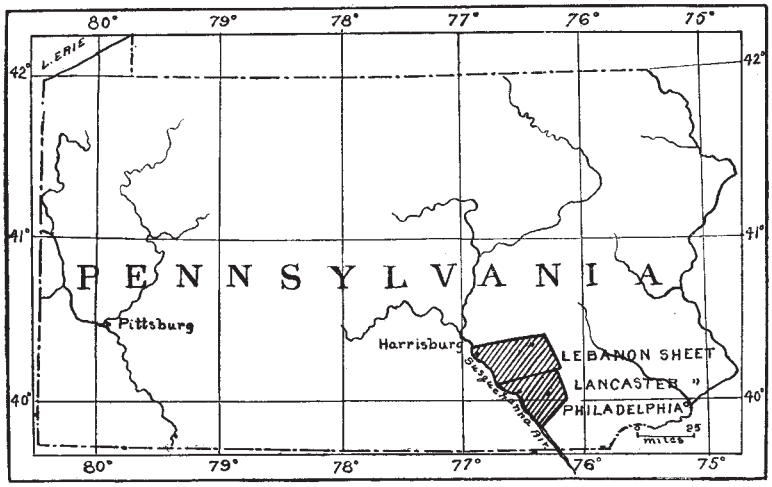


FIG. 5.—Sketch map showing areas surveyed in Pennsylvania.

The base map of Lebanon and Dauphin counties used in this work was prepared in part from topographic sheets of the United States Geological Survey, and in part—in the case of Lancaster County entirely—from accurate township maps prepared by the respective counties.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The historical matter in the following paragraphs is largely taken from the History of Lancaster County, by Franklin Ellis and Samuel

Evans (1883), and from the History of Dauphin and Lebanon Counties, by Dr. William H. Egle (1883). Considerable information was also kindly furnished by members of the local historical and agricultural societies.

About the year 1709 the Mennonites, a religious sect coming from Germany and Switzerland, made the first settlement in the area now comprised in Lancaster County. They were followed in 1715 by the French Huguenots from Alsace-Loraine, and some years later by the Scotch-Irish Presbyterians, who settled on Chickies Creek. In 1723 another colony of Germans located along the Tulpehocken, a short distance east of the Lebanon County line, near where the village of Stouchsburg now stands. These early immigrants were followed during the next fifty years by large numbers of their countrymen.

In their early settlements the Scotch-Irish generally chose the western part of the area, locating in the hills and along the frontier, where they were more exposed to attack by the Indians, while the more peaceably inclined Germans and Swiss sought the rich valley lands. As time went on the Scotch-Irish drifted gradually into the trades and professions and were supplanted in farming pursuits largely by the more agriculturally inclined Germans, until at the present time the rural population of Lancaster, Dauphin, and Lebanon counties is principally of German extraction. These descendants of the early settlers are a most frugal and industrious people, and their farms are very generally models of completeness and fertility.

Down to 1785 the areas now comprised in Dauphin and Lebanon counties formed townships of Lancaster County, but in that year Dauphin County, including Lebanon township, was organized. This arrangement continued for some twenty-eight years, when, in 1813, by a further subdivision, Lebanon County was erected, with Lebanon then, as now, the county seat. The county seat of Dauphin County was originally at Harris Ferry, later changed to Harrisburg, and now the State capital.

PHYSIOGRAPHY AND GEOLOGY.

The area under consideration includes portions of Lancaster and Lebanon valleys, both exceedingly fertile agricultural districts. To the north of Lebanon Valley lies the Blue Mountain, while to the south, along the Lancaster County line and separating the two valleys, lies the South Mountain Range. The present soil survey includes only the northern edge of Lancaster Valley, while it takes in the full width of that portion of the Lebanon Valley that extends through Dauphin and Lebanon counties. The principal drainage of the included portion of the Lancaster Valley is westward through the Little Chiquesalunga Creek and its many branches to the Susquehanna River, which

bounds the area on the west. The drainage of the northern portion of Lebanon Valley included in the survey is by way of Swatara Creek, which also empties into the Susquehanna River, while the drainage of the eastern portion is through Tulpehocken Creek, which heads near Lebanon city and flows into the Schuylkill and thence into the Delaware River. The fall of these creeks is generally moderate, but sufficient to furnish waterpower for several gristmills along their courses.

Lancaster Valley has a gently rolling surface, ranging in elevation from 350 to 450 feet above sea level, and is well watered by numerous streams. The southern half of Lebanon Valley, with much the same character of topography, ranges in elevation from 450 to 640 feet above the sea. The northern side of Lebanon Valley consists of a series of rather steep hills ranging from 40 to 100 feet above the general level of the limestone valley and from 450 to 700 feet above the sea. The South Mountain Range, in its eastern extension, is rugged and broken and but little adapted to agricultural requirements, while the western extension is more rounded and better adapted to agriculture. The South Mountain Range has an elevation above the adjacent territory of from 100 to 500 feet, and above the sea of from 700 to 1,000 feet.

The geological formations within the limits of the present survey have a northeast and southwest trend, and in a general way lie parallel to one another. The rocks composing these formations are sedimentary, excepting the trap rock, which is intrusive, and all are more or less folded, broken, and inclined. The sedimentary rocks are slightly metamorphosed. The area surveyed contains large deposits of limestone formation, which often project through the soil covering. This geological arrangement proves to be of great economical importance to the section, in that it furnishes lime rock of high commercial value over a large part of the area. This limestone is used for building, for burning lime, and the more impure portions for road metal. The rock is a massive blue limestone, Cambro-Silurian in age, containing many thin calcite veins, as well as a number of quartz veins.

In the northern portion of Lebanon Valley are extensive deposits of shales of Devonian age. Shales of Mesozoic age occur in the northern part of Lancaster Valley. Both these shales give rise to soils fairly well suited to general farming. Thin sheets of sandstone (Catskill) occasionally occur within the area of the shales in the Lebanon Valley, and where these are extensive the soil derived from them is sandy. The area occupied by the shale formations is hilly and rolling and of slightly greater elevation than that occupied by the limestone.

The Potsdam formation is here represented by a series of quartzites and sandstones, which occur to a limited extent in a portion of the

South Mountain Range. These rocks are used as building stone and in road making, and in a few instances are ground and used in the manufacture of glass. In some localities these rocks have decomposed into fine powder, which is used to some extent in puddling furnaces. A portion of the Blue Mountain included in the survey consists of sandstones that make good building stone and material for ballasting roads. The brown and red sandstone make up the greater part of the South Mountain Range. These belong to the Newark formation, which is Triassic in age.

In addition to these sedimentary rocks there are extensive areas of intrusive rock of a dark-blue color, called by geologists diabase. This formation occurs in long, narrow dikes and rounded knobs. This rock is used to a limited extent as building stone and, when crushed into small fragments, as road metal. The soils derived from this rock contain large quantities of "ironstones," as the rounded fragments of rock scattered about on the surface are locally called. These range from a few inches to 3 and even 4 feet in diameter.

Along the Susquehanna River there is an alluvial deposit, which was probably laid down at the close of the Glacial epoch, when the country to the northward was covered by great masses of melting ice. The sand in this alluvial deposit is used in making mortar, while the coarser bands of gravel make good road metal.

CLIMATE.

During the growing season it is much warmer in the Lancaster and Lebanon valleys than in the northern and western parts of the State. This is mainly due to the fact that the average elevation of these valleys is less than that of other sections. The atmosphere is generally humid, and the normal annual rainfall is about 40 inches. In winter the temperature ranges from about −10° to 60° F., and in summer from about 60° to 95° F. The last killing frosts occur in the spring from the 15th to the 30th of April, and the first in the fall from the 1st to the 15th of October. Sometimes frosts come as late as May and as early as September, but such occurrences are infrequent. Such exceptional frosts are generally limited to stream bottoms and mountain gaps and valleys, and do little or no injury. The soil seldom freezes deeply enough to prevent plowing until after the middle of November, and it has generally thawed sufficiently to allow tilling by the 15th of March. Some winter seasons are so mild that the soil is frozen but a very small portion of the time.

Normal monthly and annual temperature and precipitation for the Lebanon area.

Month.	Temperature.			Precipitation.		
	Harrisburg (12 years).	Lebanon.	Ephrata.[a]	Harrisburg (12 years).	Lebanon.	Ephrata.[a]
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
January	30.0	28.0	31.9	2.71	3.34	2.31
February	30.0	30.2	29.8	2.99	3.29	5.15
March	38.0	36.6	35.4	3.15	3.89	2.56
April	51.0	49.5	51.6	2.34	3.45	1.64
May	62.0	60.2	61.4	4.62	6.16	5.07
June	71.0	69.6	71.6	3.30	2.97	2.89
July	74.0	72.2	77.4	4.21	4.82	6.23
August	73.0	71.3	77.4	4.30	4.52	3.23
September	66.0	64.8	71.6	2.87	3.12	1.33
October	54.0	51.5	61.0	2.93	3.77	.80
November	43.0	41.7	46.8	2.91	4.13	1.89
December	34.0	33.1	33.3	2.43	3.19	2.32
Normal annual	52.2	50.7	54.1	38.58	46.65	35.42

[a] Figures are for 1900; no normals established for this station.

SOILS.

Eleven soil types, including Meadow, were recognized and mapped in this survey. Eight are residual soils derived from sandstone, shale, trap, and massive limestone rocks. The remaining three—Donegal gravelly loam, Lickdale clay loam, and Meadow—are of sedimentary character, associated principally with stream action.

The following table shows the extent of these several soils:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Hagerstown shale loam	142,210	33.2	Edgemont stony loam	20,300	4.7
Hagerstown loam	93,110	21.7	Donegal gravelly loam	13,350	3.1
Penn stony loam	49,160	11.4	Dauphin sandy loam	11,220	2.6
Penn sandy loam	40,590	9.4	Meadow	4,780	1.1
Penn loam	26,890	6.3	Lickdale clay loam	3,920	.9
Cecil clay (stony phase)	22,500	5.2	Total	428,030	.....

HAGERSTOWN LOAM.

The Hagerstown loam covers a large part of the Lancaster and Lebanon valleys. In the latter locality the area is from 2 to 7 miles wide and about 30 miles long, and extends in a southwest and northeast direction. The northern edge of this area passes through the city of Lebanon, while the southern edge reaches the South Mountain Range. In Lancaster County the surface rises from 350 to 400 feet, and in Lebanon and Dauphin counties from 450 to 640 feet above

sea level. There are no abrupt changes in elevation, but rather a succession of long, sloping ridges and broad, rounded hills.

The Hagerstown loam is derived from massive blue limestone of Cambro-Silurian age. The soil is the insoluble residue left after the more soluble carbonates of lime and magnesia have been leached away.

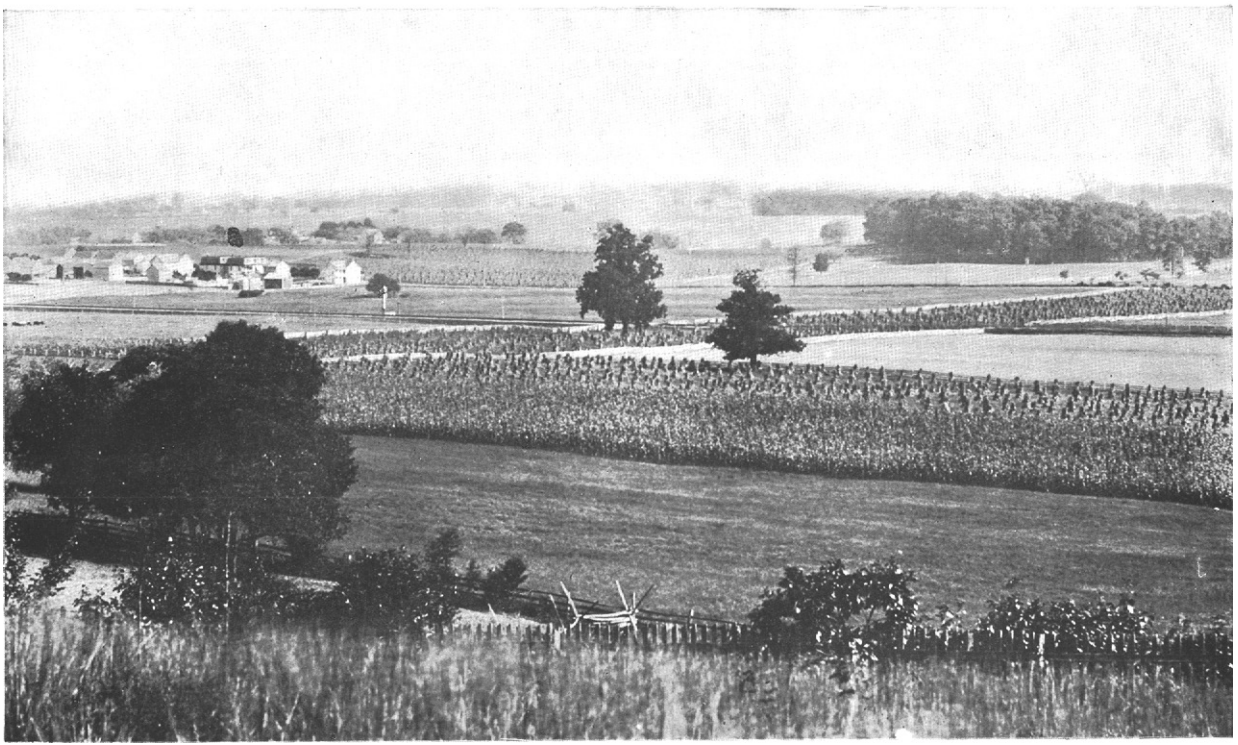
This residue, or soil, consists largely of fine particles of silica, silicates, aluminum, and iron compounds. Chemical analyses of several specimens of fresh limestone of this area show that it contains from 5 to 50 per cent of insoluble or soil-forming material. Thus it has taken great masses of limestone to form a few inches or feet of soil; and this process, going on as it has for ages, has made the "limestone" valleys 100 to 400 feet lower than the more resistant shale and sandstone formations. A chemical analyses of the first 6 or 12 inches of surface soil generally shows a relatively small percentage of readily soluble matter, indicating that the final stage of soil decomposition has been well-nigh reached. The substratum, however, 3 to 8 feet below, often contains a considerable amount of soluble carbonate. There is no "grading" of the soil into the rock beneath; the earth touches abruptly the massive limestone at a depth of 3 to 20 feet. The fact that lime added to the soil benefits crops in itself suggests that almost complete decomposition of the rock has been effected. The limestone adjacent to the shale and sandstone formation is often much folded and inclined. In some places the limestone has been altered into true marble.

The limestone is generally blue to gray in color and contains many veins of calcite and sometimes traces of calcium fluoride. Veins of quartz one-eighth of an inch to 6 inches thick are generally present. These and a cherty form of the limestone give to the soil its 5 to 20 per cent of quartz and limestone fragments. The massive limestone rocks contain many large fissures, which serve the purpose of drainage so well that artificial drainage is seldom needed. These even serve the purpose of a sewerage system for Lebanon, a city of over 17,000 inhabitants.

The ready solubility of the rock gives rise to caves and sinks, which frequently occur in the fields. If these are not too large they are filled in with stones and soil and thus reclaimed for tillage.

The principal mineral constituent of the rock is calcium carbonate, with varying amounts of magnesium carbonate. When it is composed largely of the calcium carbonate it serves well for lime burning, but where much magnesium is present it is not fit for that purpose.

The Hagerstown loam consists of a yellowish-brown silty loam 6 to 10 inches deep, underlain by a yellowish to reddish clay. Both the soil and subsoil contain from 5 to 20 per cent of limestone and quartz fragments. The soil containing, as it does, a fair proportion of clay



GENERAL VIEW OF THE HAGERSTOWN LOAM SOIL IN THE LEBANON AREA, PENNSYLVANIA.

The best soil in the area for general crops.

and organic matter, and being underlain with a clay subsoil, is well calculated to hold moisture and fertilizers, the application of which has been liberal. This soil type is quite uniform over the whole area, except for small local spots of red clay that were too small to be shown on the map. Such areas are usually found where the underlying rock comes close to the surface, and are very refractory and hard to plow unless they contain the proper amount of moisture. The typical loam has a much wider range of moisture conditions within which it can be worked.

The Hagerstown loam is a productive soil well suited to general farming and to special industries, such as tobacco and small fruits. Cigar-filler tobacco is grown, and yields from 1,200 to 2,000 pounds per acre. The tobacco acreage was larger in 1901, owing to the increased price received for the crop of 1900, which averaged 7 to 9 cents, as compared with 4 to 6 cents in recent years.

Tobacco culture in the Lebanon Valley is limited mostly to Heidelberg and Millcreek townships. In this section the loam is rather lighter in texture than farther west. However, it is urged by some that a greater demand for tobacco and a better knowledge of tobacco culture on the part of the farmers would soon cause a more extended culture of the plant throughout the whole of the Lebanon Valley. The yield of shelled corn varies from 40 to 60 bushels, wheat from 20 to 35 bushels, oats from 40 to 80 bushels, and hay from 1 to 2 tons per acre.

Extensive forests of oak, hickory, walnut, and beech once grew on these lands, but these have nearly all been cut down. In some cases the forest had a rank undergrowth of vines, bushes, and grass, which made clearing difficult. This was notably so in the case of South Lebanon Township. Until within the last thirty years there were a number of oak forest reserves, but these have now almost wholly disappeared, having been sawed into lumber or used for fences and firewood.

The estimated value of Hagerstown loam land ranges from $90 to $300 per acre.

The farms having this soil type are in a higher state of cultivation, more extensively equipped with machinery and tools, and improved with larger and better houses and barns than farms located on the other soil formations of the county.

The following table of mechanical analyses shows the texture of samples of Hagerstown loam:

Mechanical analyses of Hagerstown loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5872	Iona	Pale silty loam, 0 to 15 inches.	0.01	3.30	1.20	1.12	0.94	3.48	6.34	51.48	32.61
5874	2 miles S. of Lebanon.	Silty loam, 0 to 15 inches.	.01	4.14	1.40	2.80	2.08	4.74	4.20	47.84	32.65
5873	Subsoil of 5872	Yellow clay loam, 15 to 36 inches.	.01	2.96	.80	3.14	3.20	9.14	9.56	43.80	27.51
5875	Subsoil of 5874	Silty clay loam, 15 to 36 inches.	.01	3.22	1.52	2.48	1.62	4.00	2.50	47.36	36.17

HAGERSTOWN SHALE LOAM.

In Lancaster County the Hagerstown shale loam occurs along the northern border of the limestone valley and adjoins the sandstone ridge to the north along the county line; in Lebanon and Dauphin counties it forms the northern half of the Lebanon Valley. In the latter valley the area is about 30 miles long and from 6 to 10 miles wide. It is bounded on the north by the Blue Mountain and on the south by the limestone formation on a line passing through Myerstown, Lebanon, Palmyra, and Harrisburg. The area of this type covers a succession of well-rounded hills and ridges with V-shaped valleys. The shale, being composed of relatively insoluble material, has weathered slowly, leaving these ridges 30 to 100 feet above the stream-cut valleys and limestone formation. The rock is of Devonian age, and consists of alternate beds of gray, red, and sandy shales. The gray shale predominates, covering about 70 per cent of the area, the red only about 15 per cent, while various shades of sandy shale, together with some intrusive rocks, make up the remainder. The red and gray shales generally disintegrate into a rather heavy loam, while the other shales give a soil varying in texture from a loam to a sandy loam. These sandy areas, where large enough to be shown, have been mapped as Dauphin sandy loam, but where they result, as they often do, from sandy shale bedded alternately in narrow sheets with the red and gray shales, with a texture only slightly sandy, they have been mapped as Hagerstown shale loam. Occasional beds of slate were

CHARACTER OF THE SHALE LOAM, AND GENERAL VIEW OF THE TOPOGRAPHY IN THE HAGERSTOWN SHALE AREA.

The soil is filled with fragments of shale and requires care and attention to secure good crops of wheat or corn.

noticed that have been subjected to the processes of metamorphism to a greater extent than the softer beds of shale. Quite a number of limestone outcrops are to be found in this area. These form convenient sources of rock for burning lime and for other purposes.

The processes of soil forming have here been by disintegration rather than by decomposition, and hence soil formation has been slow. This has given a rather shallow soil on the steeper slopes and narrow ridges, where erosion is more active. On the broader, flat-topped elevations, where erosion is less active, a much deeper and heavier loam is encountered. In such positions the underlying mass of broken shale also appears more rotten than that of the steep slopes and narrow ridges.

The soil of the Hagerstown shale loam varies from a gray to a yellow or reddish clay loam 8 to 12 inches deep, containing from 5 to 60 per cent of shale fragments with an average from 40 to 50 per cent. On the slopes and narrow ridges this may be underlain by a broken mass of shale, while on the flat-topped ridges it is generally underlain by broken shale bedded in a heavy loam 2 to 8 feet thick. The character of the subsoil determines largely the moisture conditions that prevail in the soil. The subsoil that consists of a mass of broken shale with vertical arrangement is very droughty, while the broken shale bedded in clay or heavy loam holds moisture well. The heavy subsoil predominates in the area surveyed. At the foot of the slopes there are occasional springs, giving to the soil a wet, plastic character locally called "spouty land," but, in general, natural drainage is good, and but very little ditching is necessary. The roads in the shale formation are generally good.

The Hagerstown shale loam can be tilled in almost any condition, wet or dry, a characteristic seemingly due to the presence of shale fragments in the soil, as where they are absent the soil has more nearly the nature of a heavy or sticky loam. The fragments of shale are soft and easily broken; hence they wear implements very little.

This soil type is locally known as "gravel land." It was not at one time held in high esteem for general farming purposes. The original forest, consisting largely of chestnut and oak, was allowed to grow on it until tillable land became more in demand, when it was cleared and cropped. Through heavy applications of manure the productiveness of the heavier shale loam has been made nearly equal to the limestone soils. The yields, however, generally range from 10 to 15 per cent less than on the limestone soils, although the quality is usually better, nearly compensating for the smaller yields. The yield of wheat ranges from 20 to 30 bushels, of corn from 35 to 60 bushels, and of oats from 30 to 60 bushels per acre. For wheat the soil derived from the red shale is considered better than that formed by the gray shale. Tobacco of a fine quality is grown on the more sandy phase of

the Hagerstown shale loam, but the leaf is rather thin for filler tobacco, and the possibility of an increased acreage of this product on this soil type seems to depend on the introduction of a wrapper leaf.

This soil seems admirably adapted to forestry, the growing of small fruits, and orcharding. The ease with which it can be tilled under a wide range of climatic conditions and its adaptability to special lines of industries, such as the production of peaches and chestnuts, and to general farm crops when due attention is given to manuring, place the Hagerstown shale loam among the desirable soils of the area.

The texture of typical samples of this soil type is given in the following table:

Mechanical analyses of Hagerstown shale loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5880	Brickerville....	Loam, 0 to 10 inches..	0.01	5.82	9.70	6.88	3.60	7.26	4.58	34.54	27.81
5882	Fredericksburg	Heavy red loam, 0 to 12 inches.	.02	5.86	6.66	6.24	3.76	6.58	2.26	32.42	36.16
5883	Subsoil of 5882..	Heavy red loam, 12 to 36 inches.	.01	4.62	8.32	10.02	4.40	7.12	4.00	25.18	36.71
5881	Subsoil of 5880..	Loam, 10 to 36 inches.	.01	5.60	7.56	5.98	3.04	7.48	3.26	28.06	38.95

DAUPHIN SANDY LOAM.

This type of soil occurs surrounded by the Hagerstown shale loam in Dauphin and Lebanon counties, and extends as a narrow, broken area from Bunkerhill to Harrisburg. It has the same hilly topography as the Hagerstown shale loam, and ranges in elevation from 600 to 1,000 feet above sea level. The soil is derived from rocks of a nature somewhat similar to those from which comes the Hagerstown shale loam, but in addition to the shale there are many beds of flaggy sandstone, which tend to make the texture much more sandy than that of the Hagerstown shale loam. The Dauphin sandy loam consists of a yellowish-gray sandy loam, 6 to 15 inches deep, underlain by the same material, but of slightly heavier texture. Fragments of both the flaggy sandstone and fine-grained brown shale are present to the extent of from 5 to 20 per cent. This type of soil is recognized as being much more sandy than the surrounding areas of Hagerstown shale loam, and it is locally spoken of as sandy gravel land or sandy shale loam. It is adapted to corn, grain, grass, truck, and

small fruits. Tobacco could probably be produced on this soil with success. The native forest growth is very similar to that which formerly covered the shale soils, and consists largely of chestnut and oak, with a small scattering of walnut and beech. The natural drainage is good. The Dauphin sandy loam, on account of the ease with which it can be cultivated and its adaptability to many crops, is considered a valuable soil.

Mechanical analyses of samples of soil and subsoil are given in the following table:

Mechanical analyses of Dauphin sandy loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5892	Union Water Works.	Sandy loam, 0 to 8 inches.	0.01	3.90	3.46	8.24	7.60	19.48	11.10	28.38	17.83
5894	2 miles south of West Hanover.	Sandy shale loam, 0 to 15 inches.	.04	3.76	5.30	6.82	5.22	14.42	12.46	32.08	19.56
5895	Subsoil of 5894..	Stony loam, 15 to 36 inches.	.03	3.32	12.00	10.00	8.06	15.32	6.04	25.80	18.83
5893	Subsoil of 5892..	Sandy loam, 8 to 36 inches.	.01	3.26	7.18	9.84	8.08	18.32	9.28	24.64	18.99

PENN LOAM.

This type usually occurs as rolling valley land associated with the Triassic sandstone formation. Its largest development is found in the southern part of Dauphin County. In the vicinity of Mount Hope and Cocalico, Lancaster County, it also occurs to some extent. The soil is derived from a fine-grained brown sandstone (Triassic), the cementing material of which seems to be largely ferruginous clay. Beds of conglomerate were occasionally observed. The decomposition seems generally to have occurred to great depths, as can be seen in the road cuts. The soil consists of a dull reddish loam from 8 to 12 inches deep, underlain by a heavier loam that often grades into rather stiff clay. Sandstone fragments to the extent of from 5 to 25 per cent are found on the surface, varying in size from one-half inch to 3 inches in diameter. A few rounded quartz pebbles left from the decomposition of the sandstone conglomerate, varying in size from one-eighth to 1 inch in diameter, are also found. This soil is somewhat gritty, but feels greasy when rubbed between the fingers, and in wet weather becomes quite sticky. Moisture and fertilizers are well retained. The

native forest growth was largely oak, hickory, walnut, and beech. Most of this land is now cleared and farmed. Indeed, a general view of the Penn loam with its gently rolling surface presents an appearance not unlike that of the Lancaster and Lebanon limestone valleys. In fertility and in kinds of crops to which it is adapted the Penn loam closely resembles the limestone soils. Corn and wheat of an extra good quality are grown. Natural drainage is fairly good, but artificial drainage is often necessary. The land is usually plowed in beds from 40 to 80 feet wide, the dead furrow serving the purpose of a ditch. The soil is well adapted to growing grain and forage crops, and, to some extent, small fruits. Tobacco of a good quality is grown on the lighter phase of this type.

The following table contains the results of mechanical analyses of the Penn loam:

Mechanical analyses of Penn loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Find sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.5 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5900	¼ mile NE. of Gainesburg.	Loam, 0 to 10 inches..	0.01	3.46	4.20	3.60	1.50	5.88	10.48	51.74	19.15
5898	⅛ mile NE. of Brickerville.	Red loam, 0 to 12 inches.	.04	4.26	2.50	7.40	6.82	13.78	7.52	35.96	21.98
5899	Subsoil of 5898..	Red clay loam, 12 to 36 inches.	.01	4.30	6.22	10.88	6.06	13.20	8.20	36.34	14.73
5901	Subsoil of 5900..	Clay loam, 10 to 36 inches.	.01	3.30	4.00	4.38	1.68	7.02	7.04	44.40	27.39

PENN SANDY LOAM.

The area of Penn sandy loam, like most of the soil types in the present survey, has an east and west trend. It is found associated with the New Red or Triassic sandstone ridge lying along the northern boundary line of Lancaster County. It constitutes quite a large and important area. The surface features are marked by rounded ridges and hills, and broad sloping valleys. Occasional narrow ridges rise abruptly 100 to 200 feet above the valley level. The elevation above the sea ranges from about 500 to 800 feet. The soil is derived from a sandstone of Mesozoic time, 20 to 200 feet or more thick, resting on Paleozoic limestone. In texture the sandstone varies from a coarse-grained conglomerate to a fine-grained brownstone. The texture of the soil follows in a measure the texture of the original rock. In the northern part of Mount Joy Township, Lancaster County, there

is an area of soil which is derived from a coarse conglomerate and contains a large quantity of pebbles from one-fourth to 1 inch in diameter. The cementing material of the light-colored sandstone is largely silica and of the brown sandstone ferruginous clay. Disintegration and decomposition have both been active factors in forming the soil from these sandstones.

The Penn sandy loam is a brown sandy loam, 6 to 10 inches deep, containing 10 to 30 per cent of sandstone fragments, and usually underlain by much the same kind of material, although sometimes it grades into a yellow sandy loam containing many flaggy sandstone fragments. Occasionally rounded quartz pebbles one-fourth to 1 inch in diameter are found, where the parent rock was a conglomerate. On account of the mellow condition of the soil the rains readily enter it, and the slopes wash badly only in times of excessive rainfall. The native forest consisted largely of chestnut and oak. It has been generally removed, except on the rather stony ridges.

The Penn sandy loam is adapted to quite a wide range of crops. The yield of wheat ranges from 20 to 30 bushels, of oats from 35 to 75, and of shelled corn from 40 to 75 bushels per acre. The wheat crop seldom suffers from drought, as it ripens usually before the period of dry weather sets in, but corn is sometimes injured by droughts that occur late in the season. The yields are about 10 per cent less on this type of soil than on the limestone soils, but the quality of the grain is better. Millers prefer wheat from this soil type to that grown on the limestone soil. The Penn sandy loam is well adapted to forestry, wheat, fruit growing, and the production of tobacco.

The following table contains figures showing the texture of soils and subsoils of this type:

Mechanical analyses of Penn sandy loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5904	½ mile N. of White Oak.	Sandy loam, 0 to 15 inches.	0.01	2.80	2.16	11.34	13.06	26.78	11.52	20.40	10.83
5906	Schaefferstown	Sandy loam, 0 to 12 inches.	.01	3.00	2.78	6.64	4.46	9.20	6.60	45.34	21.95
5905	Subsoil of 5904..	Sandy loam, 15 to 36 inches.	.01	2.78	4.20	13.32	11.00	25.90	10.00	18.91	14.10
5907	Subsoil of 5906..	Sandy loam, 12 to 36 inches.	.01	3.54	2.98	5.12	3.80	7.48	4.84	16.32	26.03

PENN STONY LOAM.

The Penn stony loam is associated largely with the brown sandstone formation occurring on each side of the northern boundary of Lancaster County. Its surface is generally mountainous in character, but occasionally flat, stony hilltops and easy slopes occur. This type is derived largely from the Triassic brown sandstone. The cementing material seems to be silica, with considerable ferruginous clay. On account of the insoluble nature of the materials, decomposition has been slow, thus leaving a rather stony surface. The elevation above the surrounding valley lands ranges from 100 to 600 feet and above the sea from 500 to 1,000 feet. Several good brownstone quarries are in operation in this formation.

The Penn stony loam is a brown sandy loam, 8 to 10 inches deep, containing 30 to 90 per cent of rock fragments. The underlying material has much the same character as the surface, except that it is generally somewhat heavier in texture.

Only about 10 per cent of the area is tilled. Where it is, corn, wheat, oats, and other crops are grown successfully, but the Penn stony loam is best suited to forestry and orcharding. The natural growth now consists largely of chestnut, oak, wild cherry, and locust. The type is well suited to peach and chestnut growing.

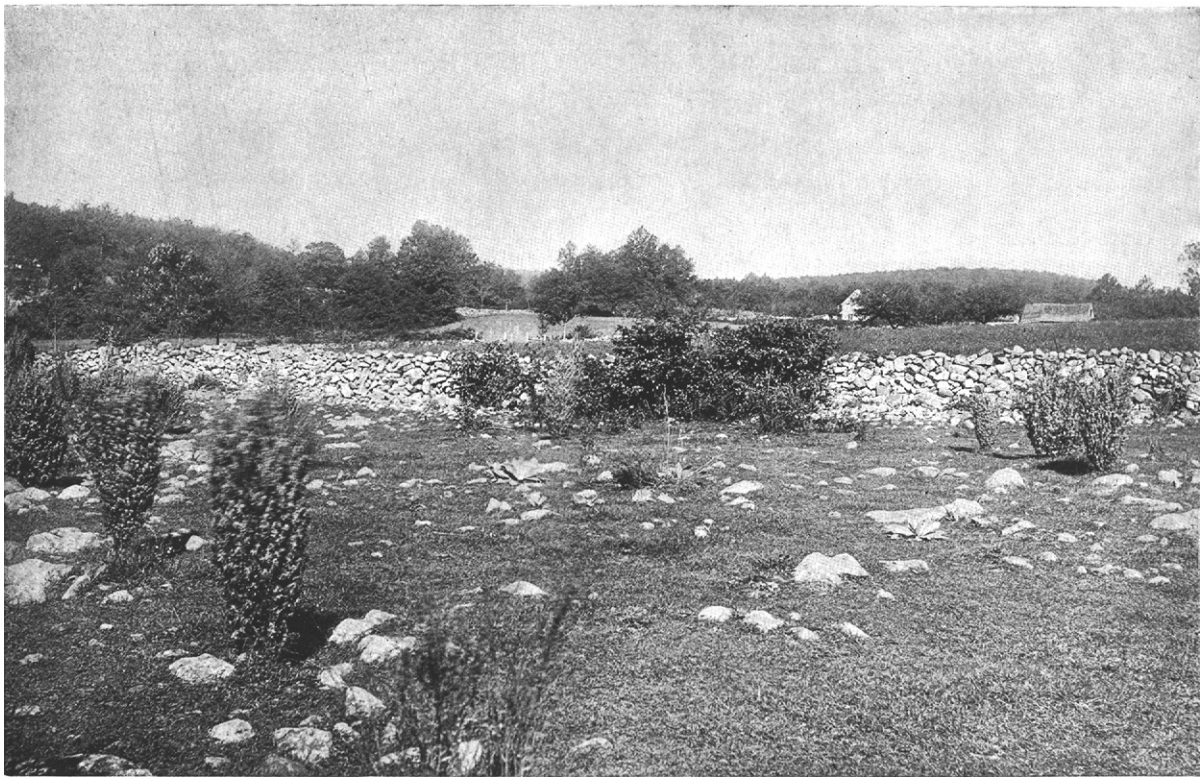
Mechanical analyses of Penn stony loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5910	1 mile E. of Mount Gretna.	Sandy loam, 0 to 15 inches.	.....	4.38	1.66	9.98	10.32	21.62	14.60	22.84	14.78
5911	Subsoil of 5910..	Clay loam, 15 to 36 inches.	0.01	3.38	3.20	9.64	9.62	17.12	10.98	25.52	20.66

LICKDALE CLAY LOAM.

This type of soil occurs chiefly along the streams at the base of Blue Mountain. The area amounts, in the aggregate, to only about 6 square miles. It is generally flat, poorly drained land. The soil is derived from the wash of hill and mountain sides, being composed largely of clay derived from the decomposition of the fine-grained sandstone and the shale.



GENERAL CHARACTER OF THE PENN STONY LOAM.

This type is so stony as to interfere with cultivation. On the more level areas stones have been picked off of some of the fields and such lands are fairly well adapted to general agricultural purposes. The type is best adapted to fruit and grazing. Only about 10 per cent of this type is under cultivation.

The Lickdale clay loam consists of from 6 to 10 inches of silty loam, underlain by a mottled yellow clay. It contains occasionally 5 to 20 per cent of quartz and gray sandstone fragments. It possesses such poor natural drainage that without artificial drainage it is sticky and waxy and suited only to pasture and hay. When artificially drained the soil is quite mellow and is suited to a wide range of crops, including wheat, corn, oats, potatoes, and grass. Tile drains, if not absolutely necessary, are said to be far superior to open drains for this land. A rank native grass, bushy blue stem (*Andropogon nutans*), does very well on this soil, even before drainage. On the undrained portion grain produces much straw and but little berry. The native forest growth is willow, alder bush, and ash—much the same as that found on ordinary meadow land. The Lickdale clay loam when properly drained is recognized as a productive soil, well suited to grain and forage crops, but until so drained it is best left with a permanent stand of native grass, which may be cut for hay or used as pasture.

The following table shows the texture of typical samples of the soil and subsoil of the Lickdale clay loam:

Mechanical analyses of Lickdale clay loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5896	Lickdale.....	Silty loam, 0 to 11 inches.	0.04	3.20	2.06	5.24	5.00	7.06	2.26	43.84	31.42
5897	Subsoil of 5896..	Stiff yellow clay, 11 to 36 inches.	.01	4.08	7.08	4.32	3.48	4.90	2.14	32.54	41.43

EDGEMONT STONY LOAM.

The main areas of this type occur upon that portion of the Blue Mountain forming the northern boundary of the present survey, and upon a part of the South Mountain Range, along the northern boundary line of Lancaster County. Its surface is distinctively stony and mountainous in character. On the steeper slopes quartzite and quartzose sandstone (Potsdam) are often seen. The elevation above the general valley level ranges from 200 to 600 feet, and above the sea from 600 to 1,200 feet.

The soil is derived by the slow disintegration and decomposition of the quartzite and quartzose sandstone and conglomerate. The Edgemont stony loam varies from a loamy soil to a coarse sandy soil 8 to 10 inches deep, underlain by solid ledges of rock or broken masses of rock and earth. The amount of rock fragments on the surface varies from 20 to 90 per cent.

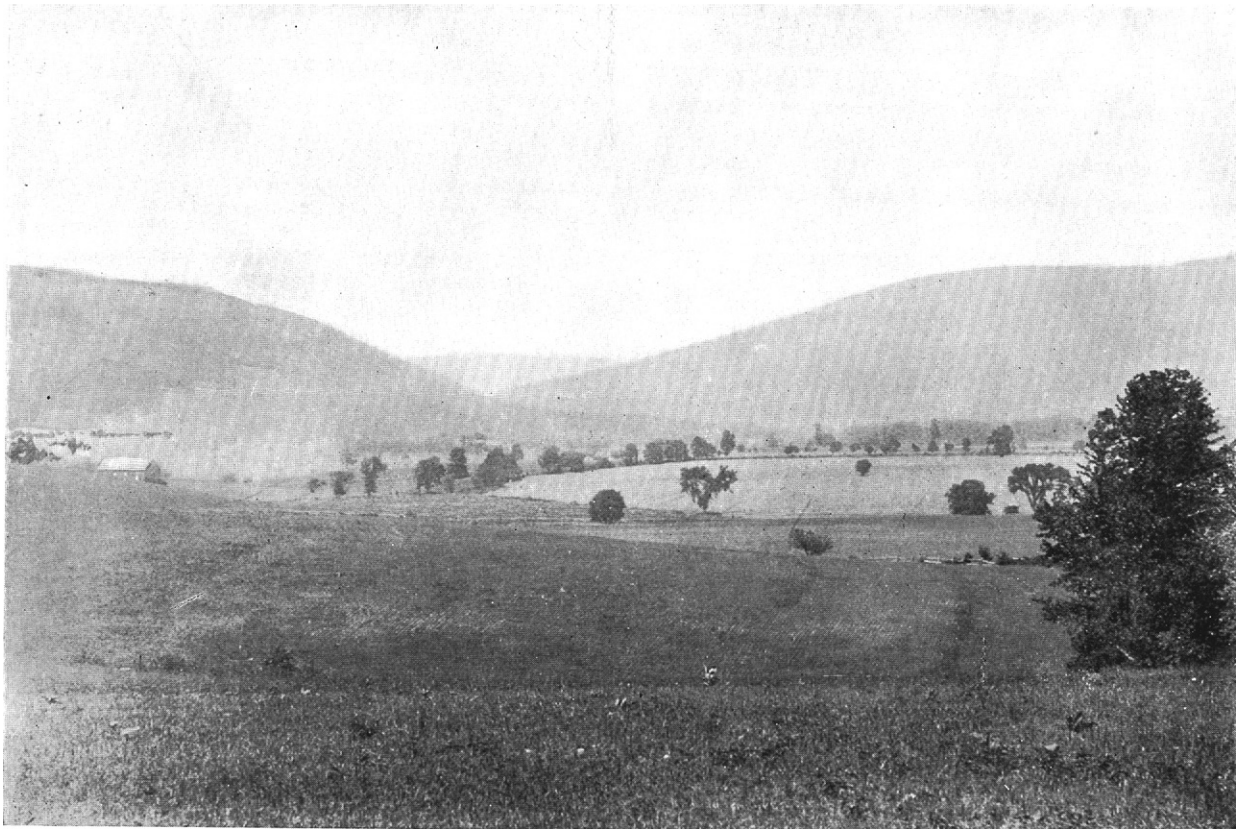
Only about 5 per cent of the area of this soil type comprised in the present survey is cultivated. A sandy loam phase of this type is found occasionally on the summits of the more rounded ridges. Such areas are somewhat freer from stones, which admits the growing of grain, corn, and other crops requiring frequent cultivation; but in general the Edgemont stony loam is adapted only to orcharding and forestry. The native forest growth now consists largely of chestnut, interspersed with some oak, pine, dogwood, hickory, and walnut. This soil is well suited to the growing of chestnuts and peaches, and some excellent peach orchards are already established on it. By grafting scions from good nut-producing chestnuts on native stocks, the mountain areas can be made to grow vast amounts of marketable chestnuts. The difficulties met with in the producing of chestnuts are the frequent forest fires and the ravages of insect pests. Steps are now being taken by the State to check insect and fungous diseases of fruit and chestnuts, thus possibly opening up greater opportunities for this industry. The insect infecting the chestnut causes quite serious loss, destroying annually about 75 per cent of the crop. No successful means of fighting this pest has yet been found, but when it shall be, and when forest fires shall be better controlled, the chestnut industry will probably have great possibilities on the Edgemont stony loam. The peach industry, too, could be extended profitably on this soil.

The texture of the fine earth of this type of soil is given below:

Mechanical analyses of Edgemont stony loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5870	Swatara Gap...	Fine sandy loam, 0 to 10 inches.	0.01	3.62	4.22	4.36	3.32	8.76	5.14	48.86	20.19
5871	Subsoil of 5870..	Fine sandy loam, 10 to 36 inches.	.01	3.08	6.42	5.50	4.06	6.90	6.96	37.92	28.73



BLUE MOUNTAIN COVERED WITH THE EDGEMONT STONY LOAM, WITH HAGERSTOWN SHALE LOAM IN THE FOREGROUND.

There are some areas of this mountain land adapted to fruit culture, especially to peaches. The Edgemont stony loam is the typical mountain peach land of western Maryland.

CECIL CLAY.

This soil formation occurs generally in narrow strips having an east and west direction, and is found in the present survey associated largely with the shale and sandstone formations, though, to some extent, also, with the limestone formation. The igneous rocks from which this type is derived have been intruded into the overlying sedimentary formations. These intrusions form knobs and ridges varying from 60 to 200 feet in elevation above the surrounding formations, and from 500 to 1,000 feet above the sea. Oftentimes the ridges are quite steep and narrow and excessively stony, but there are some fairly wide, less stony, and not elevated much above the surrounding formations.

The rocks consist largely of a diabase of Mesozoic age, together with some granite and other rocks containing considerable iron. The process of soil formation has been both by disintegration and chemical decomposition. The diabase weathers from the outside, a thin sheet at a time. The rounded iron stones often appear very fresh, possessing a clear ring when struck with the hammer.

The soil is a heavy red loam 0 to 12 inches deep, underlain with a heavy red clay. Both soil and subsoil contain from 20 to 70 per cent of rounded and subangular "ironstones" 4 to 8 inches in diameter in cultivated fields and 4 to 60 inches in virgin soils. In a number of instances the larger stones, 1 to 3 feet in diameter, have been removed, thus leaving good, though small, tillable fields. The stones so removed have been used to construct walls about the fields, which are a characteristic feature of the landscape of the area occupied by this soil type. The type ranks as a heavy clay soil and is quite productive. The natural forest growth consists largely of chestnut, oak, and locust. The less stony portions have been cleared and are cultivated, the clearings representing about 15 per cent of the area of this soil type. Owing to its generally stony nature the Cecil clay is rather better adapted to forestry and orcharding than to crops which require extensive tilling. However, the fine earth portion, being a rather heavy red loam, is naturally a fertile soil and also quite retentive of moisture, and good crops are grown on areas that are moderately free from stones. The yield of wheat ranges from 20 to 35 bushels, shelled corn from 40 to 80 bushels, and oats from 40 to 80 bushels per acre. The fields, however, are usually small and irregular, and the farm buildings are neither so elaborate nor so expensive as those to be seen on most of the other soil types.

For the most part this type is best adapted to forestry and fruit growing, ranking high with the farmers where peaches and other fruits are the crops to be produced.

The texture of the Cecil clay is given in the following table:

Mechanical analyses of Cecil clay.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5888	2 miles N. of Ebenezer.	Clay loam, 0 to 9 inches.	0.01	6.52	1.82	5.42	5.18	16.26	9.82	32.86	21.87
5890	1½ miles N. of Elizabethtown.	Red loam, 0 to 10 inches.	.03	9.36	1.88	3.86	2.10	5.66	5.30	45.98	24.23
5891	Subsoil of 5890..	Red clay loam, 10 to 36 inches.	.01	6.98	4.08	9.78	6.06	12.32	5.34	35.90	20.31
5889	Subsoil of 5888..	Red clay, 9 to 36 inches.	.01	6.34	1.70	5.14	4.98	14.60	6.18	32.52	29.09

MEADOW.

This type occurs along the streams in areas varying in width from one-sixteenth to one-fourth of a mile. It amounts in the aggregate, however, to quite a large area. The surface is generally flat and poorly drained, but occasionally it has a gentle slope from the adjoining hills toward the streams. The soil is made up of the wash from the hillsides and material transported by the streams. It consists of a dark loam 8 to 12 inches deep, underlain generally by a yellowish loam, varying from sandy to pronounced clay loam. Sometimes the subsoil is the typical blue clay. The meadow land has its most extensive development in the limestone valley, though it occurs sometimes in large areas in the other formations. Before it was discovered that clover and timothy could be grown on the uplands these meadow areas were highly prized for hay and pasture. They were commonly flooded during a portion of the season by means of dams, which increased both their area and productiveness. Early titles to land carried with them certain specified water rights for irrigation purposes. The practice of irrigation has long since fallen into disuse, and the meadows where drainage is fair are now plowed and used in rotation with the other fields. Along these stream areas grows a rank native grass, which yields well and which, before the advent of clover and timothy, constituted the hay crop. Clover does not thrive well on meadow land; neither does wheat, which runs largely to straw and does not head

well. So, unless exceptionally well drained, these meadow lands are still best adapted to grass crops, corn, or potatoes. The native forest growth consists largely of willow, ash, and alder bush, which has been cleared off to a great extent.

DONEGAL GRAVELLY LOAM.

This type occurs as a deposit on the older formations in the shape of poorly preserved terraces lying along the Susquehanna River. There is considerable variation in the surface. Where the limestone formation borders the river the terracing is rather more gently rolling, varying in elevation above the river level from 10 to 60 feet, while where the shale or sandstone reaches the river the surface is more hilly and the elevation above the river level is sometimes as much as 100 feet. The extension of this soil type back from the river is irregular, varying from one-eighth mile to 1 mile. Harrisburg is situated on a well-defined terrace. These terraces are thought to have been deposited by the Susquehanna River during the close of the Glacial epoch, when the northern portion of the State was covered with melting ice. They are no longer subject to overflow from the river. The soil is locally termed "river land," and occurs as a deposit on the older geological formations to a depth of from 3 to 20 feet. It varies from a gravelly to a sandy and even heavy loam texture, and the variations are so rapid within small distances that it was found impossible to map them separately or to ascribe any exact character to the type. A sandy loam with occasional gravel seems, however, to be the predominating phase of this type. It is an open, warm soil, well suited to trucking and to general farming. It is nearly all cleared and tilled, and is considered a very good soil by the farmers. The drainage of the Donegal gravelly loam is good, and the limits within which it may be worked with respect to moisture conditions are very wide. As a truck soil this type excels any of the other soil types of the area. Extensive fields or gardens of corn, peas, beans, eggplant, celery, radishes, sweet potatoes, melons, and strawberries are grown upon it. Much of this truck finds a ready sale in Harrisburg and near-by towns for local consumption or for shipment to other more distant places. Grapes and raspberries are grown also to a considerable extent. The islands in the Susquehanna River have a soil similar to that of the terraces, and on the larger islands the same crops are grown. Tobacco of a fine quality and suited for wrapper is grown on this soil. It is on the lighter phase of this soil that it is believed the Sumatra type of tobacco can be produced under shade.

The following table of mechanical analyses shows the texture of samples of the Donegal gravelly loam:

Mechanical analyses of Donegal gravelly loam.

[Fine earth.]

No.	Locality.	Description.	Soluble salts, as determined in mechanical analysis.	Organic matter and combined water.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
5868	Lucknow	Sandy loam, 0 to 15 inches.	0.01	1.78	.....	1.24	2.02	34.74	36.08	16.20	8.51
5864	1 mile S. of Harrisburg.	Silty loam, 0 to 15 inches.	.02	3.40	Tr.	1.16	1.00	2.06	20.08	60.12	11.90
5866	½ mile N. of Highspire.	Sandy, gravelly loam, 0 to 8 inches.	.02	4.06	4.80	12.14	13.24	11.20	7.86	32.10	14.54
5869	Subsoil of 5868..	Sandy loam, 15 to 36 inches.	.01	1.36	.....	.52	1.40	44.86	37.10	8.62	6.21
5865	Subsoil of 5864..	Silty loam, 15 to 36 inches.	.02	3.54	.14	1.16	1.30	3.04	21.62	58.82	10.64
5867	Subsoil of 5866..	Reddish clay, 8 to 36 inches.	.02	2.60	6.30	11.04	9.44	10.76	7.80	34.48	17.70

AGRICULTURAL CONDITIONS.

Two centuries ago the area surveyed was heavily forested; to-day only the hilly or mountainous stony ridges are so covered, while the valleys and smoother hills are thickly dotted with farms. In the limestone valleys grew ash, elm, hickory, beech, walnut, and several varieties of oak, while on the slate and sandstone ridges, then as now the growth was chiefly chestnut, and less frequently oak. Up to within the last thirty years there were occasional belts of timber standing in the limestone valleys, but these have nearly all disappeared. On the shale and slate ridges there still remain some forests that furnish firewood and fencing to near-by farms. The very hilly or mountainous sandstone and ironstone ridges are generally thickly covered with chestnut and oak.

The Indian method of agriculture was very primitive. The "fields" consisted of patches of ground from which the undergrowth had been burned, but in which the larger trees were left standing. Sharp sticks and stone implements were the tools used. Corn and beans were the crops grown. The work was done by the squaws while the men hunted and fished. The early whites cleared small tracts and grew at first the crops suited to home consumption, such as rye, corn, oats, barley, and buckwheat. Spelt was grown in place of wheat until it

was discovered that wheat could be profitably produced. Flax and hemp were introduced later. Lands along the streams were staked off and left permanently in the native grasses. Dams were built, traces of which yet remain, to flood these meadows to increase their acreage and yield. Early titles to deeds carried with them specified water rights. As soon as it was known that clover and timothy could be grown on the higher lands, these natural meadow reserves were plowed and used in rotation with other fields.

The early farms varied in size from 100 to 500 acres, of which usually about one-third was made arable. From 1713 to about 1730 the price for 100 acres ranged from $25 to $75, with certain small yearly quit-rent charges. By 1742 the price of land had risen 10 per cent. Just before the Revolution improved lands near Lancaster city sold for from $60 to $90 per acre, and near Lebanon for from $15 to $25 per acre. At the close of the eighteenth century, lands sold generally 25 per cent higher than during the preceding decade. These lands twenty to thirty years ago often brought $200 to $300 per acre, but have now declined in value from 25 to 50 per cent. This is accounted for partly by the decrease in the market value of wheat and tobacco during this time. Taxes are spoken of as being in the main rather high. The rate of wages for male help ranges from $8 to $12 and even $25 per month, by the year, with board, according to efficiency. Female servants are paid from $1 to $2 per week. During the rush of harvest day labor is paid from $1 to $2 per day in addition to board. As a general thing both male and female help is scarce.

The farm improvements, including houses, Swiss barns, tobacco sheds, fences, etc., range in value from $6,000 to $10,000. The houses are worth from $2,000 to $4,000, the tobacco sheds from $600 to $1,000, and the barns from $2,000 to $8,000. The land valuation ranges from $60 to $300 an acre.

During the last half century the number of farms has materially increased, while the size has decreased. This is due largely to division of estates and the apportionment of land among the heirs. Where once the farms contained from 100 to 500 acres, they now range from 40 to 200 acres, with an average size of about 85 acres.

The limestone valleys are almost wholly occupied by well-kept farms, nearly all cleared, while on the slate and sandstone ridges the farms are less numerous, larger in size, and with more of their areas in timber. Rotation of crops is almost always practiced, with corn, tobacco, small grain, and grass as the principal field crops.

Rotted manure is invariably added to the grain stubble just before the fall plowing. Lime is usually applied once in ten years at the rate of about 50 bushels per acre. Some farmers strongly recommend adding lime in smaller quantities and oftener. The lime is secured from numerous limestone outcrops that occur in the limestone valleys,

less often in the shale formations, and occasionally in the sandstone formation. Commercial fertilizers are but little used for general crops, but for the tobacco crop they are necessary to a good quality of leaf and large yield. Some farmers apply commercial fertilizers to their peach orchards with good results. Their use seems to improve the vigor of the trees and quality of the fruit, as well as also to increase the yield.

Well-kept and well-appointed public schools are to be seen at frequent intervals. The school sessions in the country range from six to nine months.

Local agricultural societies, assisted by the State board of agriculture, are well patronized by the farmers and are the means of disseminating much useful information.

Tobacco is the principal money crop. The range of tobacco acreage is from 1 to 10 acres to each grower. The crop is worth from $60 to $125 per acre, gross. A cigar-filler leaf is generally grown. This tobacco produces some wrapper but more largely a filler leaf. The yield of the filler type ranges from 800 to 1,600 pounds per acre, and of the wrapper type, when this is grown, from 600 to 1,200 pounds per acre. A 2-horse tobacco-planter, costing about $60, is now quite commonly used by the larger tobacco growers for setting out their crop.

The practice of purchasing cattle from the West for winter fattening is quite common with the well-to-do farmers. Most of the grain and forage crops raised on the farm are thus consumed and put back on the land as manure, and the revenue is obtained through the sale of beef. The farmers pay from 3 to 4 cents per pound for 600 to 800 pound steers, and aim to add from 300 to 400 pounds to the weight of each animal during the winter, selling in the spring at from 4 to 5 cents per pound. Often additional corn is purchased for this winter fattening of cattle, and the farmers are content if they succeed in clearing the value of the crops fed and the cost of labor by the sale of the cattle, leaving the manure to represent profit on the transaction. In this way the running expenses of the farm are often all paid, and the money obtained for tobacco represents a net income.

The practice of making butter on the farm is being largely displaced by the creamery system, especially in many places somewhat remote from the larger market centers. This gives to the market a more uniform article. As a rule the creamery butter commands a higher price, bringing from 20 to 30 cents a pound, as compared with 16 to 20 cents a pound received for the homemade product. Near the larger cities, like Lebanon and Harrisburg, an excellent homemade product, bringing from 20 to 30 cents per pound, is placed on the markets. It is the usual practice of the creameries to pay their patrons on the basis of the butter fat contained in the milk. Steam-power

separators are used for extracting the cream from the milk. The farmers usually take the skim milk back to the farm for use as calf and hog feed. Each creamery has from 60 to 200 patrons, and some handle as high as 9 tons of milk a day.

Considerable attention is being given to the peach and chestnut industry and to small fruits, such as strawberries, currants, and raspberries. The stony slate and sandstone ridges, unsuited for general farming, are found to be well adapted to the peach and chestnut. Of late considerable attention has been given to grafting the best varieties of domestic and foreign chestnuts on the young sprouts of native growth.

The historic Cornwall iron mines, near which there are millions invested in furnaces and iron factories, with weekly pay rolls mounting up into the hundreds of thousands of dollars, have been no small factor in the industrial and agricultural development of this section during the century and a half that they have been worked. The iron occurs in the form of magnetic ore, bedded in impure lime rock containing 1 to 2 per cent of pyrite.

Lancaster, Harrisburg, and Lebanon are the principal market and railroad cities of this section. From these centers trolley systems are reaching out into the country, connecting such centers more closely with the smaller towns and farms. Large shipments of garden produce and milk are taken to market daily over the trolley lines. Extensive pikes, supplemented by good dirt roads, make nearly all portions of the area easily accessible and permit of the ready placing of farm products within reach of market. Good stone, iron, and wooden bridges span the streams.

The old Union Canal, now abandoned, which passes along the Lebanon Valley, is of historic interest in that it marked the beginning of heavy inland transportation and was an important factor in the early development of the agricultural and mining interests of this section of the State.

Accessibility Statement

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