SOIL SURVEY OF THE VERGENNES AREA, VERMONT-NEW YORK.

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LOCATION AND BOUNDARIES OF THE AREA.

The Vergennes area, which comprises a part of the Champlain Valley, coincides with the Port Henry and Ticonderoga sheets of the United States Geological Survey. This area of 387 square miles, which includes a narrow strip along each side of Lake Champlain for a distance of 34½ miles, is comprised mainly in the townships of Ferrisburg, Panton, Addison, Bridport, Shoreham, and Orwell, in the State of Vermont, and Westport, Moriah, Crown Point, Ticonderoga, and Putnam, in the State of New York.

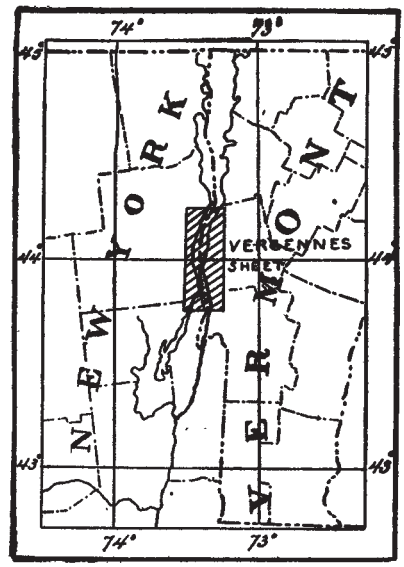

FIG. 1.—Sketch map showing location of the Vergennes area, Vermont-New York.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The first European settlement in this area was made in 1730 by the French, at Chimney Point, on the east shore of Lake Champlain. The next year a fort was erected at Crown Point, on the west shore, and in 1732 Colonel Lydias, an Englishman, purchased from the Mohawk Indians a large tract of land on Otter Creek, which included nearly the whole of the territory embraced in the present survey on the Vermont side of the lake. Another fort was built by the French at Ticonderoga in 1756. Many settlers followed in the train of the army, as both the French and English regarded the control of the lake as of great importance.

After the departure of the French, in 1763, New York and New Hampshire both laid claim to the territory which lay between them, then known only as "the wilderness," and later as the "New Hampshire grants," and the ensuing controversy over the right to grant and sell land therein caused the local inhabitants to band themselves together under the name of "Green Mountain Boys," to enable them

to hold the lands upon which they had settled. The contention for the possession of these lands was lost sight of during the Revolutionary war, but did not cease altogether until 1791, when Vermont was admitted to the Union as a State. Essex County, N. Y., which embraces the area west of Lake Champlain, was organized in 1799.

In the war of 1812 there was much activity within the limits of this area. Macdonough held his Champlain fleet in winter quarters in Otter Creek and built new vessels just below the falls at Vergennes. With this equipment the naval battle of Lake Champlain was fought the following spring.

It is interesting to note, in connection with the early agriculture of the area, that during the decade ended with 1820 the Champlain Valley was celebrated for its production of wheat, which was made the chief crop. Troy was the principal market, and the grain was hauled there on sleds during the winter. The ruling prices were high, and in 1817 wheat brought $2.25 a bushel. Under these conditions farmers became highly prosperous, but the appearance during the next decade of the Hessian fly, the blight, and the wheat midge made the cultivation of that crop unprofitable, and its production was transferred to western New York, thus inaugurating the transitory movement westward which has marked constantly the cultivation of this grain in the United States.

The failure of the wheat crop, the knowledge that its successive production led to rapid depletion of the productivity of the soil, and the consequent awakening to the importance of manuring the old fields necessitated a resort to some other branch of farming. It was believed then that the tenacious character of much of the soil along the lake forbade the extensive cultivation of hoed crops, and this was undoubtedly the case at that time; but, happily, a profitable industry was introduced which not only made this unnecessary for the time being, but also brought a great deal of prominence to the agricultural interests of this section.

During 1809 and 1810 William Jarvis, American consul at Lisbon, had obtained about 4,000 Merino sheep from the confiscated flocks of Spanish nobles and had brought them to his estate at Weathersfield, Vt. From this importation and from a small flock of the Infantado family, imported about the same time by Colonel Humphreys, our minister to Spain, the most valued merinos are descended.[a]

Sheep husbandry became the leading industry of the valley, and in 1840 Addison County, Vt., had, in proportion to both territory and population, a greater number of sheep and produced more wool than any other county in the United States. French merinos were imported later, and it is claimed that both these and the Spanish breeds

[a] Robinson's History of Vermont.

were so improved in this country that they far excelled the original importations.

From these flocks many sheep were sent to the West, and as the business obtained a foothold there the wool-growing industry, which had been so profitable here, was unable to withstand the competition of the Western States, and sheep farming was gradually superseded by dairying.

Another product which gave much prestige to the early agriculture of this section was the Morgan horse. This famous breed originated in the town of Randolph, a few miles east of the area surveyed, and for a time exerted a most important influence, both on the character of the horses produced and the consequent remunerative prices for which they were sold. This very success, however, led to the disposal of the best stock for breeding purposes elsewhere, and the natural result was the steady downfall of the business here, until to-day little trace of this blood can be found.

With the rise of the dairy industry home-made cheese became the leading farm product. The cheeses were packed four or five together in casks made especially for the purpose by the local cooper. Butter was also made, and sold by barter at the village store, where, with little assorting, it was packed in large firkins and sent to the cities. These products of the dairy, together with pork, apples (both dried and in cider sauce), potash, and lumber, constituted the chief sources of income.

CLIMATE.

The following table, compiled from the records of the Weather Bureau, shows the normal monthly and annual temperature and precipitation of the Champlain Valley. The station at Cornwall is situated in the hilly region which borders the area on the east. The station at Burlington, a few miles north of the area, is but a short distance from Lake Champlain and is believed to represent well the conditions in the main part of the valley. The normals in the table are based on the records for the last nineteen years. The records at Burlington, which have been kept at the same point for a period of sixty-six consecutive years, show the normal temperature for that entire period to be 47.6° F., and the normal precipitation to be 32.96 inches, and are quoted to show the uniformity of the weather conditions for a long term of years. These data, and also the earliest and latest dates at which the temperature was 32° F. or below, are given by the courtesy of Mr. Charles E. Allen, who has taken these observations for the last twenty-six years.

Normal monthly and annual temperature and precipitation.

Month.	Burlington.		Cornwall.		Month.	Burlington.		Cornwall.	
	Temperature.	Precipitation.	Temperature.	Precipitation.		Temperature.	Precipitation.	Temperature.	Precipitation.
	°F.	Inches.	°F.	Inches.		°F.	Inches.	°F.	Inches.
January	19.5	1.99	19.3	2.68	August	69.0	4.36	67.9	3.73
February	20.6	1.57	19.2	2.16	September	61.5	3.63	60.9	2.92
March	28.7	2.04	29.1	2.30	October	49.5	2.58	49.7	2.26
April	44.6	1.84	45.3	1.56	November	38.2	3.19	36.1	3.26
May	58.2	3.18	57.0	3.14	December	25.4	1.85	25.4	2.26
June	67.8	3.17	67.1	3.33	Year	46.2	33.08	45.7	33.13
July	71.1	3.68	70.9	3.53					

Dates of first and last killing frosts.

Year.	Burlington.		Year.	Burlington.	
	Last in spring.	First in fall.		Last in spring.	First in fall.
1893	Apr. 26	Oct. 30	1899	Apr. 11	Oct. 22
1894	Apr. 10	Nov. 5	1900	Apr. 10	Oct. 20
1895	Apr. 11	Oct. 18	1901	Apr. 12	Oct. 28
1896	Apr. 9	Oct. 10	1902	Mar. 26	Oct. 17
1897	Apr. 20	Oct. 9	1903	Apr. 6	Oct. 25
1898	Apr. 21	Oct. 10			

PHYSIOGRAPHY AND GEOLOGY.

The portion of the Champlain Valley surveyed has the general appearance of a trough hemmed in by mountains. West of the center of the area lies Lake Champlain. This lake crosses the southern boundary of the area near its center, and extends a little west of north to Ticonderoga, where it receives the waters of Lake George, and thence to Chimney Point, opposite Port Henry. Turning northeast at the latter point the lake extends for a distance of 17 miles to the northeast corner of the area. South of Chimney Point the average width of the lake is about 1 mile, while north of that point it is about 2 miles. The shore line is irregular because of many bays, inlets, and "points." Some of these points are rocky, others are entirely covered by the Champlain clays, and still others disclose the rock formation only near the water level of the lake.

Extending back from the eastern shore line, the general surface features are those of a level or gently rolling plain, marked here and there by long, narrow ridges or hills and by drainage depressions. This plain gradually ascends with increasing distance from the lake, until near the eastern side of the area it gives way in many places to a series of hills and low mountains, the forerunners of the great Green Mountain system which lies but a few miles to the east.

Along the western side of the lake the foothills of the Adirondack Mountains extend in places to the water's edge, but more often there is a considerable intervening area which is level to moderately rolling near the lake, but hilly and rough as the mountains are approached. The same kind of topography is found in the district which lies west of Split Rock Mountain, north of Westport.

The entire drainage system, with the exception of that in the northwest corner of the area, which is cut off by Split Rock Mountain, flows into Lake Champlain. Some of the streams have cut moderately deep channels, and near their entrance to the lake the highways crossing them are steep. Few of the streams are swift, and the one second in size in the area is so sluggish as to receive the name "Dead Creek." The most important stream is Otter Creek, which, if fully developed, would furnish tremendous power at the Falls of Vergennes.

Geologists tell us that in an earlier age this region was worn down by ice, that the resulting land surface was left very uneven, and that glacial material, varying greatly in thickness, was then distributed over it. The entire region was then depressed, and the waters of Lake Champlain spread over all the lower-lying portions. During this submergence were deposited the post-Glacial or Champlain clays. These clays, which cover the main part of the area east of Lake Champlain and the low-lying portions on the west side, give rise to the most important soil type.

Above these clay deposits, along the lower mountain slopes on the New York side, are found terraces and deltas of post-Glacial sands and gravels.

Glacial material comes to the surface, or near to it, on the highest hills only, and in some cases this has washed down the slopes, mingled with the post-Glacial sands, gravels, or clays in variable amount, and has exerted some influence on the formation of small areas of surface soil.

As the ice was melting, sands were sorted and deposited in local banks and other small areas. Some of the small areas of sandy loam were probably derived in the same way. The soil on Snake Mountain is probably derived from Georgian sandstone. Decomposition of this rock has been slow and the resulting soil is thin, though this is due also in large measure to the rapid wearing away of the decomposition products on account of their steep position. Limestone is exposed for a short distance up the slope on the west side. The Champlain clays extend to the base, and are mixed there for a short distance with the soils washed down the mountain slope.

The hills south of Snake Mountain are usually of limestone formation. Several ridges and small hills of this or of slaty material occur in the valley. The post-Glacial clays always extend to the base

of these elevations, and usually well up on the slopes, while the low ones are often entirely covered with them. The soil on the slopes of the high hills has been reenforced to a greater or less extent by material washed down from the older formations higher up on the slope.

SOILS.

There were mapped in this area nine distinct soil types, exclusive of Rock outcrop, Meadow, and Swamp. The area and proportionate extent of each type are shown by the table given below:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Vergennes clay	129,984	52.4	Vergennes gravelly loam	3,968	1.6
Rock outcrop	43,008	17.4	Vergennes black clay	3,584	1.4
Alton stony loam	29,056	11.7	Vergennes sandy loam	2,112	.9
Vergennes stony loam	17,024	6.9	Swamp	2,048	.8
Vergennes fine sand	8,384	3.3	Muck	384	.2
Vergennes loam	4,352	1.8	Total	247,872	
Meadow	3,968	1.6			

VERGENNES CLAY.

The surface soil of the Vergennes clay consists of heavy gray clay or light-brown clay loam, varying in depth from 6 to 12 inches. The subsoil is a gray, drab, or, rarely, light-brown heavy clay, somewhat tenacious when wet, but extremely stiff, compact, and intractable when dry. Wherever the clay loam is absent or so shallow that the processes of tillage go below it the upturned furrows of the underlying gray clay become white upon exposure to the atmosphere, and this has given rise to the local term "white-faced clay." Near Lake Champlain the principal part of the type is of this kind. With increasing distance from the lake, however, the clay loam areas are more numerous and of greater extent, but their close and indeterminate association with the "white-faced" clay renders their classification as distinct soil types unfeasible.

Minor variations of the Vergennes clay also occur. Small areas contain from 5 to 20 per cent of gravel and small stones, where otherwise the soil is typical. Local areas of sandy loam or sand, containing gravel and sometimes stones, are also found. These patches seldom exceed 5 acres, and are underlain by the typical clay subsoil at depths ranging from 12 to 36 inches.

The underlying limestone, which is usually buried deeply by later deposits, sometimes protrudes through the surface as narrow ridges or ledges. Where possible these have been included in the Vergennes stony loam, but many of them are too small to be thus represented. Other ridges and hills of small extent represent the Utica slate formation. On the steep slopes of many of these ridges outcrops of

slate are frequent, and thin fragments are often strewn over the tops and the steepest slopes. The soil on these ridges is normally a medium loam, underlain by heavy loam or light clay loam. The soil seldom is 3 feet deep, but grades into a mass of slate fragments at depths ranging from 12 to 30 inches. The Vergennes clay of later age often completely covers the lowest of these hills and extends well up the slopes of the highest ones, so that only the largest of them can be mapped as stony loam. The soil in surface depressions of the Vergennes clay sometimes closely resembles or is identical with the soil of the Vergennes black clay. This is due to inadequate drainage conditions, which have made possible the accumulation of organic matter and fine material washed from the surrounding slopes. Similar soils are found along the boundaries of these two types. When the depth of such material is less than 6 inches, it has been mapped as Vergennes clay.

The Vergennes clay is the most extensive, as well as the most important, soil type in the Champlain Valley. It occupies the main part of the area of the present survey in the State of Vermont, broken for the first few miles back from Lake Champlain only by occasional small areas of other types, until it approaches the foothills of the Green Mountains on the east. On the New York side it includes nearly all of the lower lying portions.

The type is for the most part level, or but very gently rolling, broken only here and there by occasional ridges of stony loam. Along the east side of the area, and also west of Lake Champlain, the topography is more hilly. On each side of the lake the streams have cut deep courses for some distance back. On the New York side narrow, flat bottoms often extend along these streams. Such strips are usually Vergennes sandy loam, but they seldom exceed 2 acres in extent and most of them are even smaller. Similar areas often occur on small, low-lying points which jut into the lake, though when the banks are high they are commonly the " white-faced " clay phase of the Vergennes clay.

The surface drainage of the Vergennes clay is adequate for the greater part of the formation, though there are many surface depressions which should be drained artificially. Most of the type, however, is extremely compact and so impervious to moisture that the seasons when the soil may be worked to advantage are seriously shortened. On this account much better crop returns could be secured if this soil were underdrained. The chief benefit from underdraining, however, would be derived, not as the direct result of the removal of the excess surface water, but rather from the lengthening of the seasons in which the land could be worked, the much more thorough methods of cultivation which could be followed if the supply of moisture were under better control, and the consequent decreased susceptibility to drought.

The Vergennes clay is derived chiefly from the post-Glacial or Champlain clays, which, with the exception of the mountains and highest hills, overspread the entire region. The glacial material comes to the surface, or nearest to it, on the hills, and in some cases this has been washed down the slopes and mingled with the post-Glacial clays, thus exerting some influence on small areas of the type.

Hay is the most important crop, and yields from 1 to 3 tons per acre. The system of farming is such that the average yield is very low when the possibilities are considered, being probably not much above 1 ton per acre. Some farmers maintain an average yield of 1½ tons per acre. Corn yields from 20 to 50 bushels per acre, with an average of 30 bushels; and oats 20 to 60 bushels, with an average of 25 bushels per acre.

The Vergennes clay is an excellent soil for the production of hay, and should bring an average yield of 2 tons per acre with a four-year rotation. It is not an ideal corn soil, but profitable yields of that grain may be secured, and it should give an average yield of 40 bushels of shelled corn per acre. Oats and barley both yield well and leave the ground in good condition for seeding. This type makes excellent pasture, and much of it is so used for the last year or more of a long rotation.

The Vergennes clay is adapted to the crops which are generally grown upon it, but there is much chance for improvement in methods of management and cultivation, which will be treated further under the chapter on Agricultural Methods.

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

Mechanical analyses of Vergennes clay.

No.	Locality.	Description.	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.*
11067	¼ mile N. of Orwell	Gray heavy clay, 0 to 6 inches.	2.2	5.5	3.5	3.7	2.0	15.4	67.6
11069	1 mile W. of Vergennes.	Gray heavy clay, 0 to 7 inches.	.5	2.3	2.2	3.5	3.0	19.7	68.7
11071	2 miles S. of Westport.	Mottled brown clay, 0 to 6 inches.	2.0	2.4	1.2	1.4	2.6	21.1	68.9
11070	Subsoil of 11069	Brown heavy clay, 7 to 36 inches.	.3	1.6	1.5	2.4	2.5	24.4	67.2
11072	Subsoil of 11071	Brown heavy clay, 6 to 36 inches.	.0	.4	.5	1.3	2.4	25.4	69.9
11068	Subsoil of 11067	Gray heavy clay, 6 to 36 inches.	.2	2.4	1.7	2.1	2.1	15.6	75.8

VERGENNES BLACK CLAY.

The surface soil of the Vergennes black clay consists of from 6 to 15 inches of black loamy clay or heavy black clay loam. This soil is very tenacious and sticky when wet, but granular and friable when dry, and contains a high percentage of organic matter. The subsoil is heavy, tenacious drab clay. In local areas this is somewhat plastic, but more often it is underlain at 24 inches by stiff, heavy clay similar to the subsoil of the Vergennes clay.

The areas of this type are small, only one exceeding 2 square miles in extent. The most important occurrence is along Lemon Fair Brook, in the eastern part of Bridport Township. Smaller areas are associated with the Vergennes clay or occur as narrow strips along minor stream courses.

The surface of this type is either flat, as along the Lemon Fair, or basinlike, as in the smaller areas. In the former case the natural drainage afforded by the Lemon Fair is somewhat sluggish and the area was formerly very wet. A few ditches have been dug, and the portions most easily drained have thus been made very productive. Much more extensive systems of lateral ditches, however, would vastly increase the value of this soil, and if properly managed their construction would be a profitable investment.

The Vergennes black clay owes its origin to depressions left in the Champlain clays of post-Glacial time. Such depressions have received the drainage from the higher lands, and in this way the finer sediments washed from the surrounding slopes have been accumulated. This material, mingled with the decaying vegetation, has given rise to the rich black soil of this type.

The Vergennes black clay is naturally a very strong soil. Artificial drainage, however, is absolutely necessary for most of the type if its excellent possibilities are to be realized to any degree of completeness, and, in fact, there is none of it which would not be greatly improved thereby. If this were done the Vergennes black clay would be by far the best soil of the area for the production of corn, and would equal the best corn soils of the Middle West. At present but little of it is cultivated. Hay is cut from the best-drained portions for long terms of years, with altogether too little reseeding. Excellent yields are obtained for a few years after each reseeding, but as the yield diminishes the fields are used as pasture. The more poorly drained portions are used only for pasture.

The Vergennes black clay of the Champlain Valley is an admirable soil for the production of corn and hay, and it offers superior opportunities for profitable development.

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

Mechanical analyses of Vergennes black clay.

No.	Locality.	Description.	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.*
11075	3 miles SE. of Bridport.	Black clay, 0 to 12 inches.	0.8	3.8	2.2	3.1	2.5	33.4	53.4
11077	4 miles SE. of Panton.	do	.9	2.1	1.5	3.7	2.8	33.5	55.5
11076	Subsoil of 11075	Black clay, 12 to 36 inches.	2.6	3.1	1.8	2.8	2.2	29.7	57.8
11078	Subsoil of 11077	Gray clay, 12 to 36 inches.	.0	1.0	1.0	4.2	3.8	31.3	58.6

VERGENNES STONY LOAM.

The surface soil of the Vergennes stony loam consists of clay loam, or, more rarely, loam, to an average depth of 8 inches. The subsoil of the clay loam phase is the gray clay of the Vergennes clay formation, but its depth is variable, depending on the position of the underlying rock.

This type occupies long, narrow ridges or low hills throughout the Vergennes clay formation, and also the lower slopes of the higher hills.

The ridges are corrugations of the most resistant parts of the limestone formation which underlies this region. A few of these may have been high enough to prevent the Champlain clays from completely covering them, but it is more likely that they were once covered by these deposits, which since have been eroded away from the steep positions, leaving the bare rock exposed. Small portions of the type are merely rock outcrop, but these are seldom of sufficient extent to be indicated on the map. Large quantities of limestone fragments are scattered over local areas.

Between the ledges, which are usually long and very narrow, the hollows are often comparatively free from stones on the surface, but are underlain at 3 feet or more by limestone ledges. In such cases a few inches of soil next to the limestone appears to be derived directly therefrom, but it can not be distiguished anywhere near the surface, though it is undoubtedly mixed to some extent with the Vergennes clay which overlies it. Aside from this minor influence this phase of the type has been derived directly from the Champlain clays.

Where the Vergennes stony loam occurs on the lower slopes of hills whose upper slopes were above the line of the post-Glacial deposits, the type is somewhat variable. On the western slope of Snake Mountain, for example, the soil is mainly clay loam or heavy loam, but patches of sandy loam are frequent. Such areas, if they were of sufficient extent, should be mapped as Alton stony loam. The amount of stones along this slope varies greatly, but in general increases gradually with the ascent of the mountain. The limestone near the base gives way farther up the slope to sandstone and quartzite.

A light phase of this type is found on the elevations locally known as "slaty hills." This soil ranges from a light to a medium loam, containing from 15 to 75 per cent of slate fragments. The subsoil is medium to heavy loam, or, rarely, clay loam. The slate fragments vary in size, the greater number being no larger than Indian arrowheads, but pieces a foot long from 2 to 4 inches wide and an inch thick are not uncommon. Where suitable for tillage this phase is highly esteemed for the production of potatoes, and good yields of excellent quality are obtained. Many of these hills, however, are used only for pasture or allowed to grow up in forest.

Small fields on the most level portion of the Vergennes stony loam are tilled and medium yields of corn and hay are secured, but low prices of soils better adapted to tilled crops militate against the extensive cultivation of this type, most of which is used as pasture or woodland. The best apple orchard seen in the entire area is on this type, and the fruit produced is of high quality. A large part of the Vergennes stony loam offers excellent opportunities for the production of apples on a commercial scale by the employment of modern methods of orchard cultivation, and should be used for this purpose.

The following table gives mechanical analyses of the fine earth of the soil and subsoil of this type:

Mechanical analyses of Vergennes stony loam.

No.	Locality.	Description.	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.*
11063	1 mile SW. of Richville.	Heavy loam, 0 to 9 inches.	1.0	3.0	3.3	11.1	16.6	41.2	23.8
11065	2 miles E. of Bridport.	Light clay loam, 0 to 9 inches.	2.0	8.7	13.2	22.1	8.1	20.8	25.2
11064	Subsoil of 11063	Clay loam, 9 to 36 inches.	1.0	3.0	3.0	10.8	14.3	40.6	27.4
11066	Subsoil of 11065	Clay loam, 9 to 30 inches.	2.1	7.0	10.8	22.6	9.3	18.3	29.7

VERGENNES FINE SAND.

The surface soil of the Vergennes fine sand consists of a dark-brown, black, or yellow loamy fine sand to a depth of from 6 to 10 inches. The subsoil is a yellow or light-brown medium sand, which rests upon the basal clays of the region at depths ranging usually from 3 to 4 feet, though in rare instances the sandy material may be 6 feet or more in depth. Small amounts of gravel are not infrequent in both soil and subsoil. There is a phase of the type west from Streetroad, 3 miles northwest of Ticonderoga, and in certain other small areas near the bases of hills where the surface soil is less loamy, is lighter colored, and over it are scattered small quantities of stones and bowlders; also along the foothills in New York less organic matter has been accumulated in the surface soil, and consequently the color is lighter than in the true type.

The Vergennes fine sand is found in scattered areas of rather small extent, and its surface features are much varied. In Vermont it varies only slightly, if at all, in elevation from the Vergennes clay, and in this position it represents a water deposit. West of Vergennes, between Dead and Otter creeks, occurs a level, poorly drained area, mostly covered with a scrubby growth of trees, the soil here and that of the smaller areas near Little Otter Creek being derived from late sedimentary deposits. In New York the type appears along the lower slopes which lead from the Vergennes clay adjoining Lake Champlain to the Alton stony loam of the Adirondack foothills, in which position the soil has probably been formed from the decomposition products of the mountains above, modified somewhat by shore deposits. Areas occur among the foothills of the Adirondacks where both their topography and derivation are varied. On certain slopes this soil seems entirely colluvial; again its origin is undoubtedly sedimentary; while in still other places it has been derived from one of these sources, modified by the other. Some of the areas are quite hilly, and suffer from lack of moisture in a season of normal rainfall. With the exception of a few low-lying areas, the type is usually well drained.

The Vergennes fine sand is well adapted to truck and garden crops and small fruits. It is more commonly used, however, for general farming, and fair yields of corn, oats, and hay are produced. It requires plowing and reseeding more frequently than the heavier types, and hence is seldom appreciated, inasmuch as hay is the chief crop. If a system of crop rotation were adopted, including a crop of corn and one of clover for two out of every four years, this soil should bring good returns. No crops are grown at present on certain portions of the type where the soil is of very light texture and too deficient in organic matter for the staple farm crops.

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

Mechanical analyses of Vergennes fine sand.

No.	Locality.	Description.	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.*
11049	½ mile N. of Crown-point Center, N. Y.	Yellow medium sand, 0 to 6 inches.	1.1	4.6	9.0	43.0	27.3	9.2	5.5
11047	3 miles W. of Vergennes.	Medium to coarse sand, 0 to 8 inches.	2.7	13.2	19.4	29.6	17.7	11.5	5.7
11053	2 miles SE. of Crown-point Center, N. Y.	Fine sandy loam, 0 to 8 inches.	.3	.6	.7	8.5	41.0	41.0	7.3
11055	2 miles W. of Vergennes.	Fine sandy loam, 0 to 10 inches.	.7	2.9	11.6	46.3	19.8	10.6	7.9
11051	2 miles W. of Ferrisburg.	Medium sandy loam, 0 to 9 inches.	4.1	13.8	15.4	24.3	19.3	12.4	10.5
11048	Subsoil of 11047	Yellow coarse sand, 8 to 36 inches.	5.0	13.4	22.8	41.8	10.1	3.4	3.5
11052	Subsoil of 11051	Yellow sand, 9 to 36 inches.	2.6	9.0	14.1	55.4	10.9	4.0	3.6
11054	Subsoil of 11053	Fine loamy sand, 8 to 36 inches.	.1	.3	.9	24.9	40.1	28.4	5.4
11050	Subsoil of 11049	Yellow medium sand, 6 to 36 inches.	.6	3.9	8.0	34.9	28.2	18.3	5.8
11056	Subsoil of 11055	Yellow fine loamy sand, 10 to 36 inches.	.4	.8	2.4	33.7	36.2	18.3	8.0

The following sample contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 11054, 0.8 per cent.

VERGENNES SANDY LOAM.

The surface soil of the Vergennes sandy loam consists of from 8 to 30 inches of black or dark-brown medium sandy loam. The surface material does not differ essentially in texture from the Vergennes fine sand, but the subsoil is drab clay loam or clay. Often there is an intermediary gradation zone between the typical soil and subsoil, consisting of sticky sandy loam or light clay loam. Such material ranges from 6 to 15 inches in thickness, and owes its origin to a reworking of the surface of the underlying clay with the later sandy deposits. In a few places the typical soil is underlain at an average depth of 12 inches by a layer of medium sand which rests directly upon the heavy underlying clay.

The Vergennes sandy loam occupies but a few scattered areas, of which the largest is near the mouth of Otter Creek. Its surface there is nearly level, but is marked sometimes by hummocks and low swells which extend for a considerable distance. The scattered areas are usually rolling or they occupy the lower parts of slopes.

The type is well drained, except in local areas near the mouths of the large creeks, where the water table is near the surface.

The Vergennes sandy loam is derived, in the low-lying areas, from late sedimentary deposits overlying the Champlain clays. The scattered areas are either colluvial material or shore deposits overlying the Champlain clays.

Much of this minor type is uncultivated and the tilled portions are so small that they are farmed usually with adjoining types, and as a consequence crop yields are not given.

The Vergennes sandy loam, where well drained, should produce good yields of corn, clover, and late truck.

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

Mechanical analyses of Vergennes sandy loam.

No.	Locality.	Description.	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.*
11081	4 miles W. of Ferrisburg.	Heavy fine sandy loam, 0 to 10 inches.	0.6	3.3	3.1	11.5	45.4	24.3	11.4
11079	3 miles W. of Vergennes.	Fine sandy loam, 0 to 12 inches.	.9	5.4	4.2	17.8	24.1	33.2	14.4
11082	Subsoil of 11081	Clayey sandy loam, 10 to 36 inches.	.0	.6	.4	13.8	36.5	28.5	20.0
11080	Subsoil of 11079	Gray clay loam, 12 to 36 inches.	.0	.7	.9	4.2	13.2	45.5	35.3

VERGENNES LOAM.

The surface soil of the Vergennes loam consists of heavy fine sandy loam or loam to a depth averaging 10 inches. The subsoil is either a plastic mixture of clay and sand, or medium to heavy loam, which often grades at 3 feet into the stiff subsoils of the Vergennes clay. The subsoil occasionally contains a low percentage of gravel and stones. North of Crown Point the soil is underlain in places at a depth of 10 inches by a band of medium sand, which at a depth of 20 inches grades into loam or clay loam.

The Vergennes loam occurs in only a few scattered areas. Near the mouth of Otter Creek and at the head of Bulwagga Bay it is level and drainage is somewhat sluggish in the spring when the lake is high, but the soil usually dries in time to plant corn. The Vergennes loam of these areas was derived from post-Glacial deposits, modified somewhat by stream action. The other occurrence of Vergennes loam is upon low, rounded or flat-topped hills and gentle slopes. In such areas the soil is well drained and is derived from post-Glacial deposits which, in some instances, have been modified somewhat by colluvial material.

The Vergennes loam produces an average yield of 40 bushels of corn, 35 bushels of oats, 35 bushels of barley, and 1½ tons of hay per acre. It is a more popular soil than the Vergennes clay, as it is much easier to work and consequently is more efficiently farmed. It is the best corn soil in the area, and, as desirable corn soils are not abundant here, it should be used largely for the production of that grain in a rotation with clover.

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

Mechanical analyses of Vergennes loam.

No.	Locality.	Description.	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.*
11059	4½ miles S. of Addison.	Brown loam, 0 to 12 inches.	1.1	3.0	3.1	14.6	32.1	26.9	19.1
11057	5 miles SE. of Bridport.	Brown medium loam, 0 to 9 inches.	3.1	4.9	6.3	22.9	20.5	22.9	19.6
11060	Subsoil of 11059	Sandy clay, 12 to 36 inches.	2.3	4.2	3.8	14.1	31.3	22.9	21.3
11058	Subsoil of 11057	Heavy loam, 9 to 36 inches.	3.4	6.0	7.1	22.3	17.6	21.8	21.9

MUCK.

The surface soil of the Muck consists of from 6 to 24 inches of organic matter mixed with clay and sand. This is underlain by stiff, heavy clay. In places the Muck is less thoroughly decomposed, and small quantities of peat are found. There is but one area of Muck within the present survey large enough to map, and that is of small extent. It forms a fringe which nearly encircles the swampy area occupying a depression in the Vergennes clay just north of Shoreham village. Near the borders of the Vergennes clay it is fairly well decomposed, and yields fair crops of second quality hay and pasturage. Bordering swamp it is poorly drained, and at present the expense of artificial drainage would scarcely be warranted.

MEADOW.

Low-lying areas adjacent to stream courses, with a variable soil formed by stream deposits, yet too well drained for classification as Swamp, and chiefly utilized for pasturage, have been mapped as Meadow.

SWAMP.

An area of about 2 square miles lying just north of Shoreham village was mapped as Swamp. This area occupies a depression in the Vergennes clay, and its natural drainage is so inadequate that it has

no present agricultural value. It is too wet even for pasturage, and its only use is to furnish firewood. A few other small areas too wet for classification as Meadow have been included in this type.

VERGENNES GRAVELLY LOAM.

The surface soil of the Vergennes gravelly loam consists of from 6 to 10 inches of sandy loam, containing from 10 to 45 per cent of fine gravel, pebbles, and small stones. The subsoil consists of light sandy loam or sticky sandy loam, with gravel content similar to that of the soil. The subsoil, in its lower depths, often grades into sand, with a high content of fine gravel.

There are only a few scattered areas of the Vergennes gravelly loam, and of these the largest and most important lies west of Port Henry.

The type occupies two physiographic positions: Low bars and ridges surrounded by the Champlain clays, where it represents delta deposits; and broken terrace formations along the ancient shore line.

This soil is always well drained, both on account of its texture and its position, and, with the exception of the low, narrow bars which rest upon clay at a depth of about 3 feet, it is very susceptible to drought.

Only the most loamy portions are tilled. Such fields produce an average yield of 25 bushels of corn and 1 ton of hay per acre for the first two years after seeding, but frequent reseeding is necessary. Potatoes do well, and the soil is best adapted to their production, alternating occasionally with clover, which yields well in wet seasons.

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

Mechanical analyses of Vergennes gravelly loam.

No.	Locality.	Description.	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.*
11043	½ mile N. of Crown-point, N. Y.	Sandy loam, 0 to 6 inches.	7.7	17.3	14.8	19.1	13.8	17.9	9.4
11045	5 miles S. of Addison.	Sandy loam, 0 to 8 inches.	7.2	15.6	12.9	18.9	8.8	23.4	12.8
11044	Subsoil of 11043	Sand containing gravel, 6 to 36 inches.	4.6	17.6	26.9	26.5	7.0	10.4	7.0
11046	Subsoil of 11045	Light sandy loam, 8 to 36 inches.	6.0	12.9	15.9	25.9	7.6	19.5	11.6

The following sample contained more than one-half per cent of calcium carbonate ($CaCO_3$): No. 11043, 0.8 per cent.

ALTON STONY LOAM.

The surface soil of the Alton stony loam ranges from light to heavy sandy loam, with a depth of from 6 to 10 inches. The soil is brown or yellow in color, and contains from 20 to 60 per cent of gravel, stones, and bowlders. The typical subsoil is a medium sandy loam, with from 20 to 80 per cent of stones and bowlders, but it presents a wide range of variations. In some places there is enough fine material present for classification as clayey sandy loam, while again it is chiefly medium and fine sand. The stones, rock fragments, and bowlders are chiefly gneisses, gabbros, quartzites, and sandstones. In many places these are so abundant that cultivation is hardly worth while, but at former times they have been removed from many small fields and piled in heaps or laid in stone walls. South from Crown Point this type contains patches of an acre or more which are comparatively free from stones. The soil texture of such areas does not differ from that of the true type.

East of Lake Champlain the Alton stony loam is found chiefly in the townships of Orwell and Shoreham. West of the lake it occurs in many irregular areas throughout the length of the survey.

The topography of this soil is always hilly. Small fields which are practically level are found on flat-topped hills or benches, but most of the type is much broken by steep hills and ridges. In New York it often occupies the lower slopes of the hills and mountains whose upper slopes are rock outcrop.

The greater part of the Alton stony loam is very susceptible to drought, but where the subsoil is heaviest crops suffer but little from lack of moisture in normal seasons.

This soil is derived chiefly from colluvial material representing the weathering and decomposition of glacial deposits, modified in varying degree by post-Glacial sands and gravels.

Only a small portion of the Alton stony loam is cultivated, and the tilled fields are so small, irregular, and broken that crop yields are practically unobtainable. Certain portions bring good yields of potatoes and moderate yields of corn and grass. A considerable part of the type furnishes good pasturage early in the season, but most of it is left in woods. Apples do well on the heaviest portions, and where not too rough this phase is best adapted to their production. The sugar maple also thrives and represents probably the best use to which certain parts of the type can be put. Other portions should be used as permanent pasture, but most of it is best suited to forestry.

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

Mechanical analyses of Alton stony loam.

No.	Locality.	Description.	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.*
11039	1¼ miles SE. of Orwell	Heavy sandy loam, 0 to 8 inches.	2.6	6.2	6.5	19.8	23.6	23.8	12.4
11037	1¼ miles NE. of Shoreham.	Medium sandy loam, 0 to 8 inches.	3.0	6.5	7.0	17.5	19.5	29.1	17.4
11040	Subsoil of 11039	Sandy loam, 8 to 36 inches.	3.2	6.2	7.7	23.0	25.0	26.5	8.1
11038	Subsoil of 11037	do	2.9	6.7	7.1	19.2	21.2	23.8	14.1

ROCK OUTCROP.

All land too rocky and steep to cultivate is designated on the map by the symbol ✓. The soil of such areas, where soil exists, is usually a thin, sandy loam overlying a mass of rock fragments or a ledge. The surface is strewn with bowlders and rocks, and small cliffs are common. Occasionally, however, small areas are found on benches and the lower slopes of mountains, where large quantities of stones have been collected and piled in heaps and walls, and some attempt is made at cultivation. Such areas are mere patches, are worthless for cultivation, are suggestive only of wasted labor which might have been employed to better advantage elsewhere, and should be left to grow up in forest.

AGRICULTURAL METHODS.

The great possibilities of the profitable development of agricultural interests in the Champlain Valley can not be attained until the methods of farm management are greatly improved. Little care is exercised in the preparation of soils for planting. The leading soil type is the heavy Vergennes clay, which requires painstaking cultivation if the best results are to be secured, and it is extremely unfortunate that the methods of cultivation in general use are so inefficient. In April the writer saw heavy clay soil plowed when the ground was so wet that water stood in the bottom of the furrows as soon as they were turned. Plowed under such conditions the upturned furrow immediately bakes into clods which it is practically impossible to reduce before the crop must be planted. Not only this, but the bottom of the furrow, very carefully smoothed down by the plow, also bakes into a well-nigh impermeable crust which pre-

vents the deep penetration of roots, the aeration of the soil, and the access of the root to plant food and moisture which might be available. In the spring this soil is usually too wet to plow, yet later in the season it suffers from drought. The Vergennes clay should always be plowed in the fall, and plowed deeply, leaving the surface rough for exposure to the action of frost during the winter. Moreover, the plowing should be thoroughly and carefully done. In many years there are certain periods during the autumn when the soil is so baked that it is impracticable to plow it, but the seasons are very rare, if indeed there are any, when the land may not be plowed at some convenient time during the autumn under favorable moisture conditions. During the season of this survey fields were extremely rare in which large quantities of unbroken clods were not to be seen at the time of planting, although the season was favorable for thorough preparation of the soil. These heavy clays should be worked as deeply as possible with a cutaway disk harrow until they are thoroughly mellow, but many fields are merely scratched over with a spike-toothed harrow, while others receive a semblance of preparation from a cutaway or full disk harrow, but not a single clay field was observed which had been properly prepared for planting—in other words, a field which would not have amply repaid the cost of more effective tillage by increased crop returns.

About one-half of the corn is planted by hand in check rows, so that it may be cultivated both ways. It is the usual custom to cultivate the crop twice and to hoe it by hand at least once. Corn for the silo is dropped by horse planters, and corn harvesters rapidly coming into use. Small grain is usually sown with drills.

Hay is harvested chiefly with modern machinery, but the acreage is so large as compared with the amount of labor employed that little of it is cut as soon as ripe, and thus the quality is much impaired. Large quantities of hay are stacked in the fields, and it takes only a few years for the loss from such exposure to equal the cost of erecting a suitable hay barn.

One of the wastes observed is the almost universal custom of throwing manure from the stables into the open yard, where it accumulates in piles under the eaves. The drainage then often escapes to some near-by rivulet, and the loss entailed is enormous.

Almost no attention is paid to the rotation of crops. Corn is the chief cultivated crop, yet comparatively little of that grain is grown, hence there is little chance of rotation under the present system of farm management. The most common practice is to plow sod for oats, sowing grass seed with the oats, or else to sow oats for two years in succession, and seed with the second crop. Hay is then cut for a period rarely as short as six years, usually eight, often from ten to fifteen, and from that to fifty or even sixty years in occasional

instances, before reseeding. Many farmers never reseed as long as the land will produce sufficient hay to pay for harvesting, and instances are not rare where excellent hay land has been cropped successively until it would produce only from 500 to 800 pounds of hay per acre.

A few farmers pay some attention to crop rotation, and grow corn, followed by oats, or rarely by barley, and seed. Too much stress can not be laid upon the necessity of adopting some system of crop rotation which shall involve a reseeding at least as often as once in six years. Where possible, clover should form a part of every rotation, as the increased productivity of the soil consequent upon its production will more than offset the decreased selling price of the hay for the first two years, where the hay is to be sold instead of fed on the farm; and the yield of timothy for the third and fourth years will be materially augmented. When the hay can be fed at home the advantage to be gained is even greater, because of the greater desirability of clover as a food for stock. The popular belief that corn can not be grown successfully on the stiff soils of the area owes its origin chiefly to the fact that thorough and efficient methods of tillage have not been employed.

AGRICULTURAL CONDITIONS.

As long as the center of the Merino sheep industry of the United States was in the Champlain Valley, the farmers of this area were exceptionally prosperous. Money came so easily, however, that extravagant expenditures became the rule, and when the sheep business declined the farmers failed to readjust their methods until they had lost heavily and financial ruin was staring them in the face.

The greater part of the land was owned in large tracts by men who lived on and managed their own farms. The heavy clay soils needed thorough methods of tillage, but they made excellent sheep pastures, and so were seldom plowed.

The natural adaptation of the valley soils to the production of hay, and the steadily increasing market demand for that crop as the sheep industry declined, defined at once the channel which the agricultural activities of the valley should take, and hay has been the chief money crop for many years. Under this system the agricultural possibilities of the area have remained undeveloped, but the remarkable productivity of the soils has made it easy to get a living, so that at present the farmers are fairly prosperous.

Probably less than 50 per cent of the landowners live on and till their own farms. The owner frequently occupies the farm residence and rents the land to a tenant who lives in a tenant house located on the premises. About 50 per cent of the farms are rented outright, the

owner living elsewhere. The system of rental is quite variable, depending largely upon the amount of stock furnished by the tenant, but by the most common arrangement the tenant receives half the income and half the increase in stock. The opportunities to farm profitably are so good that the tenant, if he be a good farmer, can do well under this system.

Farms range in size from 50 to 500 acres, but there are few at either extreme. Most of them include from 200 to 250 acres. The price of land ranges from $15 to $40 an acre, but good farms with suitable buildings, on the level Vergennes clay, can be bought for $20 to $25 an acre, and at this price such farms offer to intelligent farmers unsurpassed opportunities for lucrative farming.

The scarcity of labor becomes a more serious problem each year, and this is the cause generally assigned for the renting of so many farms, and also for the absence of more intensive methods of farming. Wages range from $22 to $25 a month, with board, for eight months of the year, and not enough capable men can be obtained at this price.

The principal products are hay, butter, and cheese; while the products of lesser importance are lambs, wool, beef, pork, and apples. The hay is of excellent quality, and enormous quantities are sold. Alfalfa has been grown successfully in several places. One farmer has 4 acres on the Vergennes fine sand, and the same amount on heavy Vergennes clay. This has been mowed three times a year since the first year, when two crops were obtained. The average yearly yield, with three cuttings, has been nearly 4 tons per acre. Such experiments have demonstrated that this valuable crop may be grown on most of the soils of the area where drainage is well established, by those willing to prepare the land thoroughly and to exercise the proper precautions in the care of the crop. The seed should be sown in the spring, as soon as the soil can be put in good condition.

The principal part of the milk produced is hauled to proprietary creameries, daily during the summer and two or three times a week during the winter. It is unfortunate that so little milk is produced during the winter when prices are the highest. Until recently winter dairying was almost unheard of. It is gradually increasing, however, and many silos have been built within the last five years. The opportunities for winter dairying are unexcelled, and just as soon as the land is divided into smaller farms and more intensive methods are adopted the Champlain Valley will be able to compete successfully with any other section of the country in the production of butter. It should be said in this connection that much closer attention should be given to the improvement of dairy herds.

The undeveloped condition of the dairy interests has made necessary and advantageous the inauguration of the system of proprietary creameries, but there is much dissatisfaction with the way in which

they are managed. A cooperative creamery at Crown Point is very successful at the present time, and as the dairy interests increase the cream will undoubtedly be sold by this method, which has been so successful in many places. Some of the creameries make cheese as well as butter, but this practice seems to be decreasing.

Lambs are marketed from the last of June until September. No attempt is made to produce early lambs, and with the present methods this business could hardly be successful. Steers 2 and 3 years old are sold from the pasture late in summer. Nearly every farmer produces pork for home use and sells a few fat hogs each year.

Fruit has received little attention, but there are a few large young orchards, and interest in this industry is growing.

Little attention is paid to the adaptation of soils to crops. Hay is the principal crop on all soils which are plowed at all, and small grain usually follows for seeding. The light soils are sought for potatoes and corn.

The transportation facilities on the New York side are good, as a line of railway to New York City follows the general course of Lake Champlain the entire length of the area. In Vermont a line to Boston passes through the northeast corner of the area at Vergennes. The Addison Branch crosses the southern part of the area and connects these main lines. This leaves a large part of the section along the east side of Lake Champlain 10 miles or more from a railway.

The dirt roads on the Vergennes clay, though excellent when smooth, rut deeply when wet, and upon drying bake into clods like bricks. In this condition the roads are so rough that it is practically impossible to drive faster than a walk, and riding at that rate is very uncomfortable. Often the roads are not worn smooth before the next rain, and then the same process of gradual wearing down has to be repeated. There is an excellent opportunity for the building of an electric railway, if a freight-carrying franchise were secured, to extend from Vergennes through Panton, Bridport, Shoreham, and Orwell to the south, and its construction would be of inestimable benefit to the agricultural interests of the valley.

On the Vermont side Boston is the principal market for hay, cattle, sheep, butter, and cheese, though the latter two are shipped also to Portland, Me., Providence, R. I., and Springfield, Mass. Hay and cattle are shipped also to New York, Springfield, Mass., and Hartford, Conn. On the New York side nearly all products are shipped to Albany, Troy, and New York City.

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