SOIL SURVEY OF THE SALEM AREA, OREGON.

By CHARLES A. JENSEN.

LOCATION AND BOUNDARIES OF THE AREA.

The Willamette Valley is located in the northwestern part of the State, extending from Portland on the north to some distance beyond Eugene on the south, a distance of between 130 and 140 miles. It is traversed by the Willamette River. The valley is bounded on the east by the Cascade Mountains and on the west by the Coast Range.

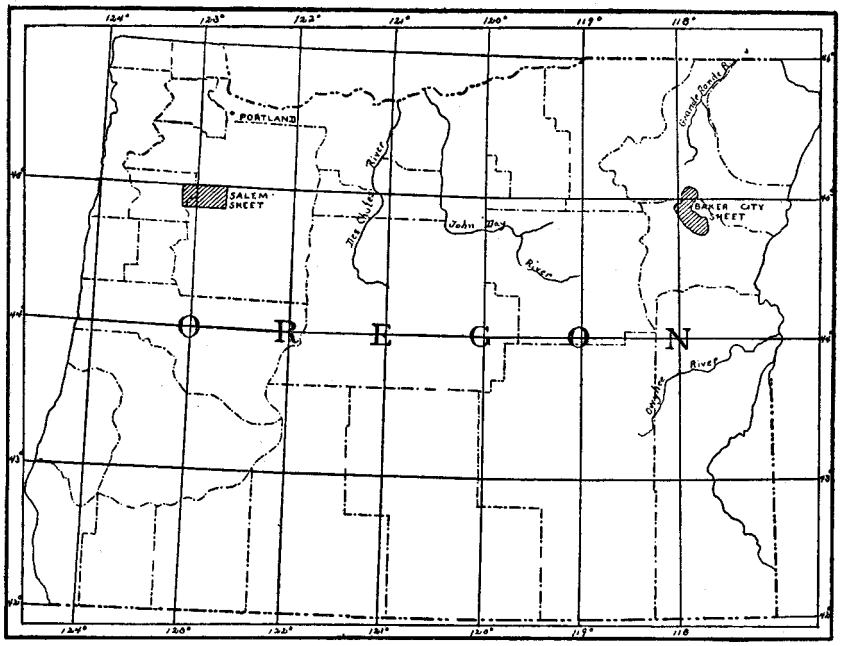

FIG. 57.—Sketch map showing location of the Salem area, Oregon.

The area surveyed comprises a rectangle of eight townships, two north and south and four east and west, containing 284 square miles, or 181,824 acres, and includes a part of Marion and Polk counties. The center of the area is about north latitude 44° 50′ and west longitude 123° Salem, the capital of the State, is included within the area.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The first settlement in Oregon was made at Astoria, at the mouth of the Columbia River, in 1811. The first settlers supported themselves

by fishing and fur trading, meanwhile fighting the Indians. Astoria was founded by fur companies, and fur trading was the principal industry for a number of years, and was confined to the region along the Columbia River and the coast. Not until many years after the first settlement was the interior sufficiently explored to encourage agricultural settlers to make their homes there.

Originally the Territory of Oregon was considerably larger than the present boundaries of the State, including all the country north of latitude 42°—the present southern boundary of the State—and west of the Rockies, comprising the present States of Oregon, Washington, and Idaho and parts of Wyoming and Montana. The population of all this territory was but 13,294 in 1850. Territorial government was granted Oregon in 1848, and in 1859 the State was admitted into the Union.

A Methodist mission was established on the present site of Salem in 1839, and the town of Salem was incorporated in 1843 and was shortly thereafter selected as the capital.

With but thirteen settlements in the Territory in 1838, which included the large area above mentioned, and with a population of but little more than 13,000 in 1850, it must be seen that the building up of the State went on very rapidly after a start had been made, the population in 1900 being about 413,000.

The mild winters and the luxuriant growth of grass in the hills were early incentives to stock raising, which was the pursuit mostly followed by the first settlers. This was supplemented to a small extent by farming.

As usual in the pioneer life of the West, the search for mineral treasures was one of the motives for exploration of the State. Oregon is not, however, important as a mineral-producing State.

CLIMATE.

The climate of that part of the Willamette Valley surveyed is humid, though the summer months are comparatively dry. The annual normal precipitation at Salem is 45.18 inches. Of this, only 4.34 inches fall during the months of June, July, August, and September. As the heavier rainfall occurs during winter and early spring, crops during their growing season are well supplied with moisture. This, together with the moisture-retaining capacity of the soils—especially the "prairie" soil—insures sufficient moisture for plant growth.

Great variation is shown in the date of the last killing frost in spring. At Salem it has varied from March 24 to June 6, since 1893. The climate is greatly influenced by the Cascade Mountains, which often receive considerable snow during the winter, thus causing late and cold spring seasons in the valley. This probably accounts for

monthly killing frosts at Silverton for a number of years. This town is located about 2 miles north of the northeast corner of the area surveyed, being considerably nearer the mountains than Salem. These late frosts have sometimes done considerable damage to fruit.

The winds are light in the valley, very seldom causing any trouble. The hills and the large amount of growing timber on these and on the prairie lands furnish admirable natural wind-breaks for orchards.

Normal monthly and annual temperature and precipitation.

Month.	Falls City.		Monmouth.		Salem.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	° *F.*	*Inches.*	° *F.*	*Inches.*	° *F.*	*Inches.*
January	39.9	9.59	40.4	4.16	40.7	6.15
February	40.8	11.23	42.5	4.25	42.9	4.17
March	45.0	6.56	45.7	4.25	45.8	4.61
April	49.1	5.03	51.6	3.06	49.8	4.07
May	52.8	2.82	58.0	2.20	55.9	3.42
June	58.7	2.04	63.6	1.19	61.3	1.47
July	63.7	.38	70.2	.23	65.7	.28
August	62.2	1.24	69.6	.47	65.9	.65
September	60.2	2.85	60.9	1.52	60.1	1.94
October	50.0	5.23	51.3	3.16	52.3	3.62
November	45.4	19.59	45.3	8.55	47.4	8.18
December	39.3	14.04	41.5	7.02	42.5	6.62
Year	50.6	80.60	53.4	40.06	52.5	45.18

Dates of latest and earliest killing frosts.

Year.	Salem.		Silverton.	
	Last in spring.	First in fall.	Last in spring.	First in fall.
1893	April 17	October 13	(*a*)	(*a*)
1894	May 9	October 11	(*a*)	(*a*)
1895			(*a*)	(*a*)
1896	April 15	November 20	(*a*)	(*a*)
1897	March 30	October 15	(*a*)	(*a*)
1898	April 19	November 12	(*a*)	(*a*)
1899	June 6	October 13	(*a*)	(*a*)
1900	April 15	October 13	February 17	November 20.
1901	March 24	December 12	February 21	December 12.

a Temperature fell to 30° F. every month in the year.

PHYSIOGRAPHY AND GEOLOGY.

The Cascade and Coast ranges are geologically recent, and the valley itself more recent than either.[a] The Cascade Mountains appeared at the close of the Cretaceous period and, together with the Sierra Nevada, formed a sea dike which shut in an enormous lake on the east with the

[a] The Two Islands—Prof. Condon.

Blue Mountains as an island. Siskiyou Mountains in southern Oregon were formed at the same time—Jurassic—as the Blue Mountains, and these mountains, then islands, were the first land areas in the west. At the beginning of Tertiary time—Eocene—the Coast Range was elevated above the sea, forming an immense bay between this and the Cascade range to the east, which extended from the Siskiyou Mountains on the south to considerably beyond the present mouth of the Columbia River on the north. This bay formed, geologically, the outline of the Willamette Valley, and remained in this state through the middle Tertiary period. In the Pliocene period the valley was freed of its water and became exposed land, but was again submerged during the Champlain period, when John Day Lake and its sister lakes were formed in the northwest.

The Eocene and Miocene beds are very fossiliferous, containing both land and water species, which indisputably attest the ages of the rocks.

The rocks from which the soils were formed—the weathering of which presumably took place during the Miocene period—consist of sandstone, argillaceous and schistose rocks, and a close-grained, heavy bluish basalt, the latter having been intruded during the extensive northwest lava flows and volcanic eruptions. These lava flows are more recent than the rocks, which are often found capped by basalt. A comparatively large proportion of iron is contained in the basalt, and there is also considerable iron in the sandstone, which causes the characteristic red color of the soils on the hills.

While geologically the Willamette Valley extends from the Cascades on the east to the Coast Range on the west, physiographically this is hardly so. The valley proper is comparatively narrow, consisting of a level area which varies in width from a few rods to 13 miles in the area surveyed. Beyond this level area, which extends along the Willamette River, is a series of hills, varying in height from about 50 feet to probably 400 or 500 feet. The extreme altitude in the area surveyed probably does not exceed 800 or 1,000 feet. The altitude at Salem is about 200 feet. These hills occasionally reach to the river, cutting off entirely the level country along the stream.

Willamette River and Mill Creek undoubtedly occupied the entire level areas along their respective courses in earlier times, and these areas have since been filled up to their present level with soil transported from the hills.

The slopes of the hills are generally not too great for cultivation, excepting the front slopes facing the level valley and those along the creek channels. Outcrops of basalt and, more rarely, sandstone often occur on the slopes of the creek channels, but generally speaking the hills themselves are quite free from rocks.

SOILS.

But four types of soil were recognized in the area, viz, Salem loam, Salem clay, Salem gravelly loam, and Salem sandy loam. The following table shows the absolute and relative extent of these soils:

Areas of different soils.

Soil.	Acres.	Per cent.
Salem clay	86,400	47.5
Salem loam	78,656	43.3
Salem gravelly loam	13,120	7.2
Salem sandy loam	3,648	2.0
Total	181,824	.....

SALEM LOAM.

The surface soil of the Salem loam consists of from 18 to 24 inches of brown to black loam, the color at the surface being darker on account of the presence of considerable organic matter. The surface foot is often very silty. From a depth of 18 or 24 inches down to 3 feet the soil is a yellowish or red clay loam or clay, the texture becoming heavier with the depth. The third foot is often mottled gray and yellow. This type occupies the level areas of the valley and generally extends some distance up the slopes of the hills. Its topography is level or gently rolling. The native forest growth is mainly oak and Douglas spruce, with some ash, birch, and alder. The soil is formed almost entirely from the transported material brought down from the hills by rains and flood streams. The original materials from which the soil is formed are a close-grained basalt, and to some extent sandstone and schist. The soil is easily tilled, but if cultivated while too wet it forms a hard crust.

A few areas occur as lowlands or badly drained areas, in which the subsoil is invariably yellow or gray and usually clayey in texture. These areas occur usually in swales or along natural depressions which receive the underdrainage from the higher lying lands. The soil in such places is only a phase of the type proper, there being not sufficient difference to warrant its classification as a new type.

As would naturally be expected, the dissolved organic matter sinks into the ground more readily in these low places, causing deoxidation of the large amounts of ferric oxides in the type proper and giving rise to the yellow or gray color of the subsoil. Where some of these areas have been drained the color of the subsoil is the typical red.

These areas need artificial drainage and in most cases this can be supplied with comparative ease. In their present state they have but little agricultural value and are generally used for pasturage.

The Salem loam is well adapted to hops, grain, and small fruits. Fifteen hundred pounds of hops per acre is considered a fair yield, while wheat produces from 25 to 30 bushels, and oats from 35 to 60 bushels per acre. It would also seem to be a good celery soil.

The following table gives mechanical analyses of this type of soil:

Mechanical analyses of Salem loam.

No.	Locality.	Description.	Organic matter.	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.*
8617	S. cen. sec. 8, T. 7 S., R. 2 W.	Loam, 0 to 18 inches.	3.25	0.24	1.30	1.10	2.50	14.70	57.20	22.22
8619	¼ N. of cen. sec. 30, T. 8 S., R. 4 W.	Loam, 0 to 18 inches.	3.52	.40	.90	.50	1.10	1.90	66.58	28.10
8618	Subsoil of 8617.....	Light clay, 24 to 36 inches.	.62	.00	.48	.66	1.38	13.18	62.28	21.14
8620	Subsoil of 8619.....	Clay, 24 to 36 inches.	.93	.30	.74	.54	.94	2.14	69.22	25.88

SALEM CLAY.

The Salem clay consists of from 12 to 15 inches of reddish-yellow loam, underlain to 3 feet by a clay loam or clay of the same color. The reddish-yellow color even extends into the partially decomposed underlying rocks from which the soil is derived.

The type is located on both sides of the "prairie" or level valley soil (Salem loam) and consists of a series of rolling hills, which vary in height from about 50 feet to 400 or 500 feet. The front slopes of these hills, that is, the slopes facing the level lands, are often too steep for cultivation, as are also the creek-channel slopes, but in the hill area itself the slopes are rarely too steep for agricultural purposes. Very rarely is a level area found in this type. Rock outcrops often occur on the steeper slopes and those along the creek channels, but elsewhere they are not common, and such as do occur are not of sufficient extent seriously to interfere with cultivation. These rolling hills are intersected by many creeks, both perennial and intermittent.

With the exception of a few low-lying areas along creek channels this type is well drained. It has been formed in situ from the decomposition and weathering of the underlying sandstone, argillaceous, and schistose rocks, and a dense, close-grained basalt. All the exposed rocks on which the weathering effect could be noticed were found to contain a large amount of iron, and a magnet could be quickly covered with soil particles any place along the road. Often beds of iron

oxides were noticed in wheel ruts after rains, and the universal red color of these soils is due to the presence of this mineral. It nearly always shows itself in crevices and joints, where weathering first begins.

Washing and gullying of the soil and the leaching away of plant food are very effectively prevented by the native forest growth of Douglas spruce, oak, maple, and alder, and the dense growth of underbrush, grass, and fern. The Douglas spruce is the predominating tree in the forests.

The crops grown on this soil type are wheat, oats, tree fruits—such as apples, prunes, and peaches—and hops. The latter are grown to a limited extent, and the crop is not so common on this soil as on the "prairie" and river bottom lands. The quality, however, is usually superior to that of the hops grown on the lower lying soils. Hops grown on these red hills are not subject to mold or to attacks from insect enemies to such an extent as they are on the soils at lower elevations. On the other hand, the reddish yellow loam does not produce as large yields nor quite so large a hop as does the sandy loam along the river. When, however, it is considered that sometimes an entire crop on the river soils is destroyed by mold, and that in any event they have to be picked while yet green, there does not appear to be much advantage in hop growing on the sandy loam.

A better quality of grain, especially of wheat, it is claimed, can be produced on the Salem clay than on the "prairie" soil. Prunes, the special fruit crop in the valley, do better on this type than on the Salem loam. A very fair price has hitherto been obtained for this fruit, and many orchards have been set out.

The average yields of wheat and oats are said to be from 25 to 30 bushels and from 30 to 60 bushels per acre, respectively, when the soil is in good condition. Hops average about 1,200 pounds per acre. The net profit for fruit is stated to be from $50 to $70 an acre.

The following table gives mechanical analyses of this soil:

Mechanical analyses of Salem clay.

No.	Locality.	Description.	Organic matter.	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.*
8621	NE. cor. sec. 2, T. 8 S., R. 2 W.	Heavy loam, 0 to 18 inches.	2.80	2.40	5.14	3.24	8.24	9.84	26.20	44.80
8622	Subsoil of 8621.....	Clay, 18 to 36 inches.	1.29	2.20	4.48	3.28	7.78	9.36	24.20	48.68

SALEM GRAVELLY LOAM.

The soil of the Salem gravelly loam consists of black or brown loam of the same character as the Salem loam, intermixed with gravel varying in size from fine gravel to stones 2 or 3 inches in diameter. The gravelly loam varies in depth from a few inches to several feet, the gravel content increasing in the lower depths and the whole resting on a bed of waterworn gravel. The type is located on Mill Creek, forming a strip a little more than a mile wide along that stream. Occasional small areas adjoining the creek consist entirely of gravel, being merely a river wash, but with these exceptions the soil is of considerable value.

The area is level and is intersected by an occasional water channel. Some portions of the type, near the creek and small channels, are poorly drained, but as a general thing the natural drainage is good.

The origin of the loam of this type is the same as that of the Salem loam—transportation of soil from the higher lying lands by rain and flood streams—while the gravel has been carried in by the creek, which formerly occupied a much larger area than it does now.

The natural growth is scrub oak, birch, alder, and underbrush. Where not too gravelly the soil is adapted to grain and fruit and large areas are used as pasture.

SALEM SANDY LOAM.

The Salem sandy loam consists of about 12 inches of medium-textured brown sandy loam, underlain to a depth of 3 feet by a coarse sandy loam which usually grades into sand and gravel. The surface foot generally contains considerable organic matter. This soil type occupies the lower, overflowed areas along the river. The areas are level and are intersected by a few shallow channels which generally expose the underlying gravel. Gravel rarely reaches the surface in other places. This type is well drained when the river is down to its normal stage, but during high water the areas are sometimes flooded to a depth of several feet. This is also the case with the Salem loam, which occupies much of the river bottom land. Owing to the porous nature of the sandy loam, together with the underlying gravel bed, the flooded areas soon drain off and dry. The type owes its origin to river deposit during high water. The native growth consists of Douglas spruce, oak, heavy underbrush, and grass.

This type forms the best truck soil in the area, to which use it is put to a small extent, but the principal crop grown on it is hops. Some grain is also raised. By far the heaviest yields of hops are obtained on this type, but unfortunately the hops and vines are more subject to disease on this type than on any other in the area. The frequent fogs along the river cause considerable trouble by producing a mold which seriously affects the quality of the crop and sometimes even completely destroys it. Usually, too, the crop must be picked

before the hops are entirely ripe. Insect enemies are more numerous here than elsewhere. The latest to become plentiful enough to endanger the industry is a worm which bores into the roots about 6 inches below the surface, causing either the entire loss of the vine or at best the crop for that year. As high as 3,000 pounds of hops per acre are claimed for the sandy loam, but the average yield is considerably less. On account of the good prices obtained during the last five years, and especially in 1902–3, a large number of hop yards have been set out in the area surveyed.

The following table gives mechanical analyses of this soil type:

Mechanical analyses of Salem sandy loam.

No.	Locality.	Description.	Organic matter.	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.*
8615	Cen. sec. 11, T. 8 S., R. 4 W.	Sandy loam, 0 to 12 inches.	1.81	0.10	0.58	4.08	47.18	19.48	16.30	12.76
8616	Subsoil of 8615.....	Coarse sandy loam, 12 to 36 inches.	.78	.00	.10	1.44	44.38	27.72	14.96	11.38

AGRICULTURAL METHODS.

The original growth on much of the soil types in the area surveyed consisted of Douglas spruce, oak, alder, and heavy underbrush, the clearing of which necessitated considerable work. The timber areas are usually pastured, and while this is not relied upon for clearing away the underbrush preparatory to clearing, it reduces the labor considerably. The timber after being felled is cut into posts, cord wood, or poles, according to kind and size. On many of these areas the stumps are left standing for a number of years, awaiting the slow process of decay, and the land is pastured in the meantime. This requires six to eight years for Douglas spruce from 8 to 12 inches in diameter. For larger stumps dynamite is used. This method of clearing is slow, and when the land is to be cropped as soon as possible the stumps are grubbed and pulled. Little or no stump-pulling machinery is used. The land thus cleared, both in the case of the hill soils and of the prairie soils, is in a very good condition, both mechanically and chemically, and yields excellent crops.

The practice of planting one crop on the same piece of land year after year is much too common in the Salem area. The writer was shown many fields which had been sown to wheat or oats for from ten to twenty years, with no alternation of crops and no rest except an occasional summer fallowing. This continued growing of one crop tends to deteriorate the soils and to decrease the yields.

The soils of the area, especially the Salem clay and Salem loam, are well adapted to the production of the cereals. When the yields show considerable decrease the usual practice is to let the land lie fallow for a season. In fact, it seems that about half of the land under cultivation is in this condition. The land is then planted to grain crops. It is admitted that summer fallowing brings better yields immediately afterwards. The gain, however, is more than offset by the losses in having the land entirely idle during the whole year, bringing no return on the investment, in the washing of hilly areas, which is necessarily considerable on the steep slopes of the hill soils in a region where the normal annual rainfall is 45 inches, and in the depleting of organic matter and humus.

A good system of rotation would greatly improve these conditions. Different plants have different feeding depths, and exert different influences on the soil constituents. Rotation promotes the destruction of weeds and checks the increase of insect enemies, and is the means of greatly improving the physical condition of heavy or poorly cultivated soils. The soils in the area, especially the red hill soils, are in need of such improvement. Cereals, cultivated crops, humus-producing and humus-consuming crops could be so alternated that summer fallowing could be done away with.

Clover would be an excellent crop for the red hill soils, though it is claimed that the crop can not be grown on these soils. As the crop has not been given a fair trial, this conclusion is premature. In the first place the soil should be given a deep plowing, in fact subsoiled, in order to break up and bring to the surface the heavy, close-textured subsoil which has been formed by continued shallow plowing. A clover—Mammoth would probably be suited to the climate—could be sown with spring grain, thereby avoiding a year's loss of the land. As clover will not do well without the presence of the nitrifying bacteria, it would pay even to inoculate small portions of a field with soil from a clover field on the "prairie" land, where clover does well, provided these bacteria are not present in the red hill soils. Red clover, Mammoth clover, Alsike clover, vetch, and field peas are all excellent for such a soil. The clovers are especially good for improving the physical condition of the soil, and all of the leguminous crops are well known for their assimilation of atmospheric nitrogen, through which process they greatly enrich the soil with this valuable constituent. As these hill soils are well drained—a requisite for good stands of clover—there ought to be little difficulty in keeping leguminous crops in good condition, once they are well started.

What has been said about summer fallowing and the consequent condition of the soil applies, though to a less extent, to the well-cultivated orchards. These are absolutely bare during the whole year, and are subject to extensive washing during the fall and winter. There can be little doubt that winter cover crops would be beneficial to the

orchards if sown during late summer or early fall. They would check the late growth of the trees in the fall, causing them to mature earlier and to be in better condition for the winter, while the loss of organic matter by rain wash would be greatly checked. They would also improve the moisture-holding capacity of the soil by the incorporation of additional organic matter. If the crop proved large in old apple orchards it could be pastured during late fall and winter, in which case little would be taken from the soil, but in plum or peach orchards or young orchards of any kind pasturing is impracticable. Cover crops would need to be plowed under in the spring, and this should be done at such a time as to keep the growth of the trees checked until danger of late frosts is past. Clover, vetch, winter rye, field peas, buckwheat, etc., are all good crops for this purpose. Of course the practice of cover-cropping orchards in winter should be carried on with sufficient moderation to prevent excessive accumulation of organic matter in the soil, which has a tendency to unduly develop the woody portion of the tree at the expense of the fruit.

It is not the purpose of the writer to detract from the importance of keeping the orchards well cultivated during spring and summer, which is absolutely necessary in order to keep the trees in the best condition for fruiting. Especially is this important during the first few years of the life of the tree, in order to encourage deep rooting. During this early period of growth tuber and root crops can well be grown as secondary crops.

AGRICULTURAL CONDITIONS.

Generally speaking, the farmers of the area are energetic, thrifty, and prosperous. They have a good idea of the value of things, and it is seldom one sees farm implements standing about exposed to the weather. Fairly good houses and farmyard buildings are seen, and the community in general appears to be prosperous.

The greater number of the farms are operated by their owners, a few are run by managers, and a few are rented. No statistics by counties were available, but 82.2 per cent of the farms of the State are operated by the owners. A few Chinese carry on truck growing, and some also own and successfully operate hop and fruit farms. A few Indians and negroes also are engaged in agriculture in the area surveyed.

The average size of farms in Marion County, in which most of the area surveyed is located, is 144 acres; while the average size in Polk County is 216 acres. This, however, includes both improved and unimproved land. For improved land the average is 72 acres for Marion County and 106 acres for Polk County, the balance being mostly timber land, including a little waste or worthless land. There are in Marion County 2,754 farms, and in Polk County 1,192, practically all of which have buildings on them. There has been a heavy

immigration to northwest Oregon during the last year or two, and this will quickly increase the area of improved land, as the immigrants consist chiefly of the farming class.

There is a good demand for timber, mainly spruce, in the form of cordwood, as that is practically the only fuel used in northwestern Oregon. It is used by all the public institutions as well as by private families, and the Southern Pacific uses it altogether on its engines in Oregon. The price of second-growth spruce cut into cordwood 4 feet long is from $3 to $3.50 a cord; original growth, from $3.25 to $4.50, and oak about 50 cents a cord more than spruce. Some lumber is cut in the area surveyed.

These timber areas are of value not only for the wood but also for pasturage, and most of the farmers have small flocks of sheep or goats. The raising of mohair is quite a local industry, and considerable capital is invested in it. Small herds of dairy cattle are also common.

The price of land depends, of course, on whether it is improved or not, that is, whether it is cleared of timber. The "prairie" soil, as the Salem loam is locally called, brings from $25 to $50 an acre if improved, while the hill soils are held at practically the same price, if the land is not very rough, although owing to steep slopes, rock outcrops, etc., the average price for the latter is less than for the Salem loam. Bushy and uncleared land brings from $10 to $14 an acre.

The valley is well known for the excellent quality of its farm products, especially wheat, apples, and prunes. The hops are of fairly good quality, and those grown on the higher lying lands, away from the direct influence of the river, are of exceptional quality.

The adaptation of soils to crops is quite well recognized, as much or perhaps more than is the case in most agricultural communities, though it seems probable that hops could be more generally grown on the red hills than at present.

Transportation facilities are good—that is, there are many railroad stations convenient for the farmers. The wagon roads are, however, by no means good, and especially is this true of the roads in the hill country. Practically no gravel is used, and the soil in the "prairie" country soon cuts up badly, while in the hills poor grades and rock outcrops cause trouble. Three lines of the Southern Pacific Railroad system traverse the area surveyed, running north and south, the main overland line passing through Salem and one running east and another west of that place. These lines all run directly to Portland, 50 miles north of Salem, and as it is a central market and large distributing point both by water and rail, the farmers get good net prices for their products. The Willamette River, on the bank of which Salem is situated, is navigable as far south as Corvallis, furnishing good local transportation facilities. Daily steamers run between Portland and Corvallis.

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