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ALASKA AGRICULTURAL EXPERIMENT STATIONS,

C. C. GEORGESON, SPECIAL AGENT IN CHARGE.

BULLETIN No. 1.

SUGGESTIONS

TO

PIONEER FARMERS IN ALASKA.

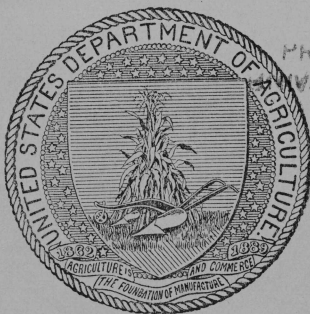
BY

C. C. GEORGESON,

UNDER THE SUPERVISION OF

OFFICE OF EXPERIMENT STATIONS,

U. S. DEPARTMENT OF AGRICULTURE.



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**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA, KENAI,  
AND RAMPART.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations,  
United States Department of Agriculture.]

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
OFFICE OF EXPERIMENT STATIONS,  
*Washington, D. C., April 25, 1902.*

SIR: I have the honor to transmit herewith for publication a bulletin containing some suggestions to pioneer farmers in Alaska, prepared by Prof. C. C. Georgeson, special agent in charge of Alaska investigations. The bulletin is devoted mainly to a discussion of the preliminary operations of selecting and preparing land for cultivation under Alaska conditions, indicating briefly the kinds of crops which have been found to succeed in Alaska and the methods of manuring which may be used with advantage in certain cases. The advice given is based upon the results of investigations carried on in the Territory since 1898, and it is believed that it will prove timely and useful to the increasing number of persons who are undertaking the home production of some of the necessities of life in Alaska.

Very respectfully,

A. C. TRUE,  
*Director.*

Hon. JAMES WILSON,  
*Secretary of Agriculture.*

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# SUGGESTIONS TO PIONEER FARMERS IN ALASKA.

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## INTRODUCTION.

A study of the agricultural resources and capabilities of Alaska was begun under authority of Congress in 1898. Results of the earlier preliminary surveys seemed to justify the continuation and extension of the work and its establishment on a more definite and permanent basis. This has been carried out by the organization of a system of stations for observation and experiment at different points in the Territory which seem best adapted to the purposes in view. Stations have now been established at Sitka (the headquarters), Kenai, and Rampart on the Yukon. Five reports giving the results of the agricultural investigations in Alaska have been issued as Congressional documents and bulletins of the Office of Experiment Stations, U. S. Department of Agriculture.

Those who have received these reports and who have noted the letters which are published in them from settlers in nearly all parts of the territory south of the Arctic Circle can doubt no longer that Alaska has agricultural possibilities. These letters bear testimony that hardy vegetables have been grown with marked success almost everywhere in Alaska where they have been tried, and that, likewise, early maturing grains have been grown successfully in many places (Pls. I and II). Potatoes, cauliflower, cabbage, kale, peas, lettuce, turnips, ruta-bagas, and radishes have been grown at nearly every white settlement in the coast region and in many places in the interior (Pls. III and IV). Early maturing varieties of barley, oats, and spring wheat have yielded well at Dawson, in the Yukon territory, and at Eagle, Alaska, near the Canadian boundary. At Rampart, on the sixty-fifth parallel, a station was established by the Department of Agriculture in the summer of 1900. Winter rye seeded there in August of that year lived through the winter under a good covering of snow; although the temperature fell to 70 degrees below zero, it came out in the spring in perfect condition and matured grain by the 1st of August, 1901. Barley seeded at this station in May was ripe by the middle of August. At the headquarters station, at Sitka, spring wheat has

matured with good results for three years past, and barley and oats have been grown there for four years. These grains have likewise been grown successfully at the experiment station at Kenai, on Kenai Peninsula. Barley, oats, and wheat have prospered well at Copper Center, in the Copper River country, and oats have been grown to maturity on Steele Creek, a tributary of the Fortymile, in latitude 64°. Oats and barley have been matured at Skagway; Killisnoo, on the coast, and at Selkirk, on the Upper Yukon.

The reports referred to give data from many other parts of the Territory which are proof that it is possible to farm successfully in Alaska if one understands the conditions and proceeds in his methods of work in accordance with the teachings of experience in Alaska.

The pioneer who comes to Alaska to farm often finds that it is not safe to follow the customs with which he is familiar in regions farther south. The season is shorter than it is in the States and he must, in order to insure success, select early maturing varieties of both vegetables and grains. In the coast region the climate is wet and the soil is often water-logged, making drainage necessary in many places.

Again, the pioneer soon learns that new soil, which contains more or less vegetable matter, does not yield satisfactory crops until it has been cultivated for two or three years. When he sows good seed on what appears to be rich soil, and the crop makes only an indifferent growth, he is apt to blame the climate for the result, when, as a matter of fact, the partial failure is due, in most cases, to the condition of the soil and not to the climate. These peculiarities in Alaska should be well understood at the outset, and it is chiefly to point out the causes of failure to those who have had little or no experience in Alaska, and to call attention to practical methods of doing the work, that these suggestions are offered.

#### CLEARING LAND.

The first step toward reclaiming a farm in Alaska, as elsewhere, consists in clearing and breaking the land. Desirable meadow land can be found usually in almost any region outside of southeastern Alaska, and even in the latter region there are in many places fine meadows which can be used for farming purposes. Wherever grass grows abundantly there is of course little or no timber, and clearing is therefore not required. Usually there is more or less moss on the ground, which must be removed (Pl. V, fig. 1). The moss can be disposed of in a number of ways. The simplest, cheapest, and therefore the most practicable method whenever it can be adopted, is to burn it off during the months of June and July. The rainfall is generally scanty during that period, and for several weeks the moss may be dry enough to burn. Adequate precautions should be taken against the spreading of the fire to the woods, but when such precautions are

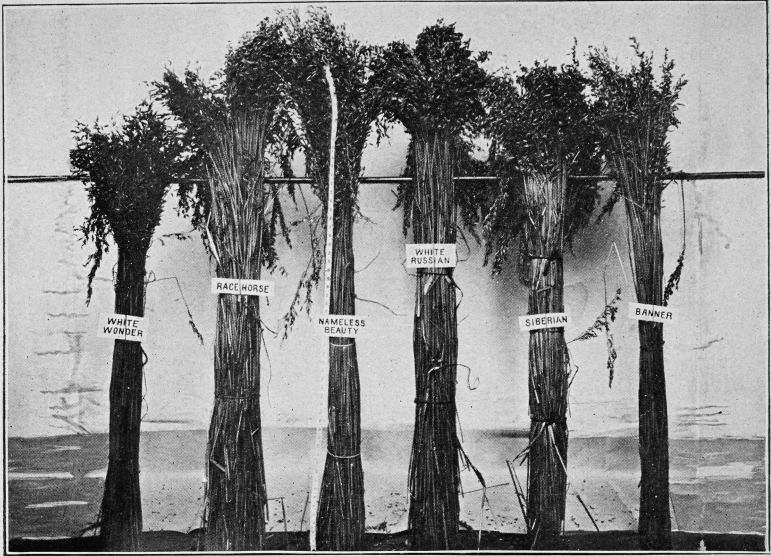


FIG. 1.—OATS GROWN AT SITKA, 1899.

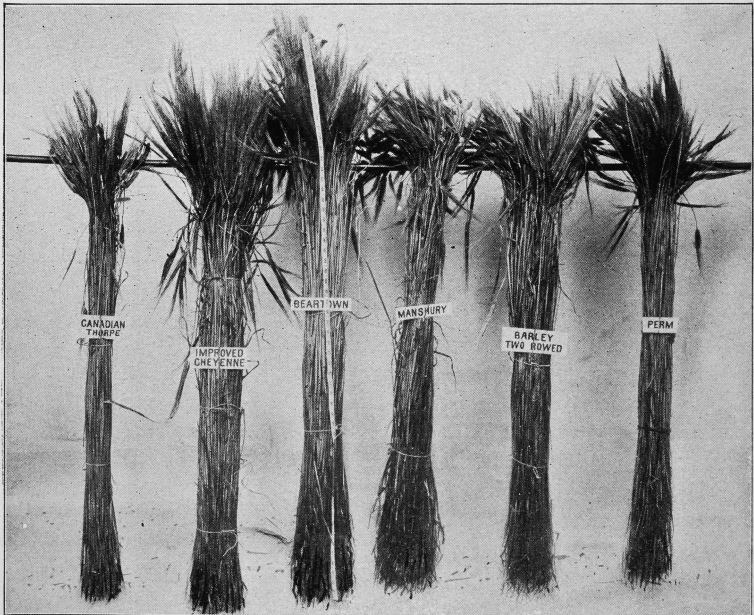
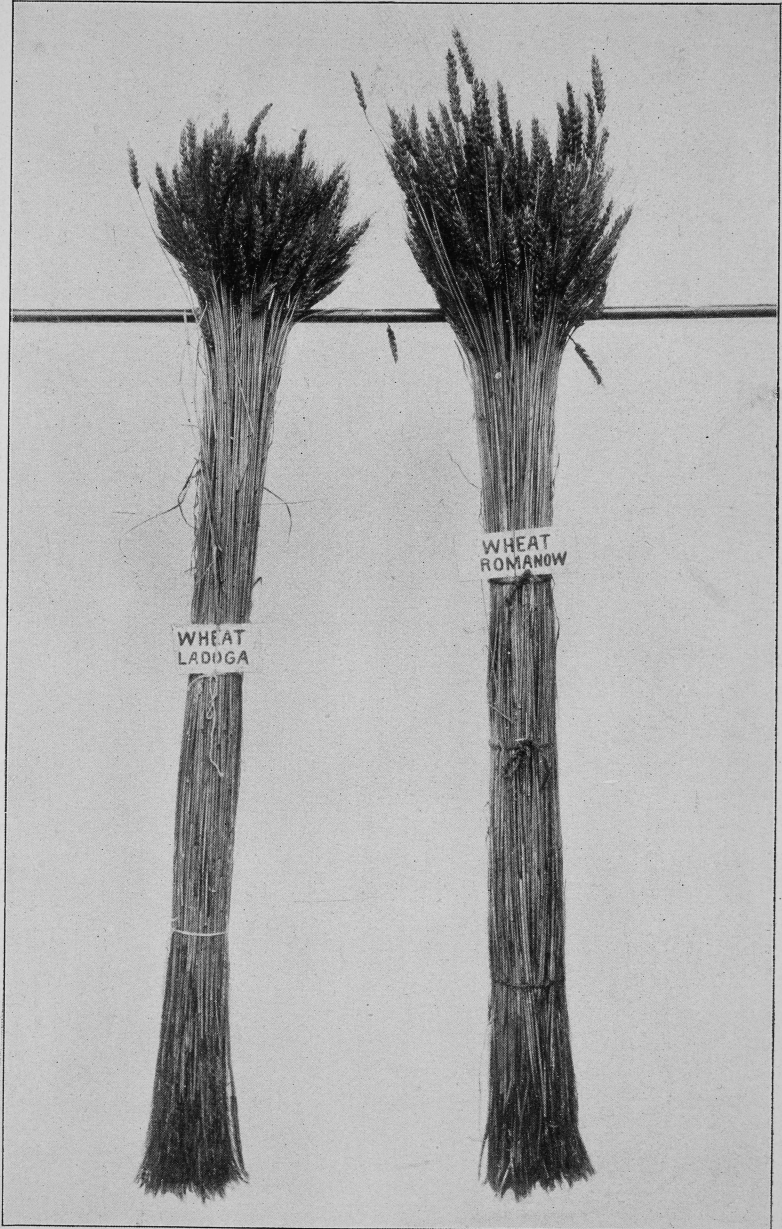


FIG. 2.—BARLEY GROWN AT SITKA, 1899.





SPRING WHEAT GROWN AT SITKA, 1899.

taken the moss can be successfully burned, at least in patches, and if the burning is well done the ground will be left ready for the plow. This is the simplest plan.

When the moss does not get dry enough to burn it must be torn up, either by hand or by the use of the prairie plow run shallow. In the majority of cases the pioneer starts his farming operations with a garden patch, and gradually extends the area under culture as he finds it profitable to do so. He will, therefore, generally do the clearing by hand. We have found at the experiment stations that a large hoe about a foot square, edged with steel and kept sharp, is perhaps as convenient and practical an implement as can be devised. This type of hoe can not be purchased in implement houses, but any blacksmith can make one. Its size makes it heavy, but its weight is an advantage in that it can be driven under the coat of moss with considerable force. The moss thus cut loose can be thrown into small windrows with a pitchfork and burned as soon as it gets dry enough. In southeastern Alaska this work should always be done early in summer so as to give the moss a chance to dry out and burn before the fall rains set in. In other regions of the Territory, where the rainfall is less, the difficulties in burning it are not so great. If the windrows are made too large only the sods on top will burn, as we have learned from experience, and more labor is involved in turning the moist sod to the surface to dry out.

When the clearing is done on a scale which shall justify the employment of a breaking plow, a 16-inch sod plow is the simplest and most convenient implement to use. The share should be kept very sharp, and it is not desirable to turn the sod completely over unless the coat of moss is so thin that it will rot in the ground readily. This is seldom the case. The better plan is to set the sod on edge as nearly as possible in order that it may dry out more quickly, and when dry burn it as before.

Where there are bushes and undergrowth in addition to the moss, which require removal, a cheap and efficient method will generally suggest itself to the practical farmer. On a small scale use the grubbing hoe and ax. When a yoke of oxen is employed many of these bushes and small trees can be pulled out readily by the use of a chain and grappling hook. For the removal of medium-sized stumps we have found the following device efficient (Pl. V, fig. 2). It is exceedingly simple, and consists of two triple blocks and about 300 feet of 1-inch rope. If the timber has not been cut, or if the stumps have been cut a yard or more high, attach a long chain to the stump or tree some distance above the ground so as to afford leverage. Hook one of the triple blocks to this chain and anchor the other triple block in the tackle to a solid stump or tree within convenient reach, then hitch a yoke of oxen to the loose end of the rope and drive up

slowly. The stump or tree, if not too large, can usually be pulled out without much difficulty. If the stumps are too large to be pulled by this method, the device can be made still more efficient by the following addition: Make a solid triangle of 4 by 6 inch scantling in the form of the letter A and about 6 feet high. The two sides should be securely bolted together at the top. If the ground is soft where it is to be used, the base should be placed on a stout plank some 6 feet long; then instead of applying the power to the trunk or the top of the stump, as the case may be, apply it to a stout root on the further side of the stump. Place the "A" in a leaning position against the stump and on the side opposite from the place where the hook is attached to the root. Secure the chain to the top of the "A" so that when the team begins to pull the "A" will be raised gradually to a perpendicular position, and at the same time tilt the stump over. We have found this a very efficient method of pulling stumps at the experiment stations, both at Sitka and Kenai. The device is quite simple, and it is hoped that the foregoing brief description has made it clear. It is at the same time so inexpensive as to commend itself.

There are, of course, very powerful and much more effective stump pullers on the market, but they are, in most cases, too costly for the means of the average pioneer; although, of course, it must be admitted that there are situations in which a more powerful, though more expensive, machine would be cheaper in the end. We have tried a hand stump puller, but did not find it a success. A machine that is strong enough to be equal to the pulling of a stump is cumbersome to move from stump to stump, and when the labor and time required to move it are considered there is little or no gain in its use over and above the digging of the stump by hand. Moreover, it is useless except for quite small stumps. Of course large stumps can not be pulled by the device here described, but it is rarely the case that one wants to make a farm where very large stumps are found.

#### DRAINAGE.

In the coast region, and particularly in southeastern Alaska, where the rainfall is heavy, we have found that drainage is necessary to put the soil in proper condition for cultivation. There are, of course, many exceptions. In sandy or gravelly soil, which admits of free percolation of the water, drainage will be unnecessary. Hillsides and other high-lying ground will, likewise, seldom require drainage, unless these lands be of a peaty formation. It is often the case that the depressions between small knolls will require drainage. If they are of a peaty formation they always do, and suitable ground of more than a few acres in extent which does not contain more or less land of a sharply rolling nature is seldom found in southeastern Alaska.

The simplest drain which can be constructed is an open ditch. In



A VEGETABLE GARDEN AT SITKA.



KLONDIKE-GROWN VEGETABLES.

many places a single ditch may suffice to drain a piece of moist ground which would be too wet for culture without such drainage, but it is not desirable to have many open ditches on the farm. They interfere with the working of the ground, they need constant clearing out, and after a time they do not carry off the seepage water from the adjoining ground very effectively. Where several ditches are required it is, therefore, preferable to cover them, or, in other words, use underground drains.

Any practical man can lay out a simple system of underground drains without the use of leveling instruments. A true eye and sound, practical judgment is all that he needs. The only cases where the use of a level may be required occur when the ground is almost entirely level, and in Alaska such ground will generally be marshy and too expensive for the pioneer to put in condition for culture, the exception being when the ground is, as noted above, of a sandy or gravelly nature.

In laying out a system of drains the first consideration is the outlet. The outlet should be at the lowest point from which the water can be carried off. From the outlet a main ditch should be dug along the lowest ground and as far into the field as may be necessary, and a series of side ditches, or laterals, so located that they will drain as much of the field as possible should all discharge into this main ditch. Most of the land at the Sitka Experiment Station is of a sharply rolling nature, with small peaty depressions between the knolls. These depressions were so wet before they were improved that in places a yoke of oxen could not be driven across them. After being drained by a simple system of drainage, as here described, work animals can be used anywhere without hindrance.

Perhaps the most serious question for the pioneer who has had no experience in the matter is the construction of the drain after the ditches have been dug. Drain tiles are out of the question. No tiles are made in Alaska, and to ship them from the States would bring their cost out of proportion to their value. At the Sitka station we have constructed brush drains, which work successfully. The ditch should be dug  $3\frac{1}{2}$  to 4 feet deep. It should have a gentle grade in the bottom down toward the outlet, or toward the main ditch, as the case may be. It should be made smooth on the bottom; that is, no clods, roots, or other obstructions should be left in the ditch. When thus prepared, fill with brush, beginning at the upper end of the ditch and leaning the brush toward the higher ground at an angle of about 30 degrees from the horizontal. The brush should be cut up with a hatchet or ax in lengths of not more than 5 or 6 feet. They should be packed in by hand and the butts should be turned downstream. This method of packing the brush will put all the butts on the bottom of the ditch, and the finer portions of the brush will be in the middle

of the ditch, thus preventing the earth from falling through and obstructing the flow of water, and at the same time leaving numerous interstices on the bottom for the water to pass through. When the ditch has been filled in this manner cover the brush with a layer of sod cut from the surface of the ground, and on top of this fill in earth. In a short time the brush will settle so that a plow can pass over the ditch without tearing the brush out. Drains constructed in this way at the Sitka station are working successfully, and they have cost nothing for material, although, of course, the labor which they represent is an important item.

A still better drain can be constructed by forming a conduit of slabs in the bottom of the ditch. Slabs are the outer cuts made from logs sawed into lumber, and, of course, they can not be obtained except where there is a sawmill; but where they can be procured, they can usually be had very cheaply. Their use is recommended.

A portion of the cleared ground at the Sitka Station has been drained in the following manner: Two slabs of nearly equal length and width are put in the bottom of the ditch, leaning against each other in the form of a letter A. To secure them in this position, a few nails are driven in at the points of contact. The edges are, of course, not straight nor square, and, therefore, they will not fit together along the whole length. Another length is placed at the end of the first one, and so on through the whole length of the ditch. Where laterals enter the main ditch the connection is made when the drain is built in the main ditch. As a matter of fact it is an advantage to have a good many small openings, as it facilitates the entrance of the water. Straight-edged boards are a failure when used as drains, because the water can not enter the conduit freely; therefore, it is not necessary to attempt to fit the slabs together closely, as the slabs are used merely to prevent the earth from sifting through to the bottom of the ditch and obstructing the free flow of the water. When these conduits have been laid on the bottom of all the ditches in the system a layer of poles can be added, and on the top of this can be packed fine brush as before, only it is not necessary to pack this layer of brush so carefully; a saving in labor can be made at this point. On top of the brush put a layer of sod, and then earth as before. Drains thus constructed, it is believed, will last for many years, and render as efficient service as tile drains.

When the bottom of the ditch happens to be soft, as, for instance, in draining peaty ground where the peat may be deeper than the ditch, invert the slab conduit to the form of a V, and then nail another slab on the top for a cover. The ditch is then filled with poles and brush as before.

Efficient drains can be constructed by using poles to form a conduit, but good judgment should be used in laying them so as not to defeat



FIG. 1.—CLEARING LAND OF PEAT AND MOSS AT THE EXPERIMENT STATION AT SITKA.



FIG. 2.—STUMP-PULLING TACKLE.



the desired purpose. If the ditch is a foot wide at the bottom (and it should not be wider than that), lay poles about 4 inches in diameter, one against each wall of the ditch, and lay the third pole over these to form a sort of cover. Care should be taken that the small end of the upper pole does not dip to the bottom in the center of the ditch, thus causing an obstruction to the water. Another layer of poles should be put on top of these and then brush packed on top of the poles. We have found that the best way of hauling the brush to the ditches is to cut down small trees on the uncleared land near by and drag several of them out at a time with a yoke of oxen—and the best time to do this is in the winter, when the ground is frozen—then the material is at hand to construct the drain as soon as the ground thaws, or even before it thaws, if the ditches are dug.

Very effective drains can be built of stones where they are plentiful on the ground that is to be drained. This, however, will not often be the case in Alaska. Considering the value of labor, it will not pay to transport stone any great distance. But when it happens that stone can be obtained near by, build a conduit in the bottom of the ditch of the larger stone, and build it in such a manner that there shall be an open passage for the water in the middle of the ditch. Then put a capstone over the conduit, next a layer of small stone on top, and finally sod and earth as before.

Drains which are intelligently and carefully constructed by any of the above methods may be depended upon to carry off the surplus water sufficiently to make it possible to cultivate ground, over which a yoke of oxen could not be driven before it was drained.

When the ground is comparatively level and a system of parallel drains are needed, the question will arise, How far ought these drains to be apart? Unfortunately, this question can not be answered satisfactorily, as the distance must vary with the character of the soil, the depth of the drains, the amount of water, etc.; but, as an illustration, it may be stated that we have drained a piece of marshy ground at the Sitka Experiment Station, about 2 acres in extent. The soil is a peat formation, almost wholly composed of moss, which has accumulated for ages. It will hold water almost like a sponge, and in its raw condition water percolates through it very slowly. Ditches were first laid out 30 feet apart, but it was found that they were wholly inadequate to meet the requirements. Ditches were then dug between. They are consequently 15 feet apart, from center to center. Slab and brush drains, as above described, have been built in these ditches, and it is believed that this method will drain the ground satisfactorily, although no crop has as yet been grown there. The work was undertaken as an experiment, in order to see if peat bogs of the character described can be subdued by these means. The question is of considerable importance, inasmuch as a very large portion of the level ground in southeastern Alaska is of this formation.

## OXEN AS WORK ANIMALS.

We have used oxen exclusively at both Sitka and Kenai stations, and the writer, for several reasons, considers them far superior to horses.

In the first place, it costs less to feed a yoke of oxen than to feed a team of horses. Cattle can live largely on grass in summer and on silage in winter, or the year round for that matter. Horses must be fed considerable grain when they are working, and, as long as grain is not produced in Alaska, horse feed is necessarily expensive. Another reason is that oxen are better fitted for pioneer work than horses. They pull more steadily and carry a larger load, even though their pace is not so fast. They can be used on soft ground, where horses would flounder about, throw themselves, and perhaps break the harness.

Again, oxen can live on silage made from native grasses. Horses require hay, and as it is difficult to cure hay in the coast region of Alaska, it is to be regarded somewhat in the nature of a luxury. At the Sitka station we have, for the past three winters, fed our oxen almost wholly on silage made from native grasses, and they have done well on it.

## THE LOG SILO.

In this connection it is pertinent to mention that we built a log silo at the Sitka station (Pl. VI, fig. 2), which answers all practical purposes just as well as a silo of the most approved construction, and it has the advantage that the pioneer can build it himself, from the material at hand, without incurring any expense other than that which is represented by his labor. Our silo is small. It is 15 feet square inside and 13 feet high, and carefully constructed. The logs are peeled, dovetailed at the ends, so as to make the corners tight, and dressed on the inside to make a smooth wall. The logs are fitted upon one another as well as possible on the inside edges, and the cracks and interstices, which are inevitable, are filled with dry moss, packed in as calking is packed in between planks in a boat. Silage made from native grass and packed in this silo keeps as well as corn silage keeps in the most approved round silo, and it makes excellent feed. The roof is made of rough boards. The writer recommends every pioneer to put up a log silo of this character wherever he finds difficulty in curing hay.

## STERILITY OF NEW GROUND.

In all reports on the Alaska investigations we have called attention to the fact that new ground will not produce good crops until it has been under culture for two or more years. Just what the cause of this sterility is can not be answered positively at present, but from the fact that a liberal application of fertilizers may cause such ground to

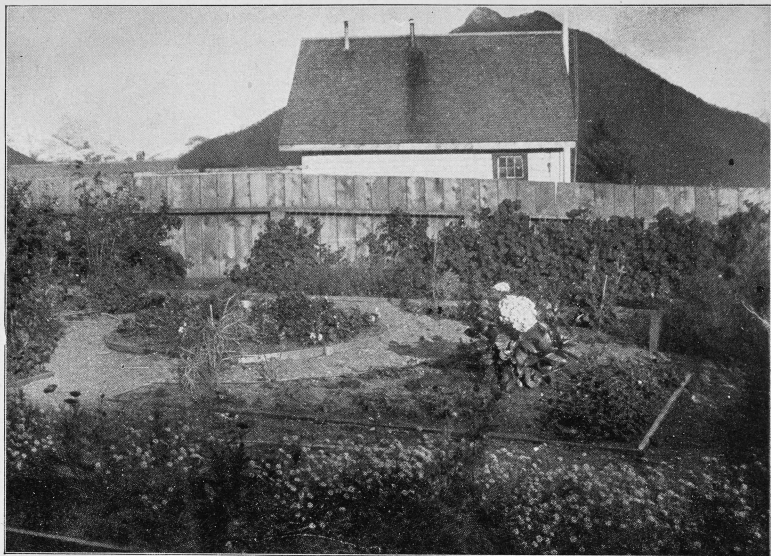


FIG. 1.—VIEW OF GARDEN AT SITKA, OCTOBER 9, 1899.



FIG. 2.—LOG SILO AND CATTLE SHED, SITKA EXPERIMENT STATION.



FERTILIZER EXPERIMENT WITH POTATOES ON NEW LAND, SITKA EXPERIMENT STATION.

produce very satisfactory crops, it would appear that it lacks available plant food; that is to say, the elements of plant food in the soil appear to be inert. Culture, drainage, and exposure to air will gradually remedy this defect. The pioneer desires, of course, to raise crops at once from the ground he has cleared and broken, and if the ground is dry, that is, if it is not water-logged, and if it contains but little peaty substance, he may raise satisfactory crops from the beginning; but ground which is covered with a layer of peat, even if it is only a few inches in depth, or if it is low and water-logged, will not yield good crops the first year or two. We have found that an application of some good fertilizer will, as above stated, remove its sterility. We have thus used satisfactorily, especially for potatoes, seaweed applied at the rate of 30 tons per acre, and plowed under. In like manner we have found that Alaska fish guano, a product which is made from herring at the little town of Killisnoo, is also a cure for this sterility (Pl. VII). It should be applied at the rate of not less than 500 pounds to the acre on new ground, and a heavier application would be better. An application of quicklime also helps to improve new soil. It should be sown broadcast at the rate of not less than 500 pounds to the acre; but as quicklime is as yet not produced in Alaska, it is a costly article. Ordinary barnyard manure is, of course, always a good fertilizer, and can be applied on new ground to advantage. Of the ordinary crops we have found that barley is most sensitive, and therefore the least satisfactory crop to grow on new ground. Oats, on the other hand, seem to do comparatively well, and wheat is intermediate between the two. There is a red subsoil in Alaska which is almost wholly sterile, whether new or old. It is apparently of volcanic origin, and is exposed here and there in clearing ground. This soil appears to be almost wholly destitute of plant food, and nothing will grow on it until it has been liberally fertilized. It contains no vegetable matter. We have found that plowing under barnyard manure and waste silage has improved this kind of soil to such a degree as to make it productive of fair crops.