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ALASKA AGRICULTURAL EXPERIMENT STATIONS.

C. C. GEORGESON, Special Agent in Charge.

ANNUAL REPORT

OF

ALASKA AGRICULTURAL
EXPERIMENT STATIONS

FOR

1912.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.

**ALASKA AGRICULTURAL EXPERIMENT STATIONS, SITKA,
RAMPART, FAIRBANKS, AND KODIAK.**

[Under the supervision of A. C. TRUE, Director of the Office of Experiment Stations,
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LETTER OF TRANSMITTAL

SITKA, ALASKA, *March 3, 1913.*

SIR: I have the honor to submit herewith a report on the work of the Alaska Agricultural Experiment Stations for the year 1912.

Respectfully,

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Special Agent in Charge of Alaska Investigations.

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Publication recommended.

A. C. TRUE, *Director.*

Publication authorized.

D. F. HOUSTON,

Secretary of Agriculture.

CONTENTS.

	Page.
Summary of work.....	9
Work at Sitka Station.....	10
Hybridizing strawberries.....	10
Potato culture.....	13
Vegetable tests.....	16
Cabbage.....	17
Cauliflower.....	17
Broccoli.....	18
Kale.....	18
Brussels sprouts.....	19
Turnips.....	19
Carrots.....	20
Beets.....	21
Swiss chard.....	21
Celery.....	21
Celeriac.....	21
Salsify.....	22
Lettuce.....	22
Parsley.....	23
Spinach.....	23
Radishes.....	23
Fruit trees.....	23
Apples.....	23
Cherries.....	24
Plums.....	24
Fruit bushes.....	24
Currants.....	24
Black currants.....	25
Gooseberries.....	25
Raspberries.....	26
Hybrid raspberry-salmonberries.....	26
Ornamentals.....	26
Chicken raising.....	27
Work at Fairbanks Station.....	28
Weather conditions.....	29
Grain crops.....	30
Potato crop.....	30
Forage crops.....	32
Hay crop.....	32
Timothy grass.....	33
Clearing of land.....	33
Thrashing machine needed.....	33
Work at Rampart Station.....	33
Hybridizing grains.....	34
Oats.....	35
Alfalfa.....	35
Potatoes.....	36
Fertilizer experiments.....	37

Summary of work—Continued.

	Page.
Work at Rampart Station—Continued.	
The root cellar.....	37
Needs of the station.....	37
Work at Kodiak Breeding Station.....	38
Results of eruption of Mount Katmai.....	38
Purchase of milking Galloways.....	43
The bear a menace.....	44
Development of cattle for the interior.....	45
A garden survey of southeastern Alaska.....	45
Report of work at Fairbanks Station.....	46
Climatic conditions.....	46
The market.....	48
Soil fertility.....	48
Soil treatment.....	49
Fertilizers used.....	49
The hay crop.....	50
Grain crop.....	50
Grasses.....	51
Legumes.....	52
Potatoes.....	53
The vegetable garden.....	55
The flower garden.....	56
Stock raising.....	56
Improvements.....	56
Report of work at Rampart Station.....	57
Climatic conditions.....	57
Work in general.....	58
Grain crops.....	59
Winter grain.....	59
Spring grain.....	60
Barley.....	60
Oats.....	62
Alfalfa.....	64
Potatoes.....	65
The garden.....	66
Report of work at Kodiak Live-Stock and Breeding Station.....	67
Results of eruption of Mount Katmai.....	67
Climatic conditions.....	72
The station herd.....	74
Sheep at the station.....	76
Report on vegetable and flower gardens in southeastern Alaska.....	77
Experiment station at Sitka.....	79
Sitka.....	79
Ketchikan.....	79
Skagway.....	80
Lake Bennet.....	80
Petersburg.....	80
Metlakatla.....	81
Haines.....	81
Douglas.....	81
Juneau.....	81
Letters from the settlers and reports from the seed distribution.....	82
Meteorological reports.....	89

ILLUSTRATIONS.

	Page.
PLATE I. Hybrid strawberries, Sitka, 1912.....	12
II. Fig. 1.—Strawberry hybrids, mother plants, Sitka Station. Fig. 2.—Red raspberries, Sitka Station.....	12
III. Fig. 1.—Potato trial plats, Sitka Station. Fig. 2.—Cabbage trial plats, Sitka Station.....	16
IV. Fig. 1.—Currants, Sitka Station. Fig. 2.—Gooseberries, Sitka Sta- tion.....	16
V. Fig. 1.—Cattle after fall of ashes, Kodiak Island. Fig. 2.—Oats seeded in volcanic ash, Kodiak Island.....	48
VI. Fig. 1.—Barley hay, Fairbanks Station. Fig. 2.—Finnish black oats, Fairbanks Station.....	48
VII. Fig. 1.—Yard at Fairbanks Station, Grimm alfalfa at left. Fig. 2.— Fertilizer tests of oats, fertilized plat at right.....	48
VIII. Fig. 1.—Potato field, Fairbanks Station. Fig. 2.—Potato trial plats, Fairbanks Station.....	48
IX. Fig. 1.—Winter rye at Rampart Station. Fig. 2.—Siberian alfalfa at Rampart Station.....	64
X. Fig. 1.—Silo and horse barn two weeks after fall of ashes, Kalsin Bay. Fig. 2.—Slide of ashes showing erosion, Kalsin Bay.....	64
XI. Fig. 1.—Perennial phlox, Sitka. Fig. 2.—Single daisies, Sitka.....	80
XII. Fig. 1.—Shirley poppies, Sitka. Fig. 2.—Petunias, Sitka.....	80
XIII. Fig. 1.—Nasturtiums, Sitka. Fig. 2.—Vegetable and flower garden, Ketchikan.....	80
XIV. Fig. 1.—Dahlias and gladioluses, Skagway. Fig. 2.—Sweet peas, Skagway.....	80
XV. Fig. 1.—Stocks, apple tree in background, Skagway. Fig. 2.—Calen- dula and scabiosa, Skagway.....	80
XVI. Fig. 1.—Small garden at Petersburg. Fig. 2.—Well-kept lawn, Juneau.....	80
XVII. Fig. 1.—Klukwan Indian School. Fig. 2.—Products, Klukwan School garden.....	88

ANNUAL REPORT OF ALASKA AGRICULTURAL EXPERIMENT STATIONS FOR 1912.

SUMMARY OF WORK.

By C. C. GEORGESON, *Special Agent in Charge.*

The plans outlined in former reports have been followed during the past year. In experimental work it is disastrous to change plans. They should be so well considered beforehand that no change will be necessary. The fundamental lines should be broad and well defined. Additions may be made to them, but to substitute others is detrimental to the results. The fundamental basis for work in Alaska is to obtain answers to the question, "What will the country produce?" It follows as a corollary to ascertain how to produce it. The dominating motive in the experiments of the stations is to answer these questions truthfully. The soil, climate, and crops must be studied and animals bred, and subsequent work must be governed by the results obtained. Experiments have already proven that grain of certain sorts can be successfully grown in Alaska, that hardy vegetables of all sorts can be produced, that live stock can be kept here, and that therefore it is possible for the farmer to make his home here. The agricultural problems of the country are new. Nowhere else in the United States are similar climatic conditions encountered, and all methods must be adjusted to meet these conditions. Every step in advance is new and untried, and no one can predict with certainty what the results will be until the fact has been established by experiments. All agricultural work in Alaska is in a peculiar sense experimental, and since there is great variation in the climate and soil throughout this great Territory, it became necessary to start experiments in several regions.

Progress has been made in all lines. Numerous variety tests with all sorts of grains and vegetables have made it possible to sift out those which are best suited to the novel conditions. New varieties better adapted to the country are being developed. Valuable new plants are being introduced with the hope that they may in time become established. Methods of soil treatment and the fertilizers most needed are being discovered. That cattle and sheep can be maintained on the native pastures has been shown, and an attempt is being

made to develop strains of animals which shall meet the needs of the pioneer settlers.

Agriculture is at all times at the mercy of the weather. This statement is trite, but it is so true that those who are not familiar with the conditions in Alaska fail to appreciate its force unless it is brought home to them with emphasis and frequent repetition. Rain and sunshine are the two factors which determine success. When sunshine is abundant during the growing season the farmers' efforts prosper; when rain and cloudy weather unduly dominate their efforts languish or fail completely. These elements are beyond control, and it is necessary to learn how to meet them. This adaptation constitutes no small part of the experimental work of the Alaska stations.

WORK AT SITKA STATION.

Sitka is the smallest of the four stations measured by the area under culture. It is the headquarters station chiefly by virtue of its location. It is more accessible and in more direct communication with the Department of Agriculture than any of the others. Its work is representative of the possibilities in agricultural lines in the coast region of Alaska, and more particularly of southeastern Alaska. Whatever can be done at Sitka can also be done in most places throughout the coast region, and whatever can not be done at Sitka can not be done with any degree of success anywhere else in this region. The nature of the country and the climate together determine the nature of this work. The region is mountainous and heavily timbered. There is but little land available for culture, and as a rule it must first be cleared of timber. Farming on an extensive scale is therefore out of the question. The climate limits the work as to the crops that can be successfully grown. Grain growing is a failure not because the season is not long enough between frosts, but because the heavy rains which prevail during the fall make it almost impossible to save grain crops after they mature. Vegetables and small fruits, on the other hand, are at home in this region, and the work of the Sitka Station is therefore naturally confined to these crops. Small areas given intensive culture will always be the rule in the coast region of Alaska; there is little chance for the use of machinery. Most of the work must be done by hand, and whenever this is the case it is imperative to produce the greatest possible crop from the smallest area. The work at Sitka has for these reasons been chiefly confined to the lines mentioned below.

HYBRIDIZING STRAWBERRIES.

The work of hybridizing strawberries and of studying the hybrids already developed has been continued during the past season. So much has been said about it in former reports that details are not

needed here. Suffice to say, for the benefit of those who have not seen former reports, that these hybrid plants are the result of crossing cultivated varieties of the strawberry with pollen from the wild Alaska berry. There are at least two species of wild strawberries in Alaska, one of them indigenous to the coast region and the other to the interior. The species in the coast region produces a moderately large berry of very high quality. The species in the interior produces little round berries the size of peas. Both species are very hardy, but they differ in many essential respects. The plants in the coast region are adapted to a wet climate and to a temperature that seldom exceeds 25° or 30° F. below zero. They grow chiefly along the beaches of the mainland from Icy Strait to Prince William Sound. They live in almost pure sand and gravel, and contend for their existence with the grasses and plants peculiar to the region.

The interior species, on the other hand, grows in good soil, preferring soil of a clayey nature. It is a slender plant with small leaves and it is exceedingly hardy, as the temperature not infrequently falls to 65° and 70° F. below zero. Transplanted to good garden soil both species become voluptuaries. They grow to great size, send out numerous runners, but very few blossoms, and produce scarcely any berries.

The hybrids here dealt with are crosses between the coast species and several of the cultivated varieties. Work has been attempted with the interior species, but so far with very poor success. The probable reason is that the interior species grows poorly in the wet more or less peaty soil of the coast region, and it has not been possible to propagate it to the extent necessary, only few blossoms having been available for cross fertilization.

The first crosses were made between an unknown variety, to which has been given the name Hollis (because the first plants were obtained from the settlement of that name), and the coast species. Later on crosses were also made on the Enhance, the Magoon, and the Bismarck, but regardless of the mother parent, nearly all the hybrid plants are of extraordinary vigor and grow to be twice or three times the size of either parent. Less than 1 per cent of this offspring resemble the native parent from which pollen was taken either in size or manner of growth. Likewise less than 1 per cent resemble the mother parent in growth and vigor. Fully 98 per cent of all the hybrid plants so far produced from crosses with the coast species show a vigor and attain a size entirely beyond what one might expect from their parentage. Some of these plants have leaves and flower stalks that reach a height of 18 inches, and many of them reach a foot in height as they are grown. Out of more than 2,600 hybrid seedlings which have so far shown fruit 334 have produced berries

which are classed as large or very large; that is to say, berries which would measure an inch and a quarter or more in the longest diameter. (Pl. I.) This is about 12 per cent which show an improvement on the mother parent and is quite remarkable. A large number of the remaining 88 per cent have medium-sized berries quite on a par with the average cultivated berry in the market; but, of course, the larger number of the plants are inferior. They have small berries and are not productive. Among those which are classed as large or very large some plants are exceedingly prolific. As many as 200 berries have been counted in all stages of development on one plant at the same time.

Among these selected plants it is expected there will be found deterioration under culture in the size of the berry. It has been already observed that many plants which produced large berries the first year have smaller berries the succeeding year and that their offspring from the runners do not maintain the expectations at first made. As a matter of fact but few plants from the runners of the original seedlings have borne fruit as yet. They are slow in coming into bearing. This will be a decided drawback to their culture. Runners which became established as individual plants in 1911 produced but little fruit in 1912, and probably a good crop can not be expected until they are 2 years old. Moreover, the most desirable hybrids produce but few runners, and propagation, therefore, is very slow. It will take some years before it will be possible to pass accurate judgment on the value of most of these new varieties. As yet they are known only by numbers, and they will not be named until their value is established. (Pl. II, fig. 1.) At this writing about an acre has been planted out to the offspring of the best of these seedlings, but they have not yet fruited. The process of selection goes on constantly. The inferior and mediocre plants are rejected and only the best ones propagated. A system of setting a yellow-painted label stake by each of the desirable plants has been adopted, while all the others have white-painted label stakes. In looking over the field the best plants can thus be located at a glance. Inferior neighbors to a good plant are removed in order to give the latter room to set runners without danger of admixture with inferior plants. It requires a considerable area to give proper space to all of these strawberries, and the result is that they will soon monopolize the available land at this station. The work will be continued, as it is not expected that the highest attainable success has been reached.

A few hybrids between the interior species and the cultivated varieties have been produced, but so far none of them has yielded fruit. Efforts will be made to enlarge this feature of the work. It is expected that the hybrids from the interior species will be hardier than the



HYBRID STRAWBERRIES, SITKA, 1912.



FIG. 1.—STRAWBERRY HYBRIDS, MOTHER PLANTS, SITKA STATION.



FIG. 2.—RED RASPBERRIES, SITKA STATION.

hybrids from the coast region species, and hardier plants are needed for interior Alaska.

It is not expected that any of these strawberries will do well south of latitude 49°. It is true that they have not been tried there, and of course no conclusions can be drawn until they are tried, but it would be reasonable to expect that they would dry up and die under a withering sun or in a drought.

As yet there are no plants for distribution, and none will be sent out until they have been thoroughly tested.

POTATO CULTURE.

The potato is the most important vegetable grown in Alaska, its culture being almost universal. Next to turnips, radishes, and lettuce, which require but little care, the potato receives the attention of the prospector wherever he may locate, and it is always grown on a larger scale than the other vegetables named. The potato can be, and is, successfully grown as far north as Coldfoot, 60 miles north of the Arctic Circle. It is a universal article of diet and is everywhere in demand. Thousands of tons of potatoes are shipped from the Puget Sound country to all sections of Alaska every year, and these potatoes could just as well be grown in Alaska, provided that the proper varieties are selected and that they are given the proper culture. It is the task of the experiment stations to find out which varieties do the best and which methods of culture each should have for the best results. With this in mind, new varieties are tested whenever they are offered on the market and give promise of being valuable for Alaska. Any variety has to be grown for several years before one can form an accurate judgment of its value. It is therefore grown at the Sitka Station, and to a lesser extent also at Rampart and Fairbanks stations, together with a number of other varieties for purposes of comparison. The potato best suited to Alaska must be very early, in the coast region because the growth is too slow to mature late varieties and in the interior regions because the summers are too short to properly mature any but the earliest sorts. Earliness is the first consideration with the potato, as indeed it is with all sorts of vegetables, grains, and fruit that are grown here. Next, the desirable potato must be firm, dry, and mealy. It should have shallow eyes and preferably a white skin, because most consumers prefer a white potato. To secure these qualities it is necessary to grow many kinds and to compare them with each other. The quality of a potato will vary greatly with the conditions under which it is grown, and these conditions must therefore be considered in passing judgment on any given variety. In a low lying wet soil the potato never matures. When it is cooked it is soft and watery. Again, in low

lying ground the frosts frequently check the growth much too early. It is these conditions that have given rise to the very common opinion that good potatoes can not be grown in Alaska. This is a mistake, as has been demonstrated repeatedly. If potatoes are grown on well-drained ground, if early varieties of good quality are selected, and if the seed is sprouted a month before planting, as good potatoes can be grown in Alaska as anywhere on earth.

Sprouting the seed before planting is a very important feature. The results of experiments in this direction have been given in several annual reports. A good way to sprout potatoes is to take a shallow box and put an inch of soil in the bottom, then pack the potatoes closely in one layer, and lastly cover with a very thin layer of soil. If one has a cold frame, boxes thus prepared can be placed in this, and the potatoes will sprout as they would in a warm room. If no cold frame is available, set the box in the house, preferably near the light. The sprouts will then be green and stronger than when grown in the dark.

It is rare that planting can be done outdoors before the first half of May. At that time the soil has not been warmed by the sun to any great extent. Rains which keep the soil cold and wet are frequent. Growth is very slow, and often such potatoes do not appear above ground until the latter part of June or even the beginning of July, and the season for development of the crop is then too short. When the potatoes have sprouts three or four inches in length, if the planting is then done carefully, leaving the tips of these sprouts in the surface of the soil, the potato will soon continue its growth, and tubers will be ready to use a month earlier than would be the case if the seed had not been sprouted.

Many of the settlers are following the recommendation of the station in this respect, and those heard from comment favorably upon the practice.

The varieties named below were grown at the Sitka Station during the season of 1912. (Pl. III, fig. 1.) In most cases there was but a single row of each variety, and in some cases only a few hills. The estimated yield per acre has been given, but it is manifestly unfair to base calculations on yields from so small plats without a full explanation of the circumstances, and no one should make a selection of varieties on the basis of the acre yield alone, at least not for a single year. If it is found that a given variety is in the lead for several successive years, as for instance the Gold Coin, then it may be concluded that such variety is a good yielder. The acre yields are based on a 60-pound bushel. The cooking qualities of many of these varieties have not been tested at this writing, and it is impossible to express an opinion on quality; however, as a rule, the earliest maturing potatoes have the best cooking quality, while the later

maturing varieties frequently lack the dry, mealy consistency that is so desirable. On the other hand, it is true that the later varieties are often the heaviest yielders, just as it is true that the late cabbages grow larger than the early ones. Thus the Gold Coin, which has been grown at the station for several years, is one of the heaviest yielders, but it is a medium to late variety, and its quality is not as good as that of several others which do not yield as well. The Irish Cobbler is an early potato (though not the earliest) of good quality, but only a moderate yielder. Early Hamilton is a fairly good yielder and at the same time a potato of good quality. The Early Michigan has also been a satisfactory potato at this station.

The potato is of more importance in the interior than it is in the coast region. In the interior the freight charges on the shipment of potatoes from the outside materially increase the cost to the consumer. In the coast region the freight charges are comparatively small. It is therefore of great importance to find the best early maturing varieties of high quality for culture in the interior, and the work with potatoes at Rampart and Fairbanks will be emphasized in the reports from these stations.

One reason for growing so many varieties at the Sitka Station is that tubers grown here during the season can be selected in early September and sent to the stations at Rampart and Fairbanks before river navigation closes, for trial the following year. They could not be shipped in during the winter because they would freeze on the way, and they could not be shipped in during the summer because they would arrive too late to plant, and could not be kept over until the following spring; hence Sitka is a sort of midway station for supplying what is needed in the interior.

Variety test of potatoes, 1912.

Name of variety.	Color of tubers.	Date ripened.	Number of hills.	Total yield.	Large tubers.	Medium tubers.	Small tubers.	Estimated yield per acre.
				<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Bushels.</i>
Banner.....	White....	Sept. 15	56	177	73	72	32	382
Bliss Triumph.....	Red.....	Aug. 25	29	67	28	21	18	279
Burhank.....	White....	Sept. 20	23	65	33	23	9	282
Burpee Superior.....	do.....	Sept. 25	24	171	75	76	20	862
Carman No. 1.....	do.....	Sept. 20	20	89	50	27	12	538
Clarks Alaska Seedling.....	do.....	do.....	60	324	75	159	90	653
Columbus.....	Flesh....	Sept. 5	60	309	82	115	112	606
Commercial.....	Pink.....	Sept. 10	60	250	95	90	65	504
Crough.....	Blue....	Sept. 24	5	13	8	5		314
Dakota Red.....	Red.....	Sept. 20	60	286	73	85	128	576
Early Beauty of Hebron.....	Pink.....	Sept. 1	39	162	71	47	44	502
Early Fortune.....	Flesh....	Sept. 10	59	229	70	84	75	469
Early Hamilton.....	White....	Sept. 15	57	278	90	112	76	573
Early Harvest.....	do.....	Sept. 20	54	243	96	82	65	363
Early John.....	do.....	Sept. 10	58	166	65	56	45	346
Early Michigan.....	do.....	Sept. 20	55	323	73	170	80	710
Early Six Weeks.....	do.....	Sept. 1	51	168	70	42	56	398
Early Vermont.....	do.....	Sept. 10	20	91	31	47	13	550
Empire State.....	do.....	Sept. 5	32	150	72	47	31	567
Extra Early.....	do.....	Sept. 20	58	199	54	85	60	415
Extra Early Ohio No. 1 (station seed).	do.....	do.....	45	271	75	136	60	728
Extra Early Pioneer.....	Flesh....	Sept. 1	60	227	70	162	95	458
Extra Express.....	do.....	Sept. 10	54	207	67	83	57	464
Fillhasket Early.....	White....	Sept. 15	58	231	74	59	98	482
Gold Coin.....	do.....	Sept. 20	59	282	98	81	103	576
Gold Coin (station seed).....	do.....	do.....	26	179	70	75	34	833
Gold Coin (Gregory).....	do.....	do.....	58	284	80	104	100	598
Great Divide.....	do.....	Sept. 5	56	211	72	49	90	426
Green Mountain.....	do.....	Sept. 20	60	361	103	185	73	728
Hamilton Early Rose.....	Pink.....	Sept. 10	57	193	70	74	49	309
Irish Cobler (station seed).....	White....	Sept. 20	60	184	76	121	87	371
Junior Pride.....	Flesh....	Sept. 15	56	240	72	82	86	536
Keeper.....	Pink.....	Sept. 10	59	275	80	105	90	564
Knowles Big Cropper.....	White....	Sept. 1	56	274	72	125	77	610
Late Beauty of Hebron.....	Red.....	Sept. 15	67	168	70	48	50	315
Late Rose.....	do.....	Sept. 5	58	258	76	66	116	579
Lightning.....	White....	Sept. 10	58	220	68	70	82	478
McCormick.....	Flesh....	Never ripened.	59	183	63	78	42	375
Mammoth Pearl.....	do.....	Sept. 22	57	193	65	80	48	409
Mammoth White.....	White....	Sept. 20	50	238	73	128	37	576
Market Prize.....	Flesh....	Sept. 1	55	204	79	55	70	448
Money Maker.....	White....	Sept. 20	60	228	75	90	63	459
Norcross.....	do.....	Sept. 25	57	265	100	125	40	562
Nortons.....	do.....	Aug. 25	60	250	77	71	102	504
Nortons Beauty.....	Pink.....	do.....	56	256	82	79	95	553
Norway No. 1.....	White....	Sept. 20	29	145	55	41	50	605
Peach Blow.....	Flesh....	Sept. 15	56	227	79	78	70	490
Piqua Chief.....	White....	do.....	40	179	71	69	39	511
Pride of France.....	Blue....	Sept. 24	31	146	56	57	33	569
Red River White Ohio.....	Red.....	Sept. 15	12	38	14	15	9	403
Rural New Yorker.....	White....	Sept. 10	52	280	80	115	83	418
Rural New Yorker No. 2.....	do.....	do.....	60	277	75	87	115	558
Rust Proof.....	do.....	Sept. 15	58	311	80	125	106	643
Russian.....	Yellow..	Oct. 1	54	224	73	50	101	502
Solanum Violet.....	Violet..	Sept. 24	56	228	62	77	89	492
Smidt P. M.....	Pink.....	Sept. 20	2	13	9			786
Snowhall.....	do.....	Sept. 10	59	208	65	83	60	426
State of Maine.....	White....	Sept. 25	9	54	20	25	9	726
Stock Coldfoot.....	Flesh....	Sept. 20	57	342	82	160	100	726
The Thorburn.....	Pink.....	Sept. 5	59	306	85	106	115	627
White Beauty.....	White....	Sept. 20	59	295	98	126	69	605
White Giant.....	do.....	do.....	49	161	72	50	39	397
Woods Earliest.....	Flesh....	Sept. 5	28	118	56	40	22	508

VEGETABLE TESTS.

A small collection of each of several leading kinds of vegetables adapted to Alaska was grown to ascertain what varieties are likely to do best under these conditions. Lack of suitable ground places a limit on the amount of work in this line. Nevertheless it is thought that the condensed records given below are of value.



FIG. 1.—POTATO TRIAL PLATS, SITKA STATION.



FIG. 2.—CABBAGE TRIAL PLATS, SITKA STATION.



FIG. 1.—CURRANTS, SITKA STATION.



FIG. 2.—GOOSEBERRIES, SITKA STATION.

CABBAGE.

Next to potatoes cabbage is the most important garden vegetable. Nearly every settler aims to raise a few heads, and in the towns cabbage is an important market vegetable. It is always a leading crop with professional market gardeners. However, since land is abundant and town dwellers quite generally cultivate part of their lots, householders who have the time and inclination very generally raise at least a portion of the cabbage as well as other vegetables which they consume. Seed was sown March 27 of all the varieties mentioned below and the plants transferred to cold frames April 18. On May 27, 50 plants of each variety were set in the field. (Pl. III, fig. 2.) The percentage of marketable heads of each variety was as follows:

Percentage of marketable heads of cabbage produced in 1912.

	Per cent.
Copenhagen Market.....	92
Danish Ball Head.....	56
Dark Red Stonehead.....	90
Early Baseball.....	86
Early Jersey Wakefield.....	94
Early Winningstadt.....	82
Holstein.....	82
Large Late Drumhead.....	80
Large Late Flat Dutch.....	88
Market Gardener Flat Dutch.....	88
Savoy.....	50

The Early Wakefield has, all things considered, been the most satisfactory variety so far tried. It stands the test year after year. It is a sure header, and while the heads are not large they are of good quality. Other varieties approach it closely, but none excel it. As a matter of fact, it is not always the earliest variety. Others, even those so-called late, are sometimes earlier. Its value rests chiefly in the fact that it can be depended upon to head under nearly all circumstances. Other varieties are less dependable.

CAULIFLOWER.

The cauliflower is at home in Alaska. It has larger, more crisp heads, and is better flavored here than it is when grown under a hot sun. It follows cabbage in point of importance. It has one drawback, however, and that is that it is only a summer vegetable, whereas cabbage can be kept all through the winter. It is grown exactly as we grow cabbage—raise the plants in boxes or in cold frames, transplant the seedlings into other boxes or cold frames 4 inches apart to give them room to develop well and to acquire a good root system. Transplant in the open ground 2 feet apart in the row, and the rows 3 feet apart. The transplanting is done as in the case of cabbages

with a ball of earth so that the roots are disturbed as little as possible; and they should not be set in the open until the latter part of May. Thus treated, and given a good garden soil, the cauliflower is one of the most satisfactory vegetables that can be grown. It is ready for the table earlier than cabbage. Market gardeners in the coast towns of Alaska have them sometimes for sale as early as July 4. Of course the earliness, as in all vegetables, depends very largely upon the nature of the season. When the spring is early and the summer warm they grow rapidly, and mature early; when the spring is late and the summer cloudy and rainy, as is often the case, they mature late. Only a few varieties were grown here, as listed below. The seed was sown March 27 and the plants transferred to cold frames April 18. On May 27, 50 plants of each variety were set in the field. The date of maturity and the percentage of marketable heads of each variety are shown in the following table:

Variety tests of cauliflower, 1912.

Variety.	Small heads matured.	Marketable heads.
		<i>Per cent.</i>
Denmark.....	July 26	90
Extra Early Dwarf Erfurt.....	July 18	92
Extra Early Paris.....	July 28	88
Extra Early Snowball.....	July 20	90
Gilt Edge.....	July 22	90

BROCCOLI.

Broccoli is similar to cauliflower. This vegetable has practically the same quality, matures later, and is not quite as sure to head. It should be treated in all respects like cauliflower. Some varieties are white, in which case they closely resemble the cauliflower. Other varieties have purple heads. Three varieties were grown the past season—Early White, Early Purple Cap, and Mammoth White. The seed was sown March 27, the plants transplanted to cold frames April 18, and to the field May 27. Early White matured heads on August 1, 78 per cent of which were marketable, and Mammoth White on August 20, of which 76 per cent were marketable. Early Purple Cap did not mature any heads.

KALE.

Kale is a valuable vegetable, but unfortunately not appreciated. It is particularly well adapted to a cool, moist climate like that of Alaska, and on the other hand kale grows but poorly under a hot sun or in dry weather. Now, since the majority of the settlers in Alaska have come from the regions south of latitude 49°, kale is but little grown. This may be the reason why it is not appreciated; and

because it has been used so little in the States many housewives do not know how to prepare it for the table. The writer has received letters from people who have grown it and reported splendid success in growing large vigorous plants, but they called it poor provender; they had tried to eat it raw as a salad. Kale must be boiled thoroughly and should be cooked preferably with salt pork or corned beef; when so prepared it will be found a very appetizing dish.

One of the chief merits of kale is that it is a winter vegetable. It can stand a moderate degree of frost, and indeed its quality is improved by freezing slightly. In the coast regions it can, therefore, be left outdoors the entire winter and cut as needed. In very cold weather, a foot or more of snow is a protecting blanket to the plants.

Treat kale exactly like cauliflower. The dwarf curled varieties are to be preferred. The tall coarser varieties can be grown for cattle feed, the only objection to this being that they will flavor the milk as do turnips, cabbage, and all other Cruciferæ.

Dwarf Scotch Green Curled and Siberian kale were sown in the open field May 27 and were ready for use September 15 and 20, respectively, 96 and 94 per cent of the plants being marketable. Brussels sprouts sown March 27, transplanted to cold frames April 18 and to the open field May 27, was mature October 27, 90 per cent of the plants forming marketable heads.

BRUSSELS SPROUTS.

This is a vegetable that deserves to be more generally cultivated than is the case. It is really a variety of kale, and is cultivated in exactly the same manner as kale and cauliflower, but the stalks grow taller than kale, and in the axil of each leaf is formed a small head, which is the portion used. These little heads properly cooked are most delicious. They are better flavored than either cabbage or kale. In the coast region the plants can be left outdoors until moderately cold weather sets in. They are not quite as hardy as kale. But one variety was grown here the past season. It is listed above with the kale.

TURNIPS.

Eight varieties of turnips were grown here, each in a 50-foot row, with yields as follows: Petrowski, 150 pounds; White Milan, 140 pounds; No. 33682, 133 pounds; No. 33684, 127 pounds; No. 33683, 97 pounds; No. 33687, 46 pounds; No. 33685, 31 pounds; No. 33686, 18 pounds.

The seed of those sorts designated by numbers were obtained from the Seed Division of the Department of Agriculture. None of them appear to have any great merit.

The Petrowski is undoubtedly the best variety so far found for Alaska. It has not as yet been offered by seedsmen in this country.

The seed which has been grown at the experiment stations and which has been distributed to all the correspondents of this office has been imported from Finland. It is a yellow, smooth, uniformly shaped turnip of delicious quality. It grows well everywhere and as noted below it is not greatly subject to the attacks of root maggots. About 2,000 packages of this seed have been distributed to settlers in Alaska, and all who have reported, speak in the highest terms of this variety. It is earnestly urged that all who have grown good turnips should save the best, wintering them free from frost with a view to planting them out for seed the following spring. Plant them early in rows 3 feet apart and 2 or 3 feet apart in the row. When the stems grow up they should each be tied to a stake. Gather the seed as soon as it matures. This variety is worthy of perpetuation.

Root maggots.—These pests are quite prevalent in Alaska, and complaints of their ravages come to this office from all parts of the Territory.

They attack turnips, cabbage, cauliflower, kale, and in fact all members of the Cruciferæ and other plants.

The maggots are the larvæ of small flies somewhat resembling the house fly, which lay their eggs on the leaves near the base of the plant. When the eggs hatch, the maggots wriggle into the ground and begin to feed on the roots near the surface. They grow rapidly and when numerous they soon suck the juice from the plant, causing decay to set in and the plant dies. Some varieties of plants are more susceptible to the ravages of this pest than others. The Petrowski turnip, for instance, is almost exempt, while other varieties of turnips grown alongside suffer badly. The reason for this fact is not fully known, and may be due to the habit of the plant, which spreads its leaves flat on the ground. The leaf stems are not upright as in many varieties, and the maggots, therefore, do not follow the stems to the ground at the base of the plant; they are already on the ground. If this is not the correct explanation, it is at least plausible. The root maggots are not troublesome at Sitka, and therefore there has been no opportunity to experiment with remedies.

CARROTS.

On May 15 a row 100 feet long was sowed to each of the following varieties of carrots. They were all ready for market on October 1, although they were not dug until some time later. In point of yield they rank in the order mentioned: Stump Rooted, 181 pounds; Yellow Danvers, 138 pounds; Chantenay, 117 pounds; French Forcing, 113 pounds; and Early Scarlet, 110 pounds.

Carrots are also a neglected vegetable. They can be grown successfully almost anywhere in Alaska, but they require a well drained soil, and the richer the ground the better the crop.

BEETS.

But one variety of beet was grown last season, namely, Extra Early Egyptian. The seed was sown on May 15 and produced medium sized roots of good quality by September 15.

SWISS CHARD.

Swiss chard is a kind of beet grown for its leaves. The stems are crisp and palatable and used as a salad. It does well in Alaska. The seed was sown on May 15. September 15 it was ready for use; was 18 inches high and of good quality.

CELERY.

Three varieties of celery were grown on a very small scale here. They were Giant Golden Heart, Golden Self-blanching, and Rose Ribbed. They rank in the order given.

Celery can be grown with great success in Alaska, provided conditions are right. In a poor soil poorly drained, it amounts to nothing. The seeds should be sown in flats or boxes in the house, greenhouse, or cold frame in the latter part of March; when the plants are an inch high or less, they should be transplanted in rich soil under glass about 4 inches apart, and about the beginning of June they can be set in the open ground.

Celery is always planted close together because it facilitates the blanching of the stems and a large number of plants can be grown on a very small area. A bed may thus be prepared of light, that is to say, more or less sandy soil in which 5 or 6 inches of decomposed manure has been dug in and thoroughly mixed with the soil. Set the plants in this bed 6 inches apart each way for the smaller varieties and 7 or 8 inches apart for the larger varieties. Inclose the bed with boards which are kept as high as the top growth. The so-called self-blanching varieties will blanch in the partial darkness caused by the dense growth of leaves. Other varieties can be blanched by filling in soil between the plants, and they will be ready for market as soon as they are large enough to use, which may be the latter part of July if the plants are started early.

Celery grows better in the interior than in the coast regions, because the summers are warmer, and all vegetation grows rapidly. The writer has never seen or tasted better celery than that grown by market gardeners at Fairbanks.

CELERIAC.

Celeriac is a variety of celery. It develops a large root like a turnip or rutabaga, and it is grown for the root. It is rarely cultivated in America except in German settlements, but it is a most

delicious vegetable which can be used either raw as a salad or better still sliced and boiled in soups and other dishes. The plants are raised like celery plants and planted out 15 to 18 inches apart in the row in rich soil.

Both celery and celeriac require a moderately dry soil. They are failures wherever their roots are continually wet.

SALSIFY.

Commonly known as oyster plant from the fancy that its root resembles the oyster in flavor. Salsify has not succeeded well at the Sitka Station. The soil is too wet. It requires a light, loamy, well-drained land for its best growth, but it can be grown in Alaska and will add variety to the available vegetable dishes.

One sort, known as the Thick Rooted, was grown the past season. The seed was sown in the open on May 16 and produced medium sized roots by October 1.

LETTUCE.

Nine varieties were grown on a very small scale the past season. The seed was sown in the open May 15, and when the plants were up they were thinned to a stand of 6 inches apart in the row. The varieties grown were valued for earliness, quality, size, and solidity of head in the following order: Tennis Ball (black seeded), Giant Crystal Head, California Cream Butter, Rheingold, Buttercup, Iceberg, Beacon, Maximum, and American Gathering.

Lettuce is easily grown everywhere in Alaska, and it is a favorite salad with everyone. In passing through the country one sees at the isolated prospector's cabin, as well as at the more comfortable homes in town, a little patch of each of three vegetables. They are turnips, lettuce, and radishes, the two latter always grown on a very small scale, perhaps confined to a single square yard. The average cultivator takes no pains with his garden. He sows the seed thickly and cuts the plants when they are large enough to use. This is one way of doing it, but a poor way. Lettuce can be had throughout the summer by making several seedings, say once in four weeks, from April to July. Then the best results are obtained by sowing the seed in shallow boxes, and when the plants are 2 inches high set them in rows some 6 inches apart on rich soil. Those varieties which produce a solid head are to be preferred, but they are not as early as those which have a loose head. Solid headed lettuce sown in June or the beginning of July will be ready for use in September, and the heads can be kept until quite late in the winter in a dry, frost-proof cellar.

PARSLEY.

Parsley is one of the few greens which is grown for the flavor it imparts to dishes, and also for decorating dishes. There should be at least a short row of parsley in every garden. It is sown in the open in early spring. The plants should be thinned if they are too thick. The seed takes a long time to germinate, and it loses its vitality very soon, hence old seed should never be used. There are but few varieties; Extra Curled is the one most commonly grown. There is also a root parsley with plain leaves, the roots of which are used in soups, and with other vegetables, like celeriac.

SPINACH.

Round Viroflay and Long Season were successfully grown at the Sitka Station the last season. Spinach does not succeed everywhere. It is a little particular about the soil. The soil should be well drained. In a wet soil it runs to seed almost at once without producing leaves. Sow it the middle of May.

RADISHES.

A 50-foot row was seeded of each of the three following varieties. They all did well, and they are valued in the order named: Early Scarlet Turnip, French Breakfast, Deep Scarlet Olive-Shaped. It is superfluous to say anything here about the culture and use of radishes. Everyone knows and appreciates them.

FRUIT TREES.

APPLES.

The following varieties of apples are grown in the small test orchard at the Sitka Experiment Station. It will be noticed that most of them are crabs or crab hybrids. These trees were planted in 1903, except those which have been planted to replace others that have died. They were, therefore, 9 years old the past season and old enough to bear fruit. In 1911 the following varieties fruited: Raspberry (crab), Yellow Transparent (crab), Hyslop (crab), Whitney (crab), and Sylvan Sweet (crab).

The past year the only varieties which set fruit were Whitney, Tetofsky, Hyslop, Raspberry, Patten Greening, Duchess, *Pyrus baccata*, and, of course, the native crab. Those which matured were the Whitney, Hyslop, *Pyrus baccata*, and the native crab. The fruits on the others blew off before they matured. None of the trees is doing as well as one could wish. Both climate and soil are unpropitious. Trees which have been sent from this station to settlers at Haines, Alaska, are doing better than they are doing here.

The soil is better and the rainfall is less. Nevertheless the fact that apples have matured here argues that it can be done again. The summer of 1911 was long and favorable, above the average. The summer of 1912 was rather cool and the trees consequently did not do well. It is evident that none but hardy and early maturing varieties—that is to say, varieties which would be early summer apples in the States—can be grown here with any expectation to success. It is hoped that new varieties may be developed suitable to this country, but as yet the experiments have been without success. A small nursery is maintained chiefly with a view to propagating trees to be tested elsewhere. As a whole it may be stated that the outlook for apple growing in Alaska is not bright.

CHERRIES.

There are at the station a few trees of each of the four varieties of the sour cherries—English Morello, Ostheim, Early Richmond, and Dyehouse. The Early Richmond is the best of the four varieties. They have been in the orchard nine years, and began to bear fruit five years ago. They are holding their own, making a moderate growth each year, and bear a little fruit, but are not at home here. They are not doing as well as they would south of latitude 49°. The fruit on all varieties was ripe the past season about August 20.

The sweet cherry, a few kinds of which are also grown at Sitka, has proved a failure.

PLUMS.

A number of young plum trees are under test, mostly hybrids produced by Prof. Hansen, of South Dakota, but none of them is doing well. The coast climate is apparently too wet, and none of them ever showed fruit. The wood does not mature well. The rainfall stimulates growth until frosts, and then the tender shoots die back from 2 to 12 inches. They succeed better in a drier climate, even though the winters were much colder than they are here. So far not a variety of plum gives promise of being a success here.

FRUIT BUSHES.

Small fruits and berries succeed well in Alaska. The fruit crop of the Territory will be confined chiefly to these.

CURRANTS.

The currant leads the list. (Pl. IV, fig. 1.) It is indigenous to the mountains of Alaska, and may often be found as far north as Rampart, where the writer has repeatedly gathered ripe wild currants. The currant is not only suited to the climate, but it has the advantage of being easily propagated. It grows from cuttings without trouble,

and there is no reason why every garden in the Territory up to and even beyond the Arctic Circle should not have currant bushes enough to supply the needs of any family. The same varieties that have been reported on in former years are growing at the station—Red Cross, Ruby Castle, Victoria, Fay Prolific, Wilder, also the so-called common Red Dutch and White Dutch. Ruby Castle is perhaps, all things considered, the best variety so far tried. It has a large berry, is moderately prolific, and matures usually a little earlier than the others named.

The native wild red currant is also grown, but it is not yielding fruit as well as the cultivated sorts, although the fruit matures earlier than the former.

BLACK CURRANTS.

These also do well here, but they are somewhat more tender than the red currant. Two species of the black currant are indigenous to the coast, but they do not range as far north as the red currant. Like the latter it is easily propagated from cuttings and can be grown anywhere in the coast region.

GOOSEBERRIES.

The gooseberry is not as hardy as the currant, but it is essentially adapted to a moist climate, and therefore it does well in the coast region. (Pl. IV, fig. 2.) In the interior it will require some winter protection. It is not so popular as the currant, probably because the latter is so extensively used for jellies, whereas gooseberries are usually eaten ripe or canned green. Another trouble is that the gooseberry is difficult to propagate. It does not grow readily from cuttings. The best method is to layer the branches, and when they have taken root, cut them loose from the parent plant and set them out in nursery rows. They can be propagated from soft-wood cuttings under glass, but the average pioneer is not prepared to do this. Because of the difficulty of propagating the gooseberry plants are priced high in nurserymen's catalogues, which in a measure deters people from planting them. Nevertheless, gooseberries can be successfully grown in the coast regions of Alaska, as has been demonstrated for some years at the Sitka Station. The varieties grown are as follows: Champion, Columbus, Industry, Red Jacket, Smith Improved, Triumph, and Whitesmith. The Whitesmith has a large green berry when ripe, very juicy, and on account of the size of the fruit may be considered the best of those named. Mildew or other diseases common to the gooseberry in the States have given little trouble. The date on which the berries ripen varies considerably with the season. The spring of 1912 was very early, and therefore the berries ripened early—that is, by the middle of August. In 1911 they did not ripen until fully three weeks later.

RASPBERRIES.

All varieties of the raspberry started growth early and by May 1 the leaves were well developed. The crop of fruit was not as heavy as last year, however, nor did it show as large nor as uniform berries. The volcanic ash which fell June 7 to 11 affected the foliage unfavorably, which doubtless had much to do with the fruiting. The berries of all sorts began to ripen about August 8, and they continued in fruit approximately for four weeks. (Pl. II, fig. 2.) The Cuthbert, all things considered, is the best variety tried. Other varieties are: Miller, Turner, Fuller, Champion, Orange, Loudon, and Superlative.

HYBRID RASPBERRY-SALMONBERRIES.

Several of these hybrids which have been mentioned in former reports fruited last year, but the berries are unfortunately no improvement on those produced by either parent. There is very great variation in the plants. They vary in vigor and in foliage all the way from the pure raspberry to the pure salmonberry. The Cuthbert raspberry was the mother plant. Those which resemble the salmonberry more closely are the more vigorous, while those that resemble the raspberry are small, spindling, and apparently of no value. None of the plants are prolific bearers. A number of younger seedlings are coming on, and their behavior is awaited with interest.

ORNAMENTALS.

Of the shrubs grown solely for ornamentation, *Rosa rugosa* takes the lead. This hardy rose is well adapted to Alaska. Whether it will survive the winters of the interior is still a question. It does well in a wet climate. The writer has seen it grow wild in abundance on the west coast of Japan, where the rainfall is very heavy. It grows there in the beach sands, and seems perfectly at home. It is one of the Japanese economic plants. They extract a delicate yellow dye from the roots which they use in coloring silks. Here, of course, it is grown solely for its foliage and blossoms. The blossoms are very large and fragrant, but single. Several hybrids with other species of the rose have been produced; but they have not been tried here as yet. The chief obstacle to the rapid distribution of this plant is that it is difficult to propagate. It will not grow from cuttings, except from young wood under glass and carefully handled. It does grow from seeds, but the seedlings take several years to develop into blooming plants.

Other ornamental bushes which do well are the Tartarian honeysuckle in all varieties and the Siberian pea-tree. The snowball and the common lilac barely hold their own.

Of the perennial herbaceous ornamentals, the columbine should perhaps head the list. It does well in the coast region and blooms

profusely. Other varieties are the phlox, forget-me-not, spiræa, iris, primula, and the herbaceous peony; several species of the lily can be grown, but they can scarcely be called a great success.

CHICKEN RAISING.

Chickens can be raised successfully all over the coast region. As a matter of fact, nearly everyone who can furnish the necessary accommodations keep a few of them. Some are more successful with their chickens than others, depending upon management, and, to a large degree, upon the kinds of chickens.

The White Leghorns are favorites in the Puget Sound country, and because they are numerous and successful there not a few of them are brought to the settlements along the coast. The Leghorn is good for laying qualities only. It has but little value for table use. After looking into the merits of several breeds, the writer decided that the Rhode Island Reds were, all things considered, best adapted to Alaska, although this claim is not conceded by everyone.

Experiments were begun some years ago with 18 head of common barnyard fowls of no special breed, and for the first two years the efforts were almost a failure. Bands of Indian dogs would descend upon the flock and kill many. The ravens destroyed many young chicks, and the wet weather was not conducive to good health.

By the introduction of pure-bred Rhode Island Red roosters, and later pure-bred pullets, the flock has been bred up until they are now practically all pure-bred Rhode Island Reds. These chickens are hardy. They have suffered but little from disease. They are heavily feathered, and therefore well protected against the cold and weather. They grow to a good size and are good table fowls as well as moderately good layers.

Chicken raising has been a side issue, and the fowls therefore have not received the attention they would have had if it were possible to take it up as a specialty. The point that it is now desired to bring out is that although chicken feed costs from \$48 to \$50 a ton laid down at the station, the proceeds from sales of chickens and eggs have amounted to a little better than the payment of actual expenses. Chickens have been sold at from 50 cents to \$1 apiece, according to size, and eggs at the uniform price of 50 cents a dozen, except for about three months in late spring and early summer, when it has been necessary to sell them at 35 and 40 cents a dozen because of the Puget Sound eggs shipped in being cheaper at that season.

If it were possible and practicable to raise the feed here which the chickens consume, there should be a snug profit in chicken raising. But it is neither possible nor practicable to do so, for several reasons. First, the cleared land is too valuable to be put into grain. It must be devoted to other and more important work. Second, grain is

difficult to save because of the heavy autumn rains, and the crop would be a failure more than half the time. Lastly, the grains that could be grown here under favorable circumstances would be barley and oats. Wheat and corn, mill feed, oil meal, etc., would still have to be shipped in. For these reasons no attempt has been made to raise the feed needed.

WORK AT FAIRBANKS STATION.

The season of 1912 was the most successful from the farmers' standpoint ever reported at this station. A mild winter was followed by a very early spring. Seeding began May 1, whereas it usually does not begin until after the middle of May and continues until the first week in June. This early start proved to be of very great advantage. The crops had fully five weeks more in which to develop than is normally the case, owing not only to an early spring but to an unusual prolongation of the summer, with the result that everything matured.

The results proved the advantage of being forehanded with the work; that is to say, everything that possibly can be done in the fall of the year in the way of preparation of the soil should be done in order that advantage may be taken of the first warm days in which to begin seeding. The farmer in interior Alaska should fall plow the land which he intends to seed in the spring. It should be put in such condition that all that is needed when spring arrives is to run over it with a harrow or a disk and then follow with the drill. It is a mistake to do the plowing in the spring. It takes too long to prepare the soil, and too much time is lost before the seed can start to grow. Moreover, deep fall plowing leaves the soil more porous in the spring for the absorption of the snow water, and it dries out more quickly and can therefore be worked earlier. Land that is not fall plowed is hard and impervious, the water stands on the surface for a longer time, and seeding is consequently much delayed. This is one of the lessons learned from work at the Fairbanks Station.

Another lesson the truth of which was very evident the past season is that the gentle slopes and hills somewhat elevated above the flat river valleys are more desirable for farming than the bottom lands. The bottom lands suffer from frosts when the slopes are exempt. This fact is not new. It is as "old as the hills," but it has been brought out anew this year at the Fairbanks Station, and it is pertinent to call attention to it.

Part of the land cultivated at the Fairbanks Station is a hill which has been cleared on the south side of a very dense growth of birch and spruce. It is not more than 30 or 40 feet above the level bottom land, but this was sufficient to save the station potatoes when ranchers who grew them in the flats lost theirs before they were fully grown. In the flats, potatoes were killed by September 1. The station potatoes

on the rising ground were not killed until September 25. This approximate four weeks of extra growth made a decided difference both in the yield and in the quality of the potatoes; and in like manner grains were not injured at all by frosts.

These elemental facts are emphasized in order to impress them upon the farmers. The homesteader and settler are all too prone to select the level bottom land and avoid the rolling portions of the country with the idea that the bottom land is the richer and more productive. This is all very true. South of latitude 49° it is a good practice, but in Alaska it is even more important that the crops should be saved than it is that the soil should be naturally rich. Soil can be made rich and improved by cultivation, but there is no exemption from frosts in the lowlands.

WEATHER CONDITIONS.

As stated, the spring was abnormally early, and it was followed by warm dry weather in the fore part of the summer; but from the first of July until the last of September, cloudy and more or less misty and rainy weather prevailed. In this respect the summer was also abnormal. Had there been the usual amount of sunshine and warmth the grain crops would have ripened a month earlier than they did. It has frequently been pointed out that in Alaska a cloudy summer means a cold summer. Agriculture is in a peculiar sense dependent upon the direct rays of the sun. When they are withheld the soil is not warmed and growth is slow. It so happened that killing frosts on the station farm did not occur until the latter part of September, when they usually occur some three weeks earlier. It was this fact that saved the crops. Nor was the rainfall heavy. The total amount of precipitation from May 1 until the last of September was only $7\frac{1}{2}$ inches. This would have been a severe drought anywhere in the States; the crops would have been destroyed, failure and financial disaster would have overwhelmed the country. In Alaska it was, if anything, more than was needed. Crops can do well on one-fourth the rainfall that is needed to produce a corn crop in the States. This is another peculiarity about Alaska that is pertinent to point out and which is well to bear in mind in studying the meteorological data which are published at the end of each of the reports. The total precipitation for the year, including the melted snow, at the Fairbanks station was but little more than 10 inches, and yet the crops would have matured earlier and the hay would have been saved in better condition had the rainfall been less, especially in the latter part of the summer. For lack of a powerful sun, evaporation goes on slowly. The soil holds its moisture well, and crops develop normal growth with an amount of moisture which would cause a failure in more southern latitudes.

GRAIN CROPS.

Because of the moist weather in July and August, all the grain crops attained a great height. The growth was so heavy, in fact, that much of it lodged. The results would have been better had there been more sunshine and less moisture. However, the early spring combined with the prolongation of summer into September caused all grain crops to mature. For the first time, spring wheat completely matured at this station. This was the case with three varieties—all that were sown—viz, Red Fife, Romanow, and Wild Goose. The seedings were limited to small plats because this favorable outcome was unexpected. The yields of all three varieties were heavy. Mr. Neal estimates that they run between 60 and 65 bushels to the acre. Moreover, the grains were large and heavy. This proves that, part of the time at least, spring wheat can be successfully grown in interior Alaska, and when earlier maturing varieties than those now sown are developed (which is only a matter of time), then probably spring wheat can be successfully grown nearly every year.

When spring wheat matured, it follows as a matter of course that all varieties of barley and oats matured also. The Finnish Black oat is still the favorite. It seldom fails to mature, and this past season Superintendent Neal estimated the yield at about 90 bushels per acre. It is a tall growing variety, and if sown for hay or green forage it will yield heavier crops than the other early oats.

Banner oats even exceeded the yield of the Finnish Black oats, but it is a later variety and it is sometimes caught by frosts, and for this reason a large acreage was not seeded to this variety.

It should be noted in this connection that no fertilizer was used on these grains. It was the natural soil from which the birch forest had been cleared, and it indicates the excellence of this class of land.

Buckwheat was only a partial success, first, because it was injured by a slight frost in early June, and secondly, because the moist weather in the latter part of the summer kept it growing to a prodigious height. Superintendent Neal reports that it was from $4\frac{1}{2}$ to 5 feet tall. Nevertheless he estimates that it matured one-fourth of a normal crop.

Winter rye seeded in August, 1911, survived the winter with a stand of 75 per cent and matured. The red Russian Kharkof winter wheat was on the other hand almost entirely winterkilled, coming out in the spring with a stand of only 5 per cent which matured normally.

POTATO CROP.

Potatoes were grown on a commercial scale at Fairbanks, and for profit. The object is to demonstrate that farming can be made to pay in Alaska. The station is somewhat handicapped in carrying out this plan because it does not want to go into competition with the

market gardeners of the vicinity. If it were not for this, the financial side would show up better than it does. Nearly everyone grows potatoes, and the number of tons which are imported from the Puget Sound country has been materially reduced by the growing of the native product; yet it is estimated that not less than 500 tons were imported for use at Fairbanks and the camps on the various creeks in that region during the past season. This being the case, it is not considered that the station entered into competition with potato growers. Last year some 30 tons of potatoes were raised on nearly 7 acres of land. This year more than a thousand bushels were grown on 5 acres, which shows an average yield of 200 bushels per acre. Aside from growing a crop for marketing, many different varieties were planted in order to determine which of them are the best suited for that region. The varieties and their estimated yields are enumerated in Mr. Neal's report. (See p. 53.)

The crop has not been sold at this writing, and the price will be low compared with the price of former years, but the crop from these 5 acres may sell for at least \$2,000, or at a rate of \$400 per acre, which will afford a good profit. It is a question whether the potato market will continue to be profitable, however. The population gradually diminishes as the placer ground is worked out, and the homesteaders are gradually extending the area in potatoes. The time will come when the price of the native-grown potato will be so low that there will be no profit in it.

In this connection it is well to call attention to the fact that potatoes grown on lowlands, as a consequence suffer from early frosts and seldom mature normally. They are therefore soft and watery when cooked, and when placed on the market they ruin the reputation of the Alaska-grown potato. Ranchers should transfer their potato growing to southern slopes of the low hills. There they will grow a potato of better quality which will not be discredited in the market.

Attention is again called to the fact that there is a great difference between varieties of potatoes. The early maturing sorts are better suited to this country than the late potatoes. Only early varieties should be grown, and of the early varieties the best cookers should be selected for culture. If these points were heeded, the consumer would not discriminate against the native potato in favor of the outside product as is now the case.

It is desired to emphasize once more that the results of sprouting the seed before planting, which have been attained at both the Rampart and Sitka stations, are greatly in favor of this practice. It is not practicable to sprout the seed when several acres are to be planted—not unless special provisions are made for so doing, but

wherever the potato is grown on a small scale there is a great advantage in sprouting them so that they will have vigorous green shoots from 2 to 4 inches in length when planted. This will lengthen the growing season by a month, with the result that the potatoes are better matured and therefore of better quality.

FORAGE CROPS.

It is a matter of very great interest to be able to report that alfalfa and red, white, and alsike clovers all made a highly satisfactory growth at the Fairbanks Station the past summer. All were grown in small plats, but under the same conditions a hundred acres would have done as well as a few square rods. They were all spring seeded, however, and it remains to be seen whether any of them will survive the present winter so as to have any value during the summer of 1913; but even if they should not survive the winter, it proves what can be done by way of providing summer pasture for dairy cows and other stock in that country. It also proves that these legumes can be used as a means of fertilizing the soil. If plowed under in August, they would be equivalent to a very heavy coat of manure, which should result in good crops the following year. It is probable that a large percentage of the white clover and the alsike clover will survive the winter, while the alfalfa and red clover may be frozen out. The problem of introducing hardy legumes is being studied at Rampart and will be further discussed under that station.

HAY CROP.

There is always a good market for hay at all mining camps, and this is especially the case at Fairbanks. The price of hay is governed, however, by the cost of bringing in baled hay from the Puget Sound country, for as yet great quantities of hay are imported into Alaska. This is an unnecessary expense—almost an inexcusable economical waste. Hay of excellent quality can be grown in Alaska. In many cases native grasses can be utilized for hay, but a better plan is to grow hay on cultivated land. Oat hay can be grown every year in any quantity in almost any part of Alaska. In the coast region it is in some places difficult to cure the hay in good condition, but it could then be made into silage. In the interior the rainfall is seldom great enough to interfere seriously with hay making. The past season was perhaps as unfavorable in this respect as it ever is, and yet some 40 tons of oat hay were put up at the Fairbanks Station. Superintendent Neal had some difficulty in curing it, and he found it advisable to build a hay shed under which to store that portion which could not be accommodated in the barn.

TIMOTHY GRASS.

A few acres were seeded to timothy two years ago. The grass survives the winters, but it has not proved a success. This year it was too short to cut. The land has never been fertilized, nor was it cultivated after the clearing, but seeded directly to grass. These facts are partly responsible for the slow growth, but it is well enough to point out that timothy does not do as well as one might expect from the vigorous growth of isolated plants which have started along trails where hay has been carried. The writer has frequently seen thick bunches of timothy grass in isolated places three or more feet tall, from which it might be inferred that Alaska was the home of timothy. The unusual growth attained by such plants is due to the fact that they are isolated, and have plenty of room in which to spread. Under field culture plants crowd each other. They do not grow as large. In this case the small experimental field has been a disappointment.

CLEARING OF LAND.

For lack of funds, but little land was cleared the past season, but it is imperative to the economical handling of the station that more land should be cleared, and it will be better to clear the south slopes of heavy timbered land than it will the north slopes with no timber and only scattered bushes. The latter, it is true, can be cleared at slight expense, but it is also very much less productive than the more heavily timbered land with southern exposure.

THRASHING MACHINE NEEDED.

The station is equipped with a self-binder. It now needs a small thrashing machine. The crops which it is proposed to grow hereafter will be too large to make it practicable to beat the grain out with the flail, and it is hoped that a suitable thrasher will be provided in the near future.

WORK AT RAMPART STATION.

The weather conditions at Rampart differed in some respects from those at Fairbanks. The spring was early but not quite as early as it was at Fairbanks, and while May and June were excellent at Fairbanks, winds prevailed at Rampart, and June was in addition very rainy. However, by the 1st of July extremely hot weather had begun at Rampart, reaching 91° F. in the shade. Toward the latter part of the month of July rains began, and from then until killing frost, September 6, the summer was wet and cold; cold because of lack of sunshine. The result was that the season was not nearly as long as it was at Fairbanks, and a portion of the grain failed to mature.

Thus some of the oats that had been intended for seed had to be cut for hay.

While 1912 at the Fairbanks Station was its banner year, at the Rampart Station it was scarcely an average good season.

The lines of work followed were those which have been described in former reports, namely, the breeding of new varieties of grain by crossing and selection, the propagating and cultivation of hardy alfalfas, and tests of varieties of potatoes. The minor features of the work included some fertilizing experiments on a small scale, the raising of garden crops, and the building of a small propagating house and of a root cellar. The propagating house was begun in the fall of 1911 but not finished until the spring of 1912.

HYBRIDIZING GRAINS.

This is considered the most important work. It is imperative that varieties shall be developed which will mature in all ordinary seasons in the interior of Alaska. During the past year it took 15 days longer to mature the earliest variety of barley than it did the preceding year. The rainy weather in late summer was abnormal to a degree, but it is the kind of variation in climate that must be provided against. It is necessary to have early maturing varieties, otherwise a single untoward summer would perhaps prevent the ripening of the crops over the entire territory.

Some success has been attained with the work of developing new varieties. Four of the hybrid barleys produced are beardless. They have longer heads than either of their parents. The heads are well filled and the grains are large and plump, and a very important character is the fact that the straw is stiff, thus enabling it to withstand the storms. All of these were ripe the past year by August 22, which is early, considering the nature of the season.

The variety which has been named Chittyna was originated at the Copper Center Station. It is valuable in that the heads are of good length, and well filled, and also in that it is moderately early; but it has the serious defect of having a weak straw, hence can not bear up against strong winds. A small field was seeded the past season, and although it lodged, all of it matured. It is a rather vigorous grower, and it will be of value as a hay crop to future Alaskan farmers in that the objectionable beards have been eliminated. Barley is in some respects more desirable for hay than oats. It can be cut earlier, and therefore saved in fine condition before the rains of late summer begin. It is more easily cured than oat hay, and it is fully as nutritious. Bearded barley is objectionable because the beards cause soreness in the mouths of the stock, and may even set up dangerous inflammation. The work of hybridizing barleys was con-

tinued, the earliest maturing and the stiffest strawed varieties being crossed in order to emphasize these qualities.

Some heads of spring wheat were also crossed, the varieties chosen being Red Fife and Saskatchewan, and, in like manner, some heads of Finnish Black oats were hybridized with the variety known as Copperfield.

OATS.

Some 18 varieties of pedigreed oats were grown. The Finnish Black is still in the lead, but there are several others which are pressing it hard, particularly the South Dakota, the Copperfield, and the Hansen. Besides the Finnish Black, we have five other varieties of Finnish oats, the seed of which was obtained from Finland direct. Their chief fault is that they are not quite early enough. Most of them required the past year, because of the abnormal season, 122 days from the date of seeding to the date of maturity. They are vigorous growing varieties with well-filled heads, and it is expected that crosses between them and some earlier variety may develop something desirable.

A variety which in former years matured when the seasons were more favorable failed to mature this year. It is the Great Mogul. It is a desirable oat except that it is too late, and it will therefore have to be eliminated from the list of those that can be grown successfully in interior Alaska. Another variety of oat which was a failure at Rampart this year but which did fairly well in previous years is the Banner, well known all over the country. It is a vigorous grower, producing heavy yields of forage, and for that reason is desirable as a hay crop. It should be noted that it matured at Fairbanks, where the season was longer and rather more favorable than at Rampart.

ALFALFA.

It is some three years since the introduction of the Siberian alfalfas at the Rampart Station was begun, and it gives much satisfaction to be able to report that they have proved themselves entirely hardy. They can withstand the cold winters. Some of them grow vigorous and produce a large amount of forage.

The Grimm alfalfa, which is supposed to be a variety of the common alfalfa, has also proved to be hardy at Rampart. There is no longer any doubt but that these valuable legumes can withstand the winters, and that where once established, they will not only furnish an abundance of nutritious forage, but they will help to enrich the soil.

The past season a small package of soil in which alfalfa had been grown was obtained from the South Dakota Experiment Station, the object being to introduce the bacteria beneficial to the growth of alfalfa. When the fields shall have become inoculated, it is expected

that the growth will be even better than it has been thus far. In one respect the experiment was a disappointment. All of these alfalfas bloomed without producing seed. Seeds were formed on some of the plants, but they did not mature. This is an obstacle that must be overcome. Plants must be found that will mature their seeds in normal summers, otherwise it will be a difficult matter to perpetuate and extend the growth of the species. These alfalfas have been raised from seed, although a small proportion of them have been propagated from cuttings at the Sitka Station, and when established sent through the mails to the Rampart Station. The seedling plants vary greatly one from the other in their habit of growth, in size and density of the leaves, in their tendency to bloom, and in other respects. Now, in order to select the plants which appear most suited to the environments and which are most prone to produce seed, these seedlings are planted and treated as individuals, being set out in rows 2 by 3 feet apart. It will thus be possible to classify them into types and to select more easily those that should mature their seed. Next to the grain breeding this is considered the most important line of work now under way at the Rampart Station.

Prof. Hansen named his varieties of these alfalfas from the regions from which the seed was obtained; they have probably all been derived from *Medicago falcata*, the yellow-flowered mother species. Some of them attained a height of 4 feet when the stems were extended.

M. ruthenica, a species which is also yellow-flowered but which has a smaller leaf, more slender stems, and a more recumbent habit than *M. falcata*, is, according to the experience so far had, not as hardy as the latter, and it will therefore probably not be of as great value. The Grimm alfalfa, on the other hand, appears to rival *M. falcata* in hardiness, and if anything it is more vigorous, and it has a more upright growth. It has purple flowers, but it blooms a little later than *M. falcata* and is therefore less likely to mature seed. The finding of a plant or the development of a strain among these varieties which will prove seed bearing is the most important step in these practical experiments.

POTATOES.

The number of varieties grown in 1912 was confined to five of the earliest and best varieties grown at the station in 1911. The seed was sprouted in a warm room for three weeks before being planted on May 14. On September 1, before the crop had fully matured, the vines were killed to the ground by a hard frost and the crop had to be harvested. At Fairbanks a killing frost did not occur until September 25 and most of the crop had then been harvested. Such are the difficulties that must be met.

The yields both at Fairbanks and Sitka were considerably greater this year than they were at Rampart. The difference, however, is

due largely to the quality of the soil. At Rampart the soil is mostly a clay and at Fairbanks it is a light loam. The testing of varieties will be continued until all the less desirable sorts can be sifted out and something is found that will mature in the brief summer which prevails in latitude 65° 30' north.

FERTILIZER EXPERIMENTS.

The experiments with the three important elements of plant food—nitrogen, potash, and phosphoric acid—which Superintendent Gasser has carried out in 1911 and 1912 all point to the fact that the soil at Rampart, and probably also throughout the whole of the Yukon Valley, is deficient in nitrogen. The nitrogenous fertilizer was the only one that had any decided effect alike on vegetables, grains, and grasses. Potash and phosphoric acid proved to be of minor importance, but nitrogen must be supplied, and since it will be impracticable to ship in artificial nitrogenous fertilizers except perhaps for certain market garden crops and for experimental purposes, it follows that the establishment of a legume which can furnish the needed nitrogen is of the utmost importance to the future of the country. It is hoped to find this in the Siberian alfalfa.

THE ROOT CELLAR.

It was necessary to provide a frost-proof shelter for potatoes and other root crops. This was done by the building of a root cellar into the base of a hill. This cellar is 40 feet long, 16 feet wide, and 7½ feet high from floor to roof. It is lined with barked poles to prevent the soil from caving when it thaws out. At a depth of 5 feet frozen ground was encountered, and the progress of the work had frequently to wait for the thawing of the ground. The construction of this cellar is based on the requirements which practical experience have shown must be met. Not only must the cellar be frost proof, but provision must be made for ventilation and likewise for artificial heating when the temperature falls below -60° F, as it sometimes does. To meet these conditions the cellar has a large anteroom in which a stove was placed, and in the rear are ventilators through which circulation can be established when the atmosphere in the cellar is artificially warmed. This plan has proved successful at the Fairbanks Station, and it is recommended for adoption by those who may build root cellars in interior Alaska.

NEEDS OF THE STATION.

The station needs a greenhouse properly constructed and provided with heating apparatus in which to breed grains in summer and in which plants can be kept alive during the winter. The work of crossing varieties of grain when done in the field can, of course, take

place only during the brief period in which each variety is in bloom, and as this period practically occurs for all varieties at the same time, it follows that there must either be a number of experts at work during this period, or the blooming period must be prolonged by growing a certain number of the grains under glass, and the latter plan is the more feasible. It is desired to erect a plant-breeding house of this character as soon as funds for the purpose are available.

Another of the station needs which has been emphasized during the past season is an additional and larger barn in which there will be space to shelter grains in the straw that would otherwise spoil by remaining outside in the wet, and these barns should at the same time have considerable floor space for the handling of these grains. A new barn was built a year ago, the ground floor of which is a shop and tool house, while the upper floor is a granary, but it is too small for the needs of the work.

Still another and pressing need is the clearing of more land. The grain work and the alfalfa work requires more space than is now available. Ten thousand dollars could be used to excellent advantage in providing these necessities.

WORK AT KODIAK BREEDING STATION.

RESULTS OF ERUPTION OF MOUNT KATMAI.

The work at this station has received a serious setback by a convulsion of nature. As stated in former reports, it was planned to start a dairy at this station from the best milkers in the Galloway herd, in order to make a test of the conceived ideal of making an all-purpose cow of the Galloway. Such a cow is needed in Alaska. Progress had been made in this direction. Eleven head of the best milkers of the breed that could be found in the herds in the States were purchased. These cattle had reached Seattle and were about to be shipped to Kodiak when the telegraphic information was received that a volcanic eruption was in progress in that region. This eruption proved to be so serious as to destroy the pastures completely and compel the abandonment for the time being of all work at the station. The dairy cows that had been purchased and were awaiting shipment at Seattle were placed temporarily on pasture at Kent, Wash., and as all feed had been destroyed at the station on Kodiak, the entire herd had to be shipped where feed could be secured. (Pl. V, fig. 1.) It was a question whether it would be cheaper to buy feed and ship to the herd, or to ship the herd to the feed, and the latter plan was found to be the more economical. The freight to Kodiak prohibited the shipment of feed to the station. The rate maintained by the Alaska Coast Co. is \$23 per ton from Seattle to Kodiak for baled hay, single compressed, and since the hay would cost at

least \$12 a ton purchased in Seattle, the cost would be \$35 a ton, to which should be added \$2 for wharfage, or a total of \$37 per ton laid down at Kodiak. This rate was prohibitive. It was therefore decided to ship the herd to the State of Washington and locate it at a suitable place where pasture and hay could be secured at reasonable figures. Such a place was found at Toppenish, Wash., where native hay was bought in the stack at \$6 a ton, and all the pure-bred stock from Kodiak Station was sent there and likewise the dairy cows temporarily placed at Kent, so that they were all together under the supervision of the superintendent.

This move was not made without first considering the possibilities of placing the herd on native pasture in Alaska. It was thought that the herd might be moved to the south end of Kodiak Island, and several locations were investigated with that end in view. The fall of ash was light on the southern half of the island and the native pastures were not destroyed, but it was found that it was impracticable to put up hay for the winter at these locations. The old dead grass which had accumulated for years formed a sort of cushion at the base of the growing grass through which it was impossible to run a mower. This grass could of course not be burned off, since it would destroy the growing grass also. There were other considerations militating against a location at any point on the island. In the first place, the cost of moving the cattle from the pastures at Kodiak to some point on the south side would be \$15 a head, and more if the weather conditions were such that it would be necessary to hold the steamer for a considerable time in order to unload, for it was impracticable to drive them overland, both because of the mountainous nature of the country and because ashes covered the pasture so that they would starve on the way. Then, too, it was found that the steamer could not approach closely to the land. It would be necessary to dump the cattle in the ocean and let them swim ashore, which involved too great a risk in the rough sea that nearly always prevails in that region. Finally it would have been necessary to buy lumber and construct shelter for the herdsman and the cattle for the winter. These considerations made it impracticable to move the herd to another location on Kodiak Island. Locations on the mainland were considered, and Kashemak Bay, in the south end of Kenai Peninsula, appeared to be the most favorable, but the same considerations operated against establishing the herd there. Winter feed could not be secured with any certainty. The snowfall is always heavy in that region, and obtaining winter pasture could not be counted on. The bay always freezes over in winter, so that no boat could come within miles of the proposed location. It would therefore be impracticable to ship in feed or, in fact, to have any communication with the herd after winter set in.

The Matanuska country was considered, but here, too, it would be impossible to put up winter feed on so short notice. The railroad had not been completed and it would be necessary to drive the herd for many miles over an almost impassable trail. The winter is severe in that region, and it would be necessary to provide good shelter for man and beast. It was not desired to take the herd out of Alaska, but after considering all these points, it appeared the only thing to be done. To have wintered the herd in Alaska would have cost three times as much as it would to ship them out and maintain them in a country where feed is abundant and cheap.

There were 28 head of grade cattle in the herd, the origin of which dated back to the beginning of the experiments with cattle at the Kenai Experiment Station, where a few common cows were secured and a small pioneer dairy was established. This dairy was a success. When the first Galloways were secured cross-bred calves resulted, and these grades, together with a single old common cow of the original stock, numbered 29 head of all ages. These cattle were shipped to Seward, Alaska, and sold for beef. They were in no condition to butcher. They had been on limited feed at Kodiak for about two months. But to ship feed in to put them in proper condition for butchering would have cost as much as they would bring when fattened, hence they had to be sold at a moderate figure. This bunch included 15 yearlings and calves, 10 two-year-olds and 4 old cows. They were sold individually and on their merits, but the proceeds from the bunch totaled only \$1,135.55.

The great expense entailed by the purchasing of feed and payment of freight in order to meet this sudden emergency has crippled the work at the other three stations. It has been necessary to confine the work to mere maintenance without being able to take up any new work or continue the improvements planned. The freight and the transportation bills alone incidental to moving the herd have exceeded \$2,500.

Mr. Snodgrass has described the effect of the eruption in his report in some detail (see p. 67), which I shall not repeat, but merely mention some of the leading features by way of explaining the work of reconstruction which it has been planned to undertake. The ashes fell to a depth of 18 inches over all the pastures. There were three grades of ashes; first, a fine but rather heavy gray sand, next a yellow deposit not unlike yellow clay dust, and lastly an exceedingly fine gray powder which had evidently been blown to great heights and which continued to settle through the atmosphere for days. This last-mentioned material was distributed over an enormous area. It fell at Rampart Experiment Station, in the interior, more than 400 miles distant. It fell all over southeastern

Alaska and was noticed as far south as Victoria, British Columbia. Sulphurous gases accompanied these ejecta, and it is thought that whatever poisonous effect the ashes had on vegetation was due to these gases. The foliage of many species of plants was injured by this impalpable powder. At Sitka Station the leaves on the currant, lilac, and salmonberry bushes curled up and died, and the same was true in a lesser degree of the strawberry plants. Other plants were not affected at all. At Kodiak no poisonous effects were noticed for the reason that all the vegetation less than 18 inches high was completely covered. The native grasses, however, do not appear to have suffered. Rains settled the ashes, and when the writer visited that station in the latter half of August the average depth of the deposit was about 14 inches. The ashes absorbed and held the moisture, and when they again dried out, cracks formed, from 4 to 10 inches in depth, like mud cracks in a dry pond. Grasses and other plants grew up through these cracks with considerable vigor. The ashes had no poisonous or deleterious effect upon plants beyond that of smothering them. This point established, it did not seem improbable that the station land could be rehabilitated by seeding the proper grasses and legumes. To ascertain how grains and grasses would behave in the ashes, small areas were seeded in July to wheat, rye, barley, and oats. Small patches were also seeded to various cultivated grasses and clovers. Part of the seeded patches were fertilized with stable manure and part were seeded on the bare ashes. The seeds germinated, but the growth was very slow in all cases. On the bare ashes the grasses and grains did very poorly. The plants remained alive, but their growth was stunted. Evidently the ashes were wholly destitute of nitrogen. Where the manure was worked into the surface of the ashes, on the other hand, the growth was almost normal, indicating that fertilizers were needed. The superintendent of the Kodiak Baptist Orphanage, the Rev. Mr. Learn, has cultivated a field of perhaps 10 acres, devoted chiefly to the growing of grain hay for his cattle. He, too, was interested in the problem of growing feed on the ashes. He therefore seeded several patches of oats, and gave these patches a top-dressing of nitrate of soda which he happened to have, with quite satisfactory results. Where a liberal top-dressing had been given, in three or four applications, the oats were dark green and vigorous. Where a lesser amount was applied they did not look so well, and where none was applied the oat plants were spindling and yellowish-red in color. This confirmed the above conclusion that nitrogen was needed. It was further observed that when a layer of the ashes was worked in with the original top soil the growth of vegetables and grains was, if anything, better than when grown in the soil

without any ashes. This may have been due to the physical improvement of the black muck, but at any rate it proved that there was nothing deleterious to plant growth in the ashes.

The writer early came to the conclusion that the disaster would prove a blessing in disguise, provided advantage was taken of the opportunity to improve this new layer of soil. Before the ashes fell it was a serious matter to level land in order to make it possible to use a mower. The surface was full of hummocks and hollows. The sod was full of tough roots of grasses, weeds, and small bushes. To break this up, level the surface, and establish a good crop of either grasses or grains, entailed much expense. The layer of ashes has in a large degree remedied all this. On the level areas it is now possible to drive a disk or any other implement over the surface in any direction without serious obstruction. Clearing is obviated except in the willow thickets and where there are other bushes. The buried vegetation will form a layer of fertilizing material for the roots of grasses and grains which are established in the ashes. It is hoped that the experience of other countries will be repeated, namely, that the volcanic ashes will prove to be rich in the mineral elements of plant food, and that when nitrogen is supplied there will be a richer soil than before.

Based on these considerations, it is planned to seed as large an area as it may be practicable to get over to a mixture of grasses and clovers, and in order to establish these plants to apply nitrogenous fertilizers as a top-dressing in not less than two applications. It is also planned to sow about 100 acres to a vigorous variety of oats like the Banner, and with the oats sow vetches and perhaps other legumes. The plan is to make hay and silage of this oat crop for the keep of the herd during the winter of 1913-14. If the oats should grow so well as to afford the necessary winter feed, then the herd could be shipped to Kodiak in the latter part of August. If, however, it should be found that the growth is not heavy enough to yield the forage needed, then the herd would have to be kept in the State of Washington for one more winter.

At this writing the station possesses 86 head of pure-bred Galloway cattle of all ages. It is planned to sell about half of this herd in order to reduce the expense of maintenance, and also to select and breed from the best milkers only, to develop, if possible, an all-purpose cow. The Alaska settler needs that kind of an animal, at least at this stage of the country's development. None of the dairy breeds are hardy enough to stand the climate without too great expense for protection and pampering. The Galloway cow requires a minimum of protection. Nature has provided her with a heavy coat of hair, developed from her outdoor life in the Scotch climate during the past 200 years, and advantage should be taken of this. In sparsely

peopled Alaska, where settlements are hundreds of miles apart, it will always be necessary to ship cattle from place to place. The Galloway cow can stand the rough usage incident to such shipment. She has no horns, which is an advantage in handling her, and for the same reason Galloways suffer no injury from hooking each other in crowded quarters. The Galloway beef ranks with the best produced, and the milk, though not rich like Jersey milk, is of good average quality. There is no doubt but that by selection and breeding, a milking strain can be formed which shall meet the necessity of conditions in Alaska.

The sheep suffered more than the cattle from the volcanic eruption. Twenty-four head were lost. Only seven of them are positively known to have suffocated in the ashes. These were found half buried. The remainder may have been suffocated or part of them at least may have been killed by bear. Among those lost were two pure-bred rams purchased for breeding purposes. One was a Lincoln and the other a Cotswold. They were fine representatives of the breeds and weighed about 300 pounds each. The loss of these rams was quite serious. Of the 42 lambs which had been dropped up to June 6, only 25 were found alive when the flock was gathered up after the disaster. The writer purchased another Cotswold ram from a breeder at North Yakima, Wash. He was shipped to Kodiak in November and arrived safely. The sheep are not bred until December. The plan is to have the lambs come with the beginning of grass in June.

The sheep and horses belonging to the station were kept at Kodiak, where feed had to be shipped, but the amount required was not great, and it is expected that with the arrival of spring the sheep will be able to make their living on the hillsides from which the ashes have been washed by the rains, at least in part. The horses were kept because they will be needed in the early spring for the preparation and seeding of the land as above mentioned. The sheep and horses were removed from the reservation at Kalsin Bay and taken to the barns on the small reservation at Kodiak, in order that they might be handled more economically. Only one man was left to care for the property, namely, Mr. C. W. Heideman. Mr. Snodgrass and Mr. Kelly were required with the herd at Toppenish, Wash.

PURCHASE OF MILKING GALLOWAYS.

The writer and Mr. M. D. Snodgrass visited a number of Galloway herds scattered over the Middle West during the month of May, 1912. Previous correspondence with breeders had located herds from which milkers could be obtained. Milkers are not common in the Galloway breed, particularly in the larger herds, where they are bred for beef only. The best cows were found in small herds owned

by farmers who had bred for the dual purpose of milk and beef. Altogether 11 cows, 5 of which had calves, were selected, and, as already related, they were shipped to Seattle for transshipment to Kodiak when the disaster occurred. They are now with the herd at Toppenish. It is a matter of regret that the conditions under which the herd is being kept this winter, and must be kept next summer, does not make it practicable to handle the cows as they would be handled if they were at the dairy at Kodiak. Galloways are naturally wild, especially when bred in large herds. It is believed by handling the calves daily they may overcome their natural shyness, and this is being done as far as possible. To make an animal gentle this must begin early, and gentleness is not only conducive to thriftiness but it is a necessity in animals intended for the dairy.

THE BEAR A MENACE.

The great brute which dominates animal life on Kodiak and other islands, as well as the adjoining mainland, has proved himself to be a menace to advancing civilization. He was caught in the act of killing a cow and calf belonging to the station. Of the cattle and sheep which are missing it will never be known how many were killed by bears, but whenever a bear sees a cow or a sheep he kills it. On Afognak Island several cows and many sheep are known to have been killed by bears. It is reported that after the fall of ash bears killed seven sheep from one flock in one night at Afognak. While the bear is an interesting animal, not only zoologically, but in that he affords good sport for hunters, and while the particular species inhabiting this region of Alaska is of especial interest because of his great size and power, and because he is probably the largest bear on earth, it is also a fact that if this region of the country is to be settled by farmers and introducers of live stock the area inhabited by the bear should be circumscribed. Cattle, sheep, and bear can not live peacefully together. If this species of bear must be protected it should be confined to a region in which stock breeding would not be practicable. Settlers in Alaska have no greater love for the bear than the pioneers had for him when they began to make homes in the primeval forests of the States, nor than the settlers in the mountains now have for the cougar. She bears are dangerous to man. Many an Alaskan carries the marks of an encounter with one of these brutes, and not a few people have been killed by them. The battle with nature which the Alaska pioneer has to fight is hard enough. It should not be made harder by compelling him to bear the inroads of brutes whose sway belongs to a bygone age. It should be made lawful to kill bears wherever they destroy live stock.

DEVELOPMENT OF CATTLE FOR THE INTERIOR.

In a former report the writer recommended the introduction of the yak from the high plateaus of Asia to Alaska, with a view to crossing him on the Galloway cows. The yak is an exceedingly hardy animal. He is at home in Thibet, where the winters are severe and life strenuous. He is the domestic ox of the people in those countries. Nature has provided him with a long coat of hair as a protection against the cold. He is of large size and furnishes a heavy weight of beef. The writer believes that if the yak were crossed on Galloway cows the offspring would result in a race of cattle that would be well adapted to the interior of Alaska. They should be as hardy as the moose and nearly, if not quite, as frugal. They should be able to withstand the severe cold of the interior winters with such pasture as they might find, and certainly if feed were provided for them. There are many examples of horses, abandoned by prospectors in the fall of the year, that have come through the winter alive, having made their living on dry grasses and such other feed as they could find. Hardy cattle could doubtless do the same. Common cattle can, of course, be wintered, but they must be adequately protected. They can not rustle for themselves. All their feed must be provided, and even with protection they sometimes succumb. The writer has known of cows freezing to death in their log stables in the interior. It would seem that it would be well worth while to attempt to develop a hardier race, and it would also seem that if such an attempt were made it would appropriately fall to the task of the Alaska experiment stations to make it. The writer is in correspondence with parties in England who will undertake to furnish suitable breeding stock of the yak for reasonable prices, and the recommendation that the experiment be tried is renewed.

A GARDEN SURVEY OF SOUTHEASTERN ALASKA.

For a number of years, through the cooperation of the Bureau of Plant Industry of the Department of Agriculture, the Alaska stations have supplied vegetable and flower seed to a large number of settlers throughout the Territory. During the summer of 1912 Mr. J. E. W. Tracy, assistant superintendent of testing gardens, was requested to visit Alaska, and, as far as opportunity offered, to inspect and report upon the gardens as viewed by one who has had considerable experience with vegetables and flowers. Attention is called to the very favorable report which he has made on the possibility of growing vegetables and flowers in southeastern Alaska. (See p. 77.)

REPORT OF WORK AT FAIRBANKS STATION.

By J. W. NEAL, *Superintendent.*

Pursuant to the plans set forth in a former report, the work of general farming rather than of actual experimental work has been continued. However, a limited amount of variety plat work has been kept up for the benefit of visiting settlers and the many visitors from the States and other lands who pass through this country.

This station has attracted much attention during the summer of 1912. Travelers from many parts of the globe registered at Fairbanks during the present calendar year, many of whom after visiting the station expressed their amazement upon seeing the fields of ripened grains, alfalfa, clover, vegetables, and flowers. The majority of people still think of Alaska as one great field of ice, and those who see the possibilities of agriculture unfolded before their eyes in one grand panorama, as displayed on the southern slope during the season of 1912, may well be surprised.

The latest visitors for the season were the honorable United States railroad commissioners, accompanied by the Hon. James Wickersham, Delegate to Congress from Alaska, Mr. Falcon Joslin, president of the Tanana Valley Railroad, also a number of prominent Alaska citizens. At this late date—October 12—the crops were already harvested and stored for the winter. There had been no snow at that date, nor was the ground frozen. The yard was still a profusion of flowers and the clover lawns were green as in midsummer. The crops were exhibited as well as possible, and the visitors were shown several tons of ripened grain in the sheaf and stack, as well as 3,000 pounds which had already been flailed out. They were shown through the large cellar, where more than 1,000 bushels of potatoes of 16 varieties were stored.

It has been stated that upon their return to Fairbanks the railroad commissioners announced that they would not dare to tell what they had seen in Alaska when they returned home, for the people would not believe them.

The season of 1912 has been the banner year thus far, and like reports are coming from all over the Tanana Valley.

Two church Sunday school picnics were held at the station in the birch grove on the hill above the cottage during the summer, which afforded some 300 of the Fairbanks citizens the pleasure of visiting the station. On both occasions the general theme of expression was—What a beautiful place! What wonderful crops!

CLIMATIC CONDITIONS.

It has been said that the climatic condition of a country is one of the first attributes to be considered when a change in habitation is contemplated, but perhaps opportunity is even more important to the

man in very moderate circumstances, who can not live on climate alone. Every country has some drawbacks, among them undesirable weather conditions; it is usually too cold, too hot, too wet, too sickly, or even all of these conditions exist in one locality. Interior Alaska has its cold winters, but the summers are not too warm, nor seldom too wet, and with proper cultivation, seldom too dry. There are few, if indeed any other, localities on the globe which can boast of a more healthful climate.

The last winter here was the mildest known to white man. The temperature ranged along about -10° to -20° F., with a great deal of the time at or above zero. The temperature fell to -34° F. one day in November, -45° F. one day in December, -42° F. one day in January, and -32° F. one day in February. The snowfall was rather light, and very little fell during the early part of the winter. Freighters were compelled to use wagons until December.

The spring of 1912 opened about three weeks earlier than usual and some of the farmers started seeding in April. At the station seeding was commenced on May 1. The early summer was warm and dry, and crops made an excellent start. The last half of the summer was quite unfavorable for growing crops. The weather continued too cool, and there was practically no sunshine after the month of June. Even on clear or partly cloudy days the atmosphere was filled with a smoky haze, probably due to the volcanic eruptions on the coast, consequently the sun had little effect on the crops. Regardless of this condition, crops matured fully as well and somewhat earlier than in former years, due to early seeding, and this is the first year in which spring wheat ripened. A light frost occurred on June 8, killing some of the buckwheat at the station, also freezing most of the early potato plantings in the lowlands. The station potatoes were not up at that date. The next killing frost occurred in the lowlands on August 12. The temperature at the station fell to 36° F.; other light frosts followed in the lowlands until many of the potatoes were more or less damaged. Some patches were frozen down by September 1, yet many escaped the frost until well into September. At the station the potatoes were frosted enough to wilt the vines on September 25; the crops were nearly all dug at that date.

The fall continued warm with very little rainfall, and the ground had only started to freeze when the first snowfall occurred October 16. Plowing could be continued until about October 20.

The rainfall from May 1 to September 30 amounted to 7.31 inches. The total precipitation for the year, including moisture in the snowfall, amounted to 10.20 inches; the snowfall was $39\frac{3}{4}$ inches.

THE MARKET.

The market is one of the most important adjuncts to the farmer, for if he can not dispose of his crops they are of little value to him. The market in Alaska is very limited, and should be thoroughly investigated before prospective settlers or newcomers engage in farming in the interior.

With the lack of necessary transportation facilities, and the sparsely settled communities in this country, the farmer must depend upon his own locality to consume his products, and it is easy for the supply to exceed the demand. At present it is estimated that 450 to 500 tons of potatoes are consumed annually in the Fairbanks district, and probably 300 tons were grown here this season. A thousand tons of timothy hay is consumed annually, for which oat, barley, and wheat hay might be substituted.

Oat hay is in sharp demand at present at \$50 a ton. Timothy sells at \$90, and feed oats at \$100.

Six thousand cases of eggs are shipped in annually, which might be produced here at a fair profit. Eggs range from \$15 a case in summer to \$30 or more in winter. The native product usually sells at double these prices.

Hog raising was becoming quite an industry until the present summer when nearly 75 per cent of the hogs throughout the Fairbanks district died with some contagious disease, presumably brought here through diseased hogs shipped in from Seattle by the local meat concerns.

Garden stuff commands a good price, but the supply usually exceeds the demand. Native potatoes are slow sale this season at 4 cents per pound. The Alaska potato market is peculiar. The Fairbanks market especially demands, first, an outside, or imported, potato regardless of price, kind, or quality; therefore, the merchants in their endeavor to please their customers do not like to handle the native potatoes, and will not, as a rule, when it is possible to have the outside stock. Another important factor peculiar to the Fairbanks market, and which applies to probably all camps in the interior of Alaska, is that there is no outlet for an overproduction. Each camp is practically isolated from every other camp, and present transportation facilities do not afford a means of exchange for overproduction with other camps, which is very different from conditions on the outside where surplus products can be shipped to a ready market.

SOIL FERTILITY.

The soil of the hilly and upland regions of this country is a silty clay, almost free from stones for a considerable depth. It is usually underlain with a gneiss or schist formation, but much of the country



FIG. 1.—CATTLE AFTER FALL OF ASHES, KODIAK ISLAND.



FIG. 2.—OATS SEEDED IN VOLCANIC ASH, KODIAK ISLAND. FAIR GROWTH WAS MADE WHERE MANURE WAS APPLIED.



FIG. 1.—BARLEY HAY, FAIRBANKS STATION.



FIG. 2.—FINNISH BLACK OATS, FAIRBANKS STATION.



FIG. 1.—YARD AT FAIRBANKS STATION, GRIMM ALFALFA AT LEFT.



FIG. 2.—FERTILIZER TESTS OF OATS, FERTILIZED PLAT AT RIGHT.



FIG. 1.—POTATO FIELD, FAIRBANKS STATION. YIELD 235 BUSHELS PER ACRE.



FIG. 2.—POTATO TRIAL PLATS, FAIRBANKS STATION.

rock is quartzite or shale. Around old prospect holes or excavations where the deep subsoil is exposed vegetation soon covers the heaps of earth. The surface soil appears to be very thin, but when it is plowed and mixed with several inches of the subsoil it makes a dark claylike loam of fine silty texture. However, plant food does not seem to be available at first to make a crop, except on the timbered land, where a great amount of vegetation has decomposed and washed into the ground. Such land is proving to be very fertile, several acres of it having been cropped for three successive years at this station, the yields increasing with each year's cultivation.

SOIL TREATMENT.

The soil in a cold climate requires somewhat different treatment from that where the ground does not freeze. Here the ground is frozen nearly seven months of the year, and chemical action is therefore very much retarded. Plant food does not become available rapidly enough to crop the land every year. A system of cropping most of the land every other year has been inaugurated, especially for the hay and grain crops. This system admits of summer plowing when more or less green stuff can be turned under, and it also relieves the spring rush of preparing the soil for seed. The soil should be plowed deeply in July or August and left rough so that the air can act upon it. For good results the spring cultivation should be very thorough before seeding. If time will permit it is highly beneficial to replot the land in the spring, as it helps to warm the soil, and it seems the more the soil is stirred in the spring the better the crops which follow. Care should be taken not to plow too much litter under, as it tends to cut off the capillary action of the moisture, and the rainfall is usually very light during the months of May and June. Without proper tillage the soil is apt to become too dry, and the crops will suffer from lack of moisture. It should be remembered that most of the snow water runs off before the soil is sufficiently thawed to absorb it, and it becomes necessary to conserve the moisture as much as possible.

FERTILIZERS USED.

Several acres of wheat, barley, and oats were fertilized this year with a light dressing of sodium nitrate at the rate of about 150 pounds to the acre, applied by hand and worked into the soil before the seeding was done. This single application more than doubled the crop over like adjoining ground not fertilized. (Pl. VII, fig. 2.) One acre of light ground on the north slope yielded 90 bushels of potatoes in 1911. This patch had also been in potatoes in 1910. Two hundred

pounds of sodium nitrate were applied to the 1-acre tract this year, and worked into the soil, then planted to five varieties of potatoes with a view to changing the seed another year on the heavier south slope soil. The nitrate ordinarily is not used alone for potatoes, but there was nothing else at hand. The result, however, was very striking. There were dug from the tract 190 bushels of tubers, and they are of excellent quality. The gain of 100 bushels is not entirely attributed to the nitrate, for the potatoes elsewhere on the station grounds yielded slightly better this year than they did the year previous. Small patches of grain on ground fertilized with stable manure made so rank a growth that it fell flat when in blossom. Much of this grain stood as tall as the average man.

THE HAY CROP.

About 22 acres were seeded to oats, wheat, and barley for hay this season, cleaning up all the old seed at hand. (Pl. VI, fig. 1.) Quite a little of this seed was native, having been flailed out from the previous crop.

Haying began this year on August 12, and continued well into September before the crop was all in the stack owing to very unfavorable weather. The 22 acres yielded about 30 tons of hay, and it was all finally cured and stacked in very good condition. Portions of the hay land were fertilized with a dressing of sodium nitrate at the rate of 150 pounds per acre, which was applied by hand in front of the harrow and before seeding. This light application doubled the crop in nearly every instance. The yield was actually about $1\frac{1}{2}$ to 2 tons to the acre, while the unfertilized ground produced from $\frac{1}{2}$ to 1 ton per acre. This experiment was upon light land sloping to the north, plowed in August of the previous year.

GRAIN CROP.

Red Fife wheat seeded May 1 began heading July 3. It had sufficiently ripened to cut on September 10. It made a thick, even growth 4 feet tall and yielded about 55 bushels per acre.

Romanow wheat seeded May 1 began heading July 4. It ripened with Red Fife. The grain stood $4\frac{1}{2}$ feet tall, very even and thick throughout the plat. This variety gave a yield of 60 bushels per acre.

Wild Goose wheat seeded May 2 began heading July 4. It ripened a few days later than the above varieties, stood 5 feet tall, very even and thick throughout the plat, and indicated a yield equally as heavy as Romanow.

The fall proved so cool and damp that these three varieties were cut and hung up in a shed to dry out and harden. The grain is well filled with plump kernels.

Sixty Day oats seeded May 2 began heading June 28. They made a thick, even growth about 3 feet tall, were ripe enough to cut August 10, and yielded about 85 bushels per acre.

Finnish oats seeded May 10 began heading July 4, and were ripe for cutting August 15. The crop was very heavy, standing 4 to 5½ feet tall. This variety yielded at the rate of about 90 bushels per acre. (Pl. VI, fig. 2.)

Banner oats seeded May 2 began heading July 4, made a very thick growth 3½ feet tall, and were ready to cut August 15. This variety gave a yield of 100 bushels per acre.

Beardless barley (No. 19852) seeded May 3 began heading June 26. It made a heavy growth 4 feet tall, was ready to cut August 10, and when thrashed yielded 50 bushels to the acre.

Hull-less barley (No. 19851) seeded May 3 began heading June 25, made a thick even growth 3½ feet tall, was ready to cut August 10, and yielded 42 bushels of 60 pounds each per acre.

The above grains were seeded with a No. 4 Planet Jr. drill on a south hillside which had been cropped to potatoes the two years previous. The tract is birch timber land cleared three years ago. No fertilizers were used on this tract, neither on the potatoes nor on the grain, but it probably represents the best soil and exposure.

Buckwheat seeded May 10 was injured by frost June 8. The first blossoms appeared July 5. It made a heavy growth 4½ to 5 feet tall. The weather was so cool and cloudy all fall that only about 25 per cent of the grains ripened. Some of this was stripped off by hand for seed, and the crop plowed under as a fertilizer. This was the heaviest growth of buckwheat the writer has ever seen, and other easterners who saw it were of the same opinion.

Fall rye and Kharkof winter wheat were seeded on a north slope of light soil the first week in August, 1911. It made a fair fall growth. About 75 per cent of the rye survived the winter, but not more than 5 per cent of the wheat lived. Both grains matured, but much later than usual. Fall grains generally ripen about August 10. The same varieties were seeded August 1 of this year on newly cleared birch land sloping to the south and west.

GRASSES.

The 5 acres of timothy which were seeded in June, 1911, survived the winter well, and the spring growth covered the ground entirely. The summer growth was tall enough, averaging more than 30 inches, and the seed ripened, but the stems stood too thin to pay to cut except in very small patches. Three acres of this grass were plowed under this fall, together with the rest of the field, and also some new ground which had been cleared the fall before.

Single plants of volunteer timothy about the fields often attain good height and make a thick bunch of stems, and the seed usually ripens. Under the general cultivation the soil appears to be too dry for timothy, as it always does better where seed has been spilled along the trails or scattered about in feeding timothy hay, where there is more or less shade and plenty of moisture.

Other tame grasses tried here have failed entirely. Wild red top, white top, and blue stem all come up along the slopes both north and south where the timber has been cut off or killed by forest fires, and if the seed could be obtained in commercial quantities these certainly would be the meadow grasses for this country.

LEGUMES.

Plats of alfalfa, red, white, and alsike clover were seeded about the yard fronting the cottage during the first week in June after the main crops were all in the ground and the yard laid out. These plats were fertilized with stable manure and sodium nitrate. The alfalfa covered a plat 24 by 48 feet. It came up very quickly and made more than a 2-foot growth standing very thick on the ground. It began blossoming about the middle of August and doubtless would have made a light second crop if cut then. (Pl. VII, fig. 1.) Visitors coming in quite frequently, the alfalfa was left standing until late in September. After it was cut for feed, the stubble had made some new growth when the snow fell.

The red clover covered a plat 36 by 48 feet, making a very thick stand. The summer growth was a little over 2 feet high, and this plat was red with blossoms from the middle of August until cut for feed late in September. This plat was also left standing all fall, being much admired by the visitors.

The alsike clover covered a plat 15 by 20 feet, and made a very thick growth 2 feet high. It was also cut for feed with the red clover. Both plats were turning quite green before the ground froze.

The white clover occupied two small plats fringed with pansies, China asters, and China pinks. The white clover covered the ground thickly with about 8 inches of growth, which was almost hidden under its blossoms.

Field peas were grown this year by some of the settlers, and they report that they are well pleased with results. They have not been tried at the station.

Other green manuring crops, such as buckwheat and rye, promise to be more suitable here, as either of these will afford a fair crop to turn under by August 1.

POTATOES.

The potato crop of 1912 has by far excelled that of previous years all throughout the Tanana Valley as far as reported. The yield in Fairbanks and the immediate vicinity, it is estimated, will total upward of 300 tons. The tubers in nearly every instance are superior in quality to those of other years. The prejudice against the native potatoes is being gradually broken down, and it is probable that in two or three years the native potatoes will control the market, if indeed imported potatoes are not excluded entirely. As the farmer here extends his clearings he is enabled to enlarge his crops, and not only produce more but also cheapen the cost of production so that he can sell potatoes for 3 cents a pound and still make a handsome profit. The dealers can no longer afford the risk of disposing of their imported stock, which will cost them at least 5 cents, to say nothing about the loss by shrinkage, which is much greater than on the native product. The station crop for 1912 amounted to about 1,000 bushels of marketable size, and probably 5 tons of small potatoes and culls from a little over 5 acres. (Pl. VIII, fig. 1.) The small tubers found a ready market at 1½ cents to 2 cents per pound before the recent hog epidemic struck the camp.

Sixteen varieties of potatoes were planted from May 14 to 22. (Pl. VIII, fig. 2.) The greater part of the crop, however, was of the varieties Eureka and Gold Coin.

The experimental plat was on ground cultivated for the third year, being in potatoes the two previous years. The ground was fertilized for the first time with old stable manure for this crop. Each variety was planted on May 14 in rows 40 feet long, the seed dropped and covered by hand 1 foot apart in the row, making 40 hills of each variety. As the rows were a trifle under 3 feet apart, each variety occupied 120 square feet of space, or 363 such rows per acre. The potatoes were dug on September 18. The marketable tubers only were gathered and weighed as follows:

(1) Butkee, a local product; white skin, rather large, oblong and quite regular in shape, deep eyes, and cooks quite dry. The yield was at the rate of 478 bushels per acre.

(2) Irish Cobbler; white skin, rather large, oblong and quite regular in shape, medium deep eyes, and cooks quite dry. The yield was at the rate of 423 bushels per acre.

(3) Gold Coin; white skin, medium size, round and somewhat flattened, quite regular in shape, small eyes, and cooks quite dry. The yield was at the rate of 375 bushels per acre.

(4) Eureka; white skin, medium to large size, round and slightly flattened, quite regular in shape, small eyes, and cooks quite dry. The yield was at the rate of 345 bushels per acre.

(5) Vornhem; white skin, medium large, oblong, irregular in shape, deep eyes, and cooks medium dry. The yield was at the rate of 314 bushels per acre.

(6) Garfield; white skin, medium size and oblong in shape, somewhat irregular with many knotty or little side tubers, deep eyes, and cooks quite dry. The yield was at the rate of 308 bushels per acre.

(7) Burpee Early; red skin, medium in size, oblong and quite regular in shape, small eyes, and cooks quite dry. The yield was at the rate of 302 bushels per acre.

(8) Early Ohio; red skin, medium in size and round, a little rough with deep eyes, cooks very dry. The yield was at the rate of 302 bushels per acre.

(9) Freeman; white skin, medium large in size, oblong and irregular in shape with many knotty or little side tubers, rather deep eyes, cooks only fair to medium dry. The yield was at the rate of 302 bushels per acre.

(10) Extra Early Pioneer; white skin, medium large, round and quite regular in shape, rather deep eyes, cooks quite dry. The yield was at the rate of 278 bushels per acre.

(11) Snowflake; white skin, medium large, oblong and irregular in shape, deep eyes, and cooks medium dry. The yield was at the rate of 272 bushels per acre.

(12) White Mammoth; large round and oblong tubers with quite deep eyes and regular in shape, cooks only fair to medium dry. The yield was at the rate of 254 bushels per acre.

(13) Extra Early Ohio; pale red skin, medium size, round, medium deep eyes, cooks quite dry. The yield was at the rate of 242 bushels per acre.

(14) Early Market; light pink skin, medium small, round, a little rough with deep eyes, cooks quite dry. The yield was at the rate of 242 bushels per acre.

(15) Bovee; pink skin, medium in size and round in shape, with small eyes, and cooks quite dry. The yield was at the rate of 206 bushels per acre.

(16) White Beauty; rather large round tubers with small eyes, cooks medium dry. The yield was at the rate of 194 bushels per acre.

Considering the market values of the above varieties, or rather such a class of potatoes as those which find preference in the market, the smoothest white-skinned varieties which are good cooks would be selected. Alaska-grown potatoes are not as dry and mealy as outside potatoes, and oftentimes some varieties become watery when cooked. On some soils the whole crop is watery and unfit for table use. This accounts for the strong prejudice against the native product.

In cooking samples of the 16 varieties grown at this station for the season of 1912 not a single watery potato was found, although those classed as "medium dry" were not far from it.

Some of the red-skinned varieties are the best cookers, but these do not sell readily because of the color of the skin.

The quality and the yield of potatoes differ materially with the season, so that several years of comparison are necessary to arrive with any degree of exactness at the relative values of different varieties.

This is the first season the many little side tubers on the Freeman and Garfield varieties have been noticed. Some very large tubers have prongs, and sometimes clusters of small side tubers firmly connected to the large tuber, rendering them unsalable.

For market purposes, Gold Coin, Eureka, Irish Cobbler, and Butkee varieties are preferred to the other 12 varieties, and these, by the way, were the heaviest yielders in 1912. The Gold Coin and Eureka take preference in the order as named because of their shape and smoothness, and also because of their cooking as well as any white potato on the list.

Based on cooking qualities only, departing from color preference, selections would be made as follows:

Early Ohio, Burpee Early, Extra Early Ohio, and Bovee, of the red or pink skinned varieties. Next, the Gold Coin, Eureka, Irish Cobbler, and the Butkee. Some of the others are close seconds to the last four named, especially the Extra Early Pioneer.

Two and one-half acres were planted to Gold Coin and Eureka on the south slope in ground that was cleared and cropped to potatoes in 1911, but the soil was never fertilized. The yield averaged 7 tons of potatoes, or about 235 bushels per acre for the entire field in 1912.

As stated elsewhere in this report, an acre of light land sloping to the north was planted to five varieties of potatoes after an application of 200 pounds of sodium nitrate, and the yield was slightly more than double that of last year. This ground has been in potatoes three successive years.

For the system of potato culture followed, see the report of these stations for 1911, page 47.

THE VEGETABLE GARDEN.

Turnips, carrots, beets, peas, parsnips, celery, rhubarb, string beans, cabbage, and cauliflower were all grown successfully for home consumption.

Horse-radish made enormous top growth; it is now 3 years old. The main roots are from 1 to 1½ inches thick.

Strawberries wintered with very little loss, but because of the necessity of moving them they did not bear much fruit.

THE FLOWER GARDEN.

The China pinks, asters, and pansies which fringe the clover beds, together with the masses of sweet peas, morning-glories, stocks, poppies, daisies, candy tuft, nemophila, sweet alyssum, and other pinks, pansies, and asters which fringed the borders of the cottage greenhouse and other portions of the yard made one profusion of flowers all summer and until the middle of October.

STOCK RAISING.

One important factor in a new agricultural country is that of stock raising. Perhaps the question of feed is the first problem, then comes the question of market, climate, etc.

A number of settlers have already attempted to raise hogs and cattle. The hog industry had begun to be successful, when suddenly the hogs began to die all over the country with some contagious disease, which was probably brought into the country through infected hogs shipped here from Seattle by the local market dealers. Upward of 75 per cent of the hogs in the country have already died, and the industry is demoralized for the present.

It has been demonstrated that hogs can be raised here almost entirely on the potato culls and various root crops by feeding very little corn to harden them off for market. The fancy prices paid for pork had much to do with stimulating the hog industry. Hogs on foot bring 30 to 35 cents a pound.

As stated above, some settlers are attempting to raise cattle, but at the present price of feed there is not much profit in raising beef. A limited number of dairy cattle can be profitably kept, as milk commands a good price. It is probable that beef raising could be made to pay if silos were introduced to avoid annoyance and a great amount of work trying to cure large quantities of hay. It frequently happens that the weather conditions are extremely unfavorable during the haying season. Crops can be cut green and made into silage much cheaper than into hay. Crops also go further when fed as silage than as dry hay. Warm shelter must be provided for all kinds of stock in winter.

IMPROVEMENTS.

The station now has a very good equipment of farm implements and tools ordinarily used on a farm.

There are about 100 acres of land now in cultivation, in four separate tracts, representing the south slope, the north slope, and

level land. To inclose this requires about 5 miles of fencing, and with a little additional fencing surrounds some 200 acres of pasture land lying between the cultivated tracts. Probably 2 miles of roadways have been cut through the timber to the different fields, and portions of them have been graded along hillsides. About 20 acres of timber lying between the railroad and the station buildings have been slashed and partly burned, bringing the station in full view of passing trains for a distance of more than one-half mile.

The buildings consist of a four-room cottage, a greenhouse 12 by 20 feet, a barn 30 by 60 feet, with a shed 16 by 60 feet. Also a blacksmith shop, a root house and root cellar, the cellar being 15 by 60 feet, and root house 16 by 24 feet. There is also a hay barn 20 by 42 feet, with a 16-foot open shed at one end, and there are now under construction 13-foot sheds along each side of the main building. The main part of this structure is 16 feet high from the floor to plates; the building is about completed with the exception of the side sheds and hay-carrier track.

A very important acquisition to the station equipment would be a small thrashing machine, as it costs considerably more to flail seed out in the old way than imported seed sells for in the Fairbanks market.

The station will also need a new team in another year to replace the team now owned.

REPORT OF WORK AT RAMPART STATION.

By G. W. GASSER, *Superintendent.*

CLIMATIC CONDITIONS.

Even to those initiated and inured to local conditions, the weather is full of surprises, and in this respect the past season has not been exceptional. The winter was mild, the minimum being but -54° F., which came December 23. The minimum for January was -32° F., and for February, -43° F. The snowfall for the winter was 36.6 inches, which is somewhat less than normal and much less than one would naturally expect during a mild winter. April proved to be a warm month, rapidly melting the snow, so that by May 1 no snow remained, except in sheltered places. During May the weather continued fair, but the temperature average was rather low, accompanied by a cold wind. The ice broke in the Yukon May 27. June, usually the driest, sunniest month of the year, began with a four days' rain. From then on, rainy, overcast weather was the rule throughout the growing season. June, July, and August each had five clear days, September none. Number of days with 0.01

or more inches precipitation: June had 14, July 7, August 11, and September 11—total, 43 days. Total precipitation for the above months, 6.59 inches. First killing frost came September 2. No more freezing weather occurred until September 19. Number of days between last spring frost and first killing fall frost, 110. A number of seismic shocks were felt during the summer, the heaviest occurring July 6. On June 12 volcanic ash was observed in appreciable quantity on the leaves of plants, giving them a grayish cast. At various times during the summer the air was impregnated with a sulphurous odor, and rain barrels and water pools were often yellow with material precipitated with the rain.

WORK IN GENERAL.

The propagating house, begun in the fall of 1911, was completed the following spring. It is 14 by 16 feet and adjoins the house on the southwest side. The stove is set under the bed at one end in a pit of sufficient depth to bring the top level with the earth floor. The stovepipe is laid under the bed which is built against the outside wall, leaving space for a door at one corner next to the house. At the door the pipe passes up and out. By laying the pipe in this manner, instead of running it up directly from the stove, there is great saving of fuel and a very even distribution of heat. In the propagating house sets of cabbage, cauliflower, celery, etc., were started, and tomatoes and cucumbers grown to maturity. In the near future another and larger propagating house should be built, so as to permit carrying on grain breeding indoors, thus greatly lengthening the season for this important work.

The immediate need of the station is a barn having considerable floor space, where ripe grain can be stored and dried preparatory to thrashing. During a wet season such a place is imperative for the proper handling of the experimental grain plats.

A frost-proof root cellar was completed in time to house the root crops. This cellar is 16 feet wide by 40 feet long, with a 16-foot entrance room to serve as a buffer against cold in the winter and heat in the summer. To build the cellar an open cut was made into a hill having a 12-foot elevation. Frozen ground was encountered at a depth of 5 feet. The ground thawed so slowly that a steam thawer was used for a few days. However, the thawer was small, operating but two points, and as the ground was a dry, sandy clay, progress was slow. Giant powder was then tried and proved a great success. The sides of the cellar are lined with spruce poles with the bark removed, and the ceiling is of similar material, only heavier. After the timbers were in place a layer of straw was put on the roof, and then the earth filled in level.

The land under cultivation was not all winter fallowed this year for the reason that it could not be cleared of crops before the ground froze. However, all was plowed that is intended for spring crops. The unplowed land will be summer fallowed and a portion, at least, seeded to winter grain. About 25 tons (estimated) of grain hay was put into stacks, the major portion being oat hay. The yield was good, averaging at least 2 tons per acre. Unfortunately, the continued rainy weather made hay curing a difficult matter. An attempt was made to aerate the stacks by building them around a series of tepees constructed of light poles long enough to project above the stacks. This device proved to be of no value. Some of the hay—that upon about 3 acres—was built into good cocks and left there until cold weather came. Another field of 3 acres was cradled, bound and shocked, and left uncapped. The last method proved the best, producing better feed at less expense for labor. An experience such as that of this summer shows that oats is not an altogether satisfactory crop for hay. Barley is better suited, at least for the main crop, and especially if a considerable area is grown. As mentioned elsewhere in this report, barley matures earlier than oats, and is ready to cut for hay at a time when good weather is more likely to prevail.

Late in September the Government boat *General Jacobs* landed a freight shipment consisting of a grain self-binder, a wagon box, some lumber, a foot-power grindstone, and 1½ tons sodium nitrate. A little later a small power thrashing machine was received. This machine was built at Lincoln, Nebr., according to plans made at the University of Nebraska.

August 6 a bunch of red fescue (S. P. I. 19796) was dug out and a root sample prepared by slipping a wire cage over it and then washing out the earth. It was found that the roots had penetrated to a depth of 4 feet, which was within 3 inches of frost. From the character of the rootlets, it appeared that they were growing downward as fast as the frost was receding. The mass of roots put out by this grass was amazing. It was all the team could do to pull a 12-inch turning plow through the plat. This grass was seeded in the spring of 1910 and has stood the winters perfectly. It would no doubt be valuable for pasture, since it makes an early and vigorous growth. It seeded very sparingly early last year and again this year. A little seed was gathered.

GRAIN CROPS.

WINTER GRAIN.

One acre of ground was seeded with winter grains, three-fourths of the acre being in rye and one-fourth in wheat. This ground had been summer fallowed and when the seeding was done, July 30, was

in excellent tilth. A perfect stand resulted, and by fall the rye would have made excellent calf pasture and would probably have been benefited if cropped lightly.

The wheat (Kharkof S. P. I. 12001) for some unexplainable reason did not winter as well as usual, not more than 5 per cent surviving. The growth, also, was not satisfactory, but it matured fair heads and was harvested September 23.

In adjoining plats the rye stood in sharp contrast to the wheat. A finer field of rye it would have been hard to find. The winter survival varied from 75 to 99 per cent in the several plats. All made a satisfactory growth, some of it attaining a height of 6 feet. (Pl. IX, fig. 1.) The heads filled well and ripened by the end of the first week in September. A very little lodged. Practically all could be cut with a grain cradle, and was bound and shocked. The following varieties were grown: Giant French, Excelsior, Amber, Brandon, and Monster; S. P. I. Nos. 1134 and 12890, and G. I. Nos. 959, 281, and 3B1. Most of these have been grown for several years, and are practically on a par in points of excellence.

It is not too early to predict that on the future Alaska farm rye will undoubtedly take an important place in crop rotation. Since it requires 13 months to mature a crop, it is obvious that winter rye can not be grown consecutive years on the same ground. It will, however, follow spring grain advantageously, thus affording an excellent opportunity to clean the ground of volunteer growth. The land can be thoroughly cultivated during June and July, and if the rye is then sown it will supply excellent fall pasture for calves and milch cows. If pastured judiciously, the resultant grain crop would not be impaired.

SPRING GRAIN

BARLEY.

Barley is proving to be the best all-purpose grain for this region. Ripening, as it does, well within the period free from frost, the sheaves dry out sufficiently to permit of stacking, even in an off year, such as the last has been. Maturing earlier than oats, it is better adapted for hay, since July is a better month for haying than August. For hay, the hooded or smooth barleys are to be recommended, but should not be grown on rich ground because of liability to lodge. Unfortunately none of the hooded or smooth varieties tried so far have as stiff straw as several of the bearded varieties, notably Manshury, Abyssinian, and Finland. (See table, p. 62, Nos. 1, 2, 3, 15, and 17.) This year, among the new hybrids is a black two-rowed hooded barley that has the desirable characters sought, namely, earliness and stiff-

ness of straw, and beardless. This hybrid is the result of a cross between Hull-less S. P. I. 19851 and G. I. 362, Nos. 25 and 13, respectively, in the table. (See p. 62.)

Last year the least time required to mature barley was 80 days; this year 95 days. This gives a good index as to the nature of the past season and shows, what is even more evident, in regard to the oats, that grain breeding must be resorted to in order to produce grains that will mature without fail every year and leave sufficient margin to permit the grain to dry out enough to allow it to be stacked and thrashed.

In addition to the barley grown, as shown in the table (p. 62), two small fields were seeded with Hull-less barley (S. P. I. 12709), one three-fourths of an acre in extent, the other one-fifth of an acre. In neither was the growth of straw satisfactory, but the heads in the larger field were well filled. In the smaller field, near by on a knoll, many of the heads were not more than half filled, the tips being entirely sterile. No explanation was apparent. All of the barley in both fields ripened thoroughly and was cradled and bound. After remaining in the shock for a month it was stacked and will be thrashed in the spring.

A small field (three-eighths acre) was seeded with Chittyna barley. This is a hooded type and considerable difficulty was experienced in getting the drill to sow it, as the grain would not settle down into the feed holes, because of the tip or hood on the grain which was not broken off in thrashing. This was the finest looking field of barley ever grown here, until the wind and rain beat it flat. However, it ripened fully, and, though harvested with difficulty, was bound, shocked, and later stacked.

The cross breeding of barley was continued. Hybrid 6a14 was used as the mother plant. This is a hooded type producing large heads and stiff straw. Pollen was taken from the following barleys: Champion, Finland, Lapland, Pamir, Hansen No. 279, Abyssinian No. 362, black two-rowed, and S. P. I. 12709 Hull-less. A few heads of Red Fife and Saskatchewan (spring) wheat were cross-fertilized. Also a few heads of Finnish Black oats were cross-fertilized with pollen from Copperfield oats.

The following table shows the more salient points regarding the character and growth of pedigreed and hybrid barleys.

Description of pedigreed and hybrid barleys.

Plot No.	Name of variety.	No.	Days ma- turing.	Height.	Character of heads.	Length of heads.	Grains per head.	Type rows.	Lodged.	Date ripe.
				<i>In.</i>		<i>In.</i>			<i>P. ct.</i>	
1	Abyssinian.....	360B6	107	39	Bearded.....	2.75	52	6	0	Aug. 26
2	do.....	361B6	107	39	do.....	2.5	50	6	0	Do.
3	do.....	362B6	98	39	Bearded, black.....	3.0	22	2	0	Aug. 17
4	do.....	669B	103	39	do.....	1.75	48	6	100	Aug. 22
5	do.....	669B	107	39	do.....	3.25	18	2	100	Aug. 26
6	do.....	675B	107	39	do.....	2.25	42	6	100	Do.
7	do.....	675B	109	40	Bearded, purple.....	2.75	48	6	95	Aug. 28
8	do.....	676B	109	40	Bearded, black.....	2.75	48	6	95	Do.
9	Hansen.....	279B3	98	39	do.....	3.0	54	6	100	Aug. 17
10	do.....	674B	109	40	Bearded, purple.....	2.75	48	6	99	Aug. 28
11	do.....	674B	109	40	do.....	2.5	42	6	75	Do.
12	Peru.....	B	98	36	do.....	2.25	36	6	60	Aug. 17
13	Pamir.....	18922B4	95	26	do.....	1.75	20	6	0	Aug. 14
14	Swedish.....	19557B4	97	40	do.....	2.5	44	6	100	Aug. 16
15	Finland.....	B	105	39	do.....	2.0	57	6	0	Aug. 22
16	Lapland.....	B6	107	39	do.....	3.0	44	6	5	Aug. 26
17	Manshury.....	B6	107	42	do.....	3.0	44	6	5	Do.
18	Urjala.....	B	112	46	do.....	2.75	24	2	75	Aug. 31
19	Eagle.....	B4	112	46	do.....	3.0	26	2	75	Do.
20	Primus.....	B1	112	46	do.....	2.8	24	2	75	Do.
21	Chittyna.....	B3	107	40	Hooded.....	3.0	54	6	100	Aug. 26
22	Koyukuk.....	B3	107	40	do.....	2.5	40	6	99	Do.
23	Champion.....	B1	107	40	do.....	2.75	48	6	100	Do.
24	Hull-less.....	B4	110	40	Smooth.....	2.5	44	6	100	Aug. 29
25	Wyoming hull-less.....	B1	111	38	do.....	2.5	42	6	100	Sept. 1
26	Hull-less.....	19851B2	110	38	do.....	2.5	42	6	100	Aug. 29
27	Hybrid.....	3a6-1	110	40	Hooded.....	3.25	54	6	100	Do.
28	do.....	4a1-1	110	40	do.....	2.25	54	6	100	Do.
29	do.....	2a1-1	110	38	do.....	2.75	38	6	100	Do.
30	do.....	3a2-1	110	40	do.....	2.5	38	6	100	Do.
31	do.....	5a1-1	110	40	do.....	3.25	56	6	100	Do.
32	do.....	1a1-1	109	40	do.....	3.25	56	6	100	Aug. 28
33	do.....	6a14-1	103	52	Bearded, purple.....	4.0	50	6	0	Aug. 22
34	do.....	6a14-2	103	52	Hooded, purple.....	4.0	50	6	0	Do.
35	do.....	6a14-3	103	52	Bearded.....	4.0	50	6	0	Do.
36	do.....	6a14-4	103	42	Hooded.....	4.0	50	6	0	Do.
37	do.....	7a1-1	103	48	Hooded, black.....	3.0	22	2	0	Do.

B indicates pedigree plats, the numeral following the number of years grown at the station.

OATS.

This year the need of growing early maturing varieties of oats was very apparent. Even the earliest required 116 days to ripen, and although sowed almost a week earlier than usual, they were more than a week later in ripening. Of the 18 varieties grown in pedigreed plats, Finnish Black continues to be the best, taking all things into consideration, with South Dakota and Copperfield following in the order given. Hansen is one of the finest appearing oats ever grown at this station, producing very large heads and coarse, stiff straw, but in unfavorable seasons it will not ripen fully.

Three-quarters of an acre, in a little swale, was sown May 18 with Finnish Black oats. This field was given a dressing of complete fertilizer at the rate of 500 pounds per acre. The oats made a splendid growth, standing thick and 5 feet high. The wind and rain, however, beat it down so completely that it had to be harvested with scythes. The grain was bound and shocked, and later put into ricks, where it will remain until it is dried out thoroughly enough to permit of thrashing.

This is the first time that Finnish oats have lodged, stiff straw having always been one of its chief points of excellence.

On ground adjoining the above field a $\frac{3}{10}$ -acre plat of black Great Mogul (S. P. I. 20464) oats was seeded May 14. A fine stand and growth was secured, but it did not fully ripen. It was cradled September 18, bound, and will be fed in the sheaf. For the last three years these oats have ripened perfectly, and made good yields, although it is usually a later variety by 10 days than Finnish Black.

In another field, $2\frac{3}{4}$ acres were seeded with Great Mogul May 10. This ground has not been fertilized, and while the growth was not heavy it stood up about 42 inches and had well-filled heads. It was left standing in the hope that it would ripen, but when harvested on October 22 only the tips of the heads were ripe. It, too, will be fed in the sheaf.

On May 13 eight adjoining plats, each 4 rods long and 1 rod wide, containing $\frac{1}{10}$ acre each, were laid out and seeded with Banner oats. Plat No. 1 was given a dressing of sodium nitrate, 15 pounds (rate of 600 pounds per acre); plat No. 2, potassium sulphate, 15 pounds; plate No. 3, superphosphate, 15 pounds; plat No. 4, the three foregoing in a mixture of 5 pounds each; plat No. 5, sodium nitrate and superphosphate, $7\frac{1}{2}$ pounds each; plat No. 6, no fertilizer; plat No. 7, sodium nitrate and potassium sulphate, $7\frac{1}{2}$ pounds each; plat No. 8, potassium sulphate and superphosphate, $7\frac{1}{2}$ pounds each. The ground was in excellent condition, having been in potatoes the previous season. A 99 per cent stand resulted and the growth was all that could be desired. The oats in plat No. 1 lodged badly, otherwise no difference in the plats was discernible. It is to be regretted that the season was such that the oats on the plats did not ripen fully enough to permit of their being thrashed. Last year this variety made a remarkably fine yield and was harvested August 14.

Fertilizer plats identical with those just described were laid out in a field of awnless brome grass (*Bromus inermis*). There was sufficient rain to dissolve the fertilizer thoroughly and carry it down to the grass roots. Only those plats receiving sodium nitrate showed an increase of growth. It is a noteworthy fact that the plat receiving nitrate alone (15 pounds) made a better showing than the plat receiving half nitrate and half superphosphate, and the difference was still greater where nitrate constituted but one-third of the fertilizer applied. There was no effect whatever from the other two fertilizers, superphosphate and potassium sulphate. These results tally very closely with the results of the two years previous, and lead to the conclusion that nitrogen only need be applied to the soil.

The following table shows the principal characters of oats grown at this station:

Description of pedigreed oats.

Plat No.	Name.	Pedigree No.	Date ripe.	Days matur- ing.	Height.	Length of heads,	Grains per head.	Color of berry.	Lodged.
					Inches.				Per ct.
35	Ruovesi.....	B	Sept. 9-10	122	56	9.0	100	Black...	0
36	Orismala.....	B	9-10	122	56	9.0	100	...do.....	0
37	Kurbijoho.....	B	9-10	122	56	9.0	100	...do.....	100
38	Soaulahti.....	B	9-10	122	56	8.0	80	...do.....	100
39	Toholampi.....	B	9-6	116	52	8.0	80	...do.....	100
40	Finnish Black.....	B4	9-6	116	60	9.0	100	...do.....	0
41	South Dakota.....	637B1	9-9	121	56	9.0	125	...do.....	0
42	Early Champion.....	B	9-10	122	38	6.0	60	White.....	100
43	Yakutsk.....	498B4	9-1	111	38	5.0	60	...do.....	100
44	New Swedish.....	B1	9-18	130	52	5.5	50	...do.....	0
45	Irish Victor.....	B	9-18	130	50	5.5	72	Black.....	0
46	Kherson.....	B	9-6	116	36	5.0	50	White.....	100
47	Minnesota.....	B1	9-6	116	36	5.0	50	Black.....	100
48	Copperfield.....	B2	9-7	117	42	8.0	100	Gray.....	100
49	Hanson.....	B1	9-18	130	62	10.0	140	White.....	15
50	Black Tartarian.....	B	9-18	130	52	7.0	110	Black.....	10
51	Norwegian.....	500B4	9-6	116	48	8.0	75	...do.....	1
52	Silver Mine.....	B	9-18	130	48	8.0	84	White.....	1

B indicates pedigree plats, the numeral following the number of years grown at the station.

ALFALFA.

It is a pleasure to report that the winter hardiness of alfalfa in this location is an established fact. Small plats have been wintered successfully three years with no apparent diminution of vigor or stand. Plats have been established in different places on the farm to test the adaptability of the different soils. The indications are that the higher, drier soil which is a reddish, sandy clay, is better adapted, after it has been manured, than the lower lying black soil. More or less alkali is present in the black soil. It remains to be seen how resistant alfalfa will be to these salts. Of the varieties tried so far *Medicago falcata* easily leads, with Grimm alfalfa and Cherno close seconds. However, it is too early to say much as to the relative merits of each. *M. falcata* is yellow flowered and inclined to be procumbent in growth. It began blooming July 1 and bloomed profusely until frost. Seed pods formed freely but no seeds ripened. The height was 2 feet. In the same soil Turkestan alfalfa, though it wintered perfectly, failed to make much growth and very little bloom showed. In other soil it would no doubt do better. Only a few plants of *M. ruthenica* survived the winter. The growth was shorter than *M. falcata* and less vigorous. It also had yellow blossoms.

Grimm alfalfa is a vigorous, upright growing variety with a purple blossom. It appears to be as hardy here as the yellow flowered kinds and is better to grow for hay because of its upright habit. A plat seeded May 31 grew to a height of 26 inches and was just beginning to bloom when cold weather came on.

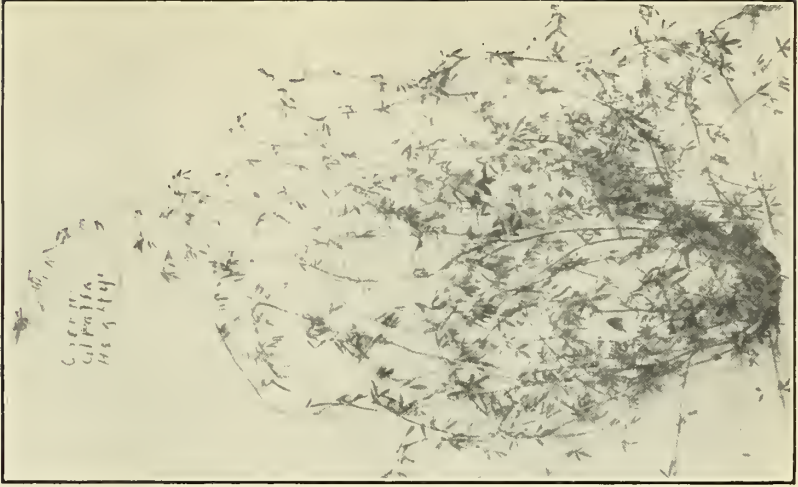


FIG. 2.—SIBERIAN ALFALFA AT RAMPART STATION.



FIG. 1.—WINTER RYE AT RAMPART STATION.



FIG. 1.—SILO AND HORSE BARN TWO WEEKS AFTER FALL OF ASHES, KALSIN BAY.

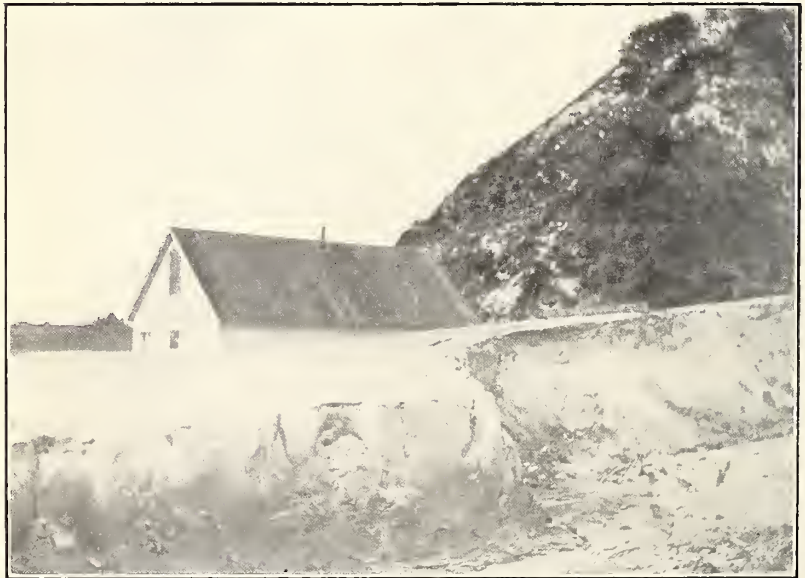


FIG. 2.—SLIDE OF ASHES SHOWING EROSION, KALSIN BAY.

August 30 a 4-pound package of inoculated alfalfa soil was received from the experiment station at Brookings, S. Dak. This was drilled in on the above plat of Grimm alfalfa. Plants of North Sweden, Gobi Desert, and Cherno alfalfa were transferred from nursery row to good garden soil. They were set in rows 3 feet apart with a two-foot space in the row to allow for maximum development of each individual plant. Plate IX, figure 2 shows a Cherno plant. (The heavy, recumbent growth has been fastened to a screen for photographic purpose.) The height or rather length of stalk when in its natural position, is 4 feet. A few blossoms (purple) appeared but no seed formed. This plant among many others was received from Sitka last year and was reset this spring, so is really making its first season's growth.

This summer a number of alfalfa sets were received from Sitka of the varieties Cherno and Semipalatinsk.

Next year the area devoted to alfalfa will be increased in so far as the seed on hand will permit. Some of the Turkestan alfalfa will be transplanted to better soil and other varieties thinned out and reset so that individual plants may be studied. As soon as facilities permit, cross-breeding should be taken up in order to produce a strain that will ripen seed.

POTATOES.

Two-thirds of an acre just back of the house was given over to the main crop. The ground yielded an excellent crop of oats the previous year, was winter fallowed and in the spring disked and leveled off with a float drag. The furrows were laid off 38 inches apart with a turning plow and the seed dropped by hand about 14 inches apart in the row. The seed was covered with the same plow, using one horse, and the ground dragged as fast as planted. Later a harrow was run over the field to maintain a surface mulch. Potatoes should not be planted deeper than necessary to secure sufficient moisture to insure their coming up promptly.

The seed had been sprouted by placing in a warm room for three weeks, and when planted on May 14, had formed sprouts from 1 to 3 inches long. Whole tubers were planted. The stand was practically perfect. The rows were $12\frac{1}{2}$ rods long. September 1 the vines were killed by a hard frost, the first of the season. To dig them a turning plow was run under the row. The potatoes were graded and put into crates in the field to avoid extra handling and bruising. The varieties and yield were as follows:

Extra Early Pioneer, 4 rows, yielded 1,089 pounds, or at the rate of 299.4 bushels per acre.

Gold Coin, 11 rows, yielded 2,994 pounds, or at the rate of 299.4 bushels per acre.

Extra Early Eureka, 7 rows, yielded 2,010 pounds, or at the rate of 315.8 bushels per acre.

Extra Early Ohio, 4 rows, yielded 670 pounds, or at the rate of 184.2 bushels per acre.

Hamilton Early, 8 rows, yielded 2,371 pounds, or at the rate of 325.9 bushels per acre.

Many of the potatoes weighed a pound and over, especially of the Eureka variety. The potatoes are smooth, well-formed and well flavored, and have always made good yields. Hamilton Early, which made the best yield this year, is a white-skinned potato of the Burbank type and of excellent quality. It is a vigorous grower and a good cropper, but not one of the earliest. Irish Cobbler, the earliest, seems particularly well adapted to dry situations and dry seasons. The tubers, which are borne on short stems, are roundish with deep eyes and rather dark skin. The texture of the flesh is inclined to coarseness and the flavor not of the best.

Hill selection of seed potatoes, which was begun last year, was continued. Last year as the potatoes were dug a number of hills of several varieties were selected. Each hill had to measure up to a certain standard; that is, the tubers had to be of even size and well formed according to type. These hills were planted in a special plot last spring. This fall each hill was dug and piled separately. When all were dug the best hills were again selected and labeled. This sifting out process will be continued until the best hill is found, which will then be used as a nucleus of future crops.

THE GARDEN.

With the exception of turnips, vegetables in sufficient quantities for the table only were grown. Seed was sown May 23. The abundance of rain was conducive to rank growth and everything did well. Peas, Alaska and Nott Excelsior, were large enough to use July 10. As usual, a sufficient amount of seed was ripened for the next crop.

The cabbage, Winningstadt and Jersey Wakefield, matured too early, causing many of the heads to burst and making them worthless for winter storage. This was particularly true of the Winningstadt. One of the Wakefield heads weighed, trimmed, 16 pounds. Another head of the same variety had a spread of leaves of $5\frac{1}{2}$ feet.

Only one variety of cauliflower, Dwarf Erfurt, was raised. The first head was cut July 10. From then on they matured rapidly, so that only a few were left for fall storage. This variety does not form large heads, but it is a sure header here, and the quality leaves nothing to be desired. Root maggots became so troublesome that an attempt was made to kill them with white hellebore. Various strengths were used, from one ounce to a gallon of water to a quarter

of a pound. A hand pump was used and a cupful of the liquid applied around the stalk, saturating the ground. Later in the day a second application was made, yet many of the maggots survived. The next day the plants were given an application of sodium nitrate ($\frac{1}{2}$ cupful to 5 gallons of water) and were then hilled up well. New roots promptly appeared above the infested area, and very few of the plants failed to make satisfactory heads.

Rhubarb, *Victoria*, started from seed in the spring of 1911, wintered perfectly without any protection except the natural snowfall. This year a splendid growth was made which supplied the larder with an abundance of crisp, juicy stalks. A number of the stalks were 2 feet long and $1\frac{1}{2}$ inches in diameter, with enormous leaves.

The following turnips and rutabagas were grown. Roots of the best varieties will be saved and seed raised from them next year. The varieties are: *Petrowski*, and a white winter turnip, from *Helsingfors*, Finland; Norwegian *kohl-rabi* from *Wrangell*, Alaska; "worm-proof" rutabagas and "worm-proof" turnip seed grown at *Bethel*, Alaska; and *Golden Ball* turnip and *Purple Top* rutabagas from station-grown seed. All varieties, both turnips and rutabagas, were more or less infested with root maggots, but the yellow kinds not so much as the white. Of the varieties tried so far, *Petrowski* and *Golden Ball* are the best. Of the two, *Petrowski* is the better keeper, while the *Golden Ball* is much more tender and sweeter to eat out of the hand.

REPORT OF WORK AT KODIAK LIVE-STOCK AND BREEDING STATION.

By M. D. SNODGRASS, *Superintendent*.

RESULTS OF ERUPTION OF MOUNT KATMAI.

Work at the Kodiak Station was interrupted by an 18-inch fall of volcanic ash from *Katmai* Volcano, some 90 miles west of Kodiak, which was in eruption from June 6 to June 8. The ashes were carried over Kodiak by a west wind which blew from the same direction during the two days' eruption, falling like snow for 48 hours and covering the ground with ashes and sand to a depth of 18 inches without drifting. (Pl. X, fig. 1.) Numerous slides of ashes followed the fall on all steep hill and mountain sides, filling, running, and sliding down the canyons and out into the valleys and flats at the foot of the mountains, sweeping away fences or covering them in many places and almost burying some of the station buildings. (Pl. X, fig. 2.) During the fall of ashes everything was in total darkness for 43 hours. There was no loss of human life, but sheep and calves suffocated in some instances. Live stock was without feed or water during the

time except those that happened to be in the barns when the darkness came on. Vegetation was covered and all pasture was destroyed for the time. Stock were able to get but scant feed from the foliage of shrubs and trees for more than a month, when the hardier and stronger of plants and weeds pushed through cracks in the ashes, which opened after the rains came; the grass also came through where the greater part of the ashes slid off the mountain sides.

The work of the winter consisted of caring for live stock and building a large skiff for hauling them, also the hay and silage. The breaking up of ground was continued in the spring, and 10 acres seeded to oats for hay. During the months of April and May the writer and the special agent in charge of Alaska investigations visited a number of herds of Galloway cattle in the northern Central States and purchased 11 of the heaviest milking Galloway cows to be found, together with 4 heifer calves from the cows and 1 bull calf. These cows were selected after corresponding with all the Galloway breeders in that portion of the United States, to learn of heavy milking Galloways, and visiting numerous herds. The cows were assembled at St. Paul, Minn., and shipped from there to Kent, Wash., where they were placed for the summer, the plan to take them to Kodiak having been abandoned on account of the ashes from the volcano.

Immediately after the news of the eruption hay was shipped to Kodiak for the relief of the stock there, and the cattle had to be fed for the greater part of the summer, owing to the scarcity of pasturage and the danger of miring in the ashes of the slides immediately after all heavy rains, and in the quicksands of the creeks resulting from the ashes and sand washed from the mountains and hillsides. The quicksands became a constant danger to man and beast, and on several occasions came near resulting disastrously, both to men, horses, and cattle; while among the sheep there were heavy losses through this source. The sheep would lie down at night in what seemed perfectly dry places, to find themselves mired in the sand and ashes by morning and unable to get out. The sheep scattered over the mountains and along the beaches in search of food immediately after the ashes came and made it impossible to find them all in time to save them. To make matters worse, the bear, a constant menace to live stock on Kodiak Island, which were unable to get pasturage or fish from the streams clogged with ashes, came from the mountains to feed upon the stock.

All the streams and springs were filled with ashes, and it became necessary to dig a well for watering the stock. A 30-foot well was dug and cased up with lumber. This furnished water for all stock, and for the greater part of the summer it was necessary to water from the well.

The work of excavating about the house and other buildings was pushed as rapidly as one team and three men could move the sand and ashes with scraper and shovels. Two farm wagons were completely buried, tool shed and blacksmith shop were filled 3 feet deep, barnyard fences were buried or carried away with the slide. The cottage was almost buried in the slide, the windows being mashed in and one room filled within 2 feet of the ceiling, burying the kitchen stove, table, cupboard, and everything in the way of eatables; another room was half filled through the door between the rooms.

As soon as the immediate needs of the live stock were relieved, and the buildings put into shape to live in, work of hauling manure was begun, and the preparation of experimental plats for testing the growing of crops in the ashes. The ashes having settled by rains to 13 inches in depth by July 13, oats were seeded. The land had been plowed and seeded in the spring. A small plat was given a light dressing of manure and seeded by hand to oats; at the same time two other plats were seeded in the ashes. The plats were double disked and harrowed, giving a most perfect seed bed. One of the plats was then given a top-dressing of manure and harrowed again. A garden plat was prepared and seeded June 26. Test plats were prepared as follows: (1) All ashes removed. (2) Two inches of black soil mixed with all ashes. (3) Three inches of ashes mixed with black soil. (4) Six inches red ashes mixed with black soil. (5) Six inches bottom ash mixed with black soil. All these plats were seeded on June 26 in the same manner with the following garden vegetables: Beets, rutabagas, turnips, parsnips, carrots, radishes, lettuce, and parsley. Peas and onion sets were also planted at this time. The garden seed germinated more quickly in the mixtures of black soil and ashes than in black soil alone, due perhaps to the quicker warming up of the former. Throughout July and August the vegetables in plats 3, 4, and 5 made a more rapid growth than those in 1 and 2, furnishing radishes for table use five weeks from time of seeding. Lettuce was large enough for use by the middle of August. All vegetables grew fairly well considering the little sunshine there was during the summer. Turnips and radishes grew where they were planted in the ashes without black soil, but the growth was slow for the first six weeks, after which period they grew more rapidly, turnips attaining a diameter of $2\frac{1}{2}$ inches, while those grown in mixed soil and ash were 4 to 5 inches in diameter and averaging a little larger than those grown in black soil alone.

The oats seeded July 13 germinated readily and came in good stand. Those in plat with manure disked in grew more rapidly than the other plats and grew 8 to 12 inches high before frosts came. (Pl. V, fig. 2.) The plat receiving the top-dressing of manure grew more slowly the

first month than where the manure was disked in with the grain, but as the later rains came its growth was more rapid and compared favorably with the former, while that seeded without manure grew very slowly all summer and was from 4 to 6 inches high on October 17, the date of the first hard frost. The roots went through the ashes into the black soil and seemed to get enough plant food from the ashes to maintain the plant, but the oats turned reddish and yellow after the third week, and showed the lack of nitrogen, while those where manure was used grew well from the first and were of good color where the fertilizer was evenly spread.

At the neighboring Baptist Mission on Wood Island a small plat of oats was seeded in the ashes immediately after they fell and given a light dressing of sodium nitrate four times during the summer with gratifying results. The oats grew rapidly and headed out before frost at 26 to 30 inches in height. Their color was dark green and they grew thriftily after receiving the first dressing of nitrate until it was exhausted, when they turned yellow and showed lack of nitrogen, and were again treated with nitrate with speedy results.

Ground was prepared for seeding fall grains during the fore part of August. Small plats were double disked after receiving a light dressing of barnyard manure, and check plats alongside these were prepared in the same manner, and on August 16 seeded to wheat, rye, and barley with a press drill. The seed bed was ideal and the grain came in good stand. It showed green all over the plats by August 29 and was 2 inches high. The writer was away from the station from that date until October 23, and found that the grain had made good growth on the manured plats and was in good thrifty condition for winter. That seeded in the ashes without manure made but fair growth, but was well rooted and bids fair to go through the winter. On the manured plats rye was perhaps the best grower, and both wheat and rye were well rooted, the roots going through the ashes into the black soil beneath.

Plats of about one-half an acre each were heavily manured and seeded to rye and wheat at the same time as the above plats. On these plats the growth was the same as that receiving the light dressing of manure.

Since the fall of ash and settling by the rains the surface of the ground cracked open like a dried up lake bed in dry weather. Many of the cracks were 7 to 8 inches deep and allowed grass and other small plants to come through, while many of the hardier and larger growing plants pushed up through the ashes late in the summer. Fireweed and ferns grew very well on the mountain sides.

The erosion was very slow during the summer months, but as the ground froze to a depth of 4 inches about the middle of October, and

was followed by a week of rainy weather, the erosion was great. As the ground was thawed by the rains, the ash was carried off. Fully 2 inches of ash was carried off the land where there was a light slope to the ground, and in many places deep gullies were washed through the deposits at the foot of the mountains. Creeks and rivers were so muddy that fish were killed off or driven to salt water. The flat lands of the valleys are building up by the deposits, and in many places the heavy growth of willow is nearly covered. The willow sends out roots near the surface and will soon bind this new soil, and in time the valleys will be far more fertile than they now are. The constant deposit of leaves from the trees in the valleys and the weeds and ferns and alders from the mountain sides will soon build up the soil without the aid of man. Reseeding will take place naturally, but slowly, from the grass that came through the cracks in the ash and on steep mountain sides where slides uncovered the grass. An open winter, such as the last one was, would carry far the greater portion of the ash from the mountains, and the grass would come more quickly there, as some of the grass covered all the summer is still alive. This was demonstrated late in the fall where the ash was sluiced off, and the grass began to grow immediately. Should the winter be cold and the ground freeze early in December and remain so until spring, the erosion would be retarded until the thawing begins in the spring.

On the gently rolling land erosion and settling will enable one to plow up some of the black soil beneath the ash in spring, and in such case a remarkably fine soil will be made.

From the observations made during the season and the tests carried out, it is reasonable to believe that, with sufficient manure or sodium nitrate to nourish the plants until their roots grow down into the soil below the ashes, grasses and grains can be grown successfully. Where the ashes settle or pack down enough to allow the mixing of ash and soil below by means of a plow, the growing of crops is assured. Gardens can be spaded deep enough to do this nicely, and in every case the soil will be much benefited by the ashes, even if they do not contain available plant food. The heavier soils need the sand and ashes to improve their texture, and such a soil as results from the mixture is better adapted to trucking than the original soil of the island.

In the latter part of July the writer made a trip to the south side of Kodiak Island in search of a possible location for wintering the live stock. Ugak Bay, Kileuda Bay, and Old Harbor were visited and looked over; also Sitkalidik Island. At Sitkalidik Island was found a very good site for a temporary location, but owing to the heavy matting of old grass upon the ground, it would have been impos-

sible to secure hay enough for the herd this year, and as it was more than 100 miles from the regular steamship route, it was deemed inadvisable to move the herd there. From August 10 to 14 the writer visited Lazy Bay at the extreme southwestern point of Kodiak, Chirkoff Island, located 90 miles to the southwest, and Uyak Bay, on the north side of the island. The same obstacle was met at these places when it came to the putting up of hay. The old dead grass is so deeply matted on the ground that mowing by machinery is almost impossible. Meadow land here must be burned over in the spring before satisfactory work with a mower or rake can be done.

Investigation as to freight rates on hay from the States and freight rates on moving the cattle showed it would be cheaper to ship the cattle to where cheap hay could be purchased. Consequently, on August 29, the cattle were shipped by the steamship *Admiral Sampson*, 28 head, consisting of steers and grade cattle, to Seward, Alaska, for beef, and 76 head, consisting of the breeding cows and calves, to Toppenish, Wash. The trip by water took 8 days, and after 2 days' rest at the yards in Seattle, 1 day's travel by train landed them in Toppenish, with but the loss of 2 small calves. The cattle stood the trip exceedingly well, losing very little weight in transit. The cows purchased in the spring and left at Kent, Wash., were picked up on the way to Toppenish, and there all were put on pasture for one month before feeding began. An open shed 80 feet long and 16 feet wide with mangers along one side and at each end was built for winter shelter. Feed yards and calf pens were built in order that the stock may be easily handled and separated for feeding purposes.

A team of young horses was purchased, also harness and wagon for use in feeding the cattle this winter, and to be shipped to Kodiak in the spring for the work there.

The sheep and horses on Kodiak Island were kept at Kalsin Bay during the fall, where they could get some pasture during dry weather and then moved to the dairy station near the village of Kodiak for winter. Here they can be looked after and fed during the winter without risk of miring in quicksand. Hay was shipped from Seattle for feeding during the winter, and Assistant Heideman left in charge.

CLIMATIC CONDITIONS.

The climate of Kodiak Island has been more variable the past 12 months than experienced in many years. The early fall of 1911 was warmer than known for years. Frost came late in October, and the mean temperature for the month was 8° warmer than recorded in the past four years for that time of the year. Cloudy weather and more rain than normal prevailed, but no snow fell during the month. The weather for November and December was similar to that of the past

four years in temperature with a little greater precipitation than normal. There were 21 days of sunshine each month. The snowfall was about the same as for the same months in 1910, considerably above normal. Snow fell during the latter part of November. The weather grew colder, and the snow remained covering the ground all through the month of December. Ice formed to a thickness of 7 inches in December, and the ground froze very little under the snow. Ice went out of the lakes and the frost out of the ground with the January rains. There was little snowfall in January, very little sunshine, and more rain than known in years. Rain fell on 30 days, with but one clear day in the month. The mean temperature was 7° higher than for January of 1911, and far above normal. Very little snow fell in February, while the mean temperature was several degrees above normal. There was about as much sunshine as usual, with but 10 cloudy days. There were but 6 cloudy days in March, with 4 inches of snow and normal rainfall. Weather was warm and grass began to grow, affording some pasture for stock on tide flats and beaches.

As a whole, the winter was the mildest experienced in southwestern Alaska. The total snowfall for the winter was but 33¼ inches, which is less than one-half the normal snowfall of this region. The rainfall was greater than usual, while the total precipitation was 15 inches above normal for the six months.

April was warmer than normal, but the record of temperatures was not kept owing to the breaking of the thermometers early in the month. Cloudy weather prevailed during this month with normal precipitation. May was cloudy and very wet and warmer than usual.

The prevailing winds for the winter and spring were from the east, which accounts for so much cloudy weather and heavy rainfall. Heavy gales from the west were less frequent than last year, but unusually heavy seas, caused by the constant easterly winds, made travel by water in small craft uncertain and hazardous.

Spring opened early and grass afforded considerable pasture to stock in April on the tide flats and beach land. In May the grass grew rapidly and pasturage was good. Cattle put on flesh rapidly and by June 6 were in good condition. Spring seeding was done in May and was coming nicely when the fall of volcanic ash from the eruption began.

The first six days of June were clear and warm, then following the eruption cloudy weather prevailed throughout the month. When the sun shone the sky was so heavy with smoke that it barely cast a shadow. There was no rain till June 14, and the latter half of the month was wet. July was very dry, and there were but four cloudy days. The sunshine was dimmed by the smoky atmosphere, and at

no time could the clear blue sky be seen. Frequent rains occurred throughout the months of August and September and very little sunshine.

After the rains in June the weather was damp and cold. The ground did not warm up as usual, and at all times the nights were cold. The blanket of ash on the ground seemed to withhold heat from the earth. The middle layer of ash was a veritable sponge and at all times was saturated with moisture. At any time during the summer it could be puddled by stamping the foot a few times in one place. This did not allow the soil beneath to warm up as usual and was responsible for the heavy fogs hanging over all valleys, such as is common over a lake or river in the morning and evening. Plant growth was slow in the ash, and the effect was very noticeable on the trees. The leaf growth was retarded throughout the month of June. In July the leaves grew more rapidly, and weeds, ferns, and such grass as came through the ash made fair growth. Grain and vegetables planted in the ash in the different experimental plats grew but slowly until late in July and through August, and at no time as in former years.

THE STATION HERD.

The herd of Galloways at this station maintained their good record in this country the past year until the volcanic eruption covered the pastures at Kodiak.

The cattle held their flesh well during October and November of 1911 on pasture. On November 22 feeding was begun. The entire herd was wintered at Kalsin Bay. Those pastured at the Kodiak Dairy Station were driven overland to Kalsin Bay the latter part of October. During the entire winter the cattle ran in the woods during the day and were kept in the sheds at night during stormy weather. When the ground was covered with snow or frozen they were fed on the ground in the pasture every morning and evening. When muddy or stormy, they were fed in the sheds. The breeding herd was fed on native hay and beach grass silage entirely. A few of the late calves were fed a small grain ration once daily. At all times the cattle were fed what hay they would consume in the morning and from 30 to 40 pounds of silage per head for each grown animal at night. The younger stock was fed all they would clean up and were kept growing and in thrifty condition throughout the winter. The light snowfall during the winter made it possible for them to browse more than usual, and on the whole they came through the winter in better condition than in the five previous winters at Kodiak.

The early spring also was to their advantage. Considerable grazing was possible on the tide flats by April 1, and there was good grass

by May. The cattle made rapid gains in May and the first week in June. A portion of the herd was taken to a neighboring bay for beach-grass pasture so as not to shorten the silage crop by too close grazing. This allowed the cattle much better pasture than there would have been otherwise.

After the volcanic eruption the cattle had a hard time securing feed for several days, and there was no water for four or five days. Every creek was clogged with ashes to such an extent that cattle and horses could not drink. A few of the lakes which were not filled afforded water, but this physicked the cattle badly for several days, and with the scarcity of feed, they lost flesh rapidly for three weeks. A well, referred to elsewhere, was dug in the early part of July, and the stock was watered from it the remainder of the season. The cattle at Middle Bay were driven back to the station on June 28. By this time nearly all the grass which stood above the ashes on the beaches, and that uncovered on the steep hillsides, was eaten down, and feed on the range was getting scarce. The stock browsed on willow and cottonwood as the supply of grass diminished, and throughout the months of July and August they fed on willows when herded during the day. At night they were fed alfalfa hay in the barn and sheds. This method of feeding was followed during July and August except immediately after rains when it was necessary to keep them in the yards to guard against miring in the ashes of the slides and the quicksands deposited in the creeks and lakes. At such times a maintenance ration of alfalfa hay was fed. During the summer the fireweed on the hillsides made good growth and furnished some feed for the cattle. During August they gained somewhat in flesh. On August 30 all steers and grade cattle were shipped to Seward, Alaska, put on pasture, and sold for beef in October. The steers consisted of yearlings and two-year olds. These are usually kept until the age of three years before butchering or selling for beef. The grades were cows and heifers left from those brought from Kenai Station. In all, 18 head of Galloway steers and 11 head of grades—cows, heifers, steers, and calves—were sold.

To the original herd there were added 29 calves born since the last report, of which 14 were bulls and 15 heifers. Six bull calves and 6 heifer calves died during the summer and fall, 3 in the ashes and 9 with blackleg at Toppenish. Two heifers died in the spring from eating wild parsnip, 1 cow and calf were killed and eaten by bear soon after ashes fell, 1 steer and 4 cows and heifers and 1 grade cow disappeared. No trace of these latter could be found, and it is believed they were either eaten by bear or mired in the quicksand in the creeks and lakes.

The addition to the station herd of 11 of the best milking cows to be found among the Galloway herds of the central Northern States and

the 5 heifer calves and 2 bull calves from these cows brings the herd easily to the foremost of milking Galloways in the United States. The herd now consists of 73 cows, heifers, and heifer calves; 3 bulls; and 10 bull calves.

It is recommended that a rigid selection of the better milkers be made from this herd before taking them back to Alaska, and that 30 or more of the beef type of cows, which are below this standard, be sold for breeders for beef Galloways. All but two bull calves should be sold. Some will be castrated and the others offered for breeders next fall or the following spring.

SHEEP AT THE STATION.

Sheep at the Kodiak Station during the winter of 1911-12 remained on pasture until December 25, at which time they were fat and in prime condition for mutton. From that date until February 24 they were sheltered at night, and fed hay in the barn in the morning and silage at night. During the day they were allowed to run in an open lot. With the exception of a few lambs, the sheep were in good condition when turned out on pasture February 24. From this date on they lived entirely upon pasturage on the southeastern slopes of the hillsides and the tide flats, doing fully as well as when kept confined and fed hay and silage. On May 5 the lambing season began, and from that date until June 6, 35 ewes dropped 42 lambs, with a loss of but 1 lamb. During the fall of the volcanic ash the Cotswold and Lincoln rams and 5 head of grown sheep are known to have suffocated, and at that time and closely following 17 head more suffocated or mired in the ashes and died, while the number of lambs lost during the ash fall could not be determined. When the sheep were gathered up there were but 25 lambs. The sheep were able to live on pasture during the entire summer, but were kept in the lot and fed after rains to guard against miring. During the late summer and fall the sheep fattened on pasture and were in prime condition on October 28, at which time they were put in the lot for winter feeding.

The sheep, 74 in number, were moved from Kalsin Bay to Kodiak for the winter, where they can be cared for without transporting hay from Kodiak. All winter feed for the sheep was shipped from the States.

A fine Cotswold ram was purchased at North Yakima, Wash., and shipped north in November. The ewes will be bred so as to bring the lambing season the latter part of May and early June. It is thought that there will be sufficient pasture on the hillsides another year, and enough hay grown on the beaches and in the ashes to warrant the handling of sheep on a larger scale on Kodiak Island.

All cattle and sheep at the Frye ranch on Kodiak Island were butchered this fall. As they had a wide range and much rolling

land, the stock which escaped miring in the ashes found sufficient pasture to fatten upon, and the beef and mutton was shipped to Valdez, Alaska, where there was a ready market.

Two ranchers on Raspberry Island were forced to abandon their ranches and ship what stock survived the volcanic ash to the mainland. Settlers who had but a few cows or sheep were obliged to kill down to a single cow in all cases, and many killed all they had as soon as they would do for beef or mutton, rather than see them starve during the coming winter. The Government aid to settlers and natives through the Revenue-Cutter Service was insufficient to furnish enough feed to winter a cow for each family owning cattle. In a very few cases the natives may be able to buy a little feed and get their cows through the winter, but in most cases the cattle probably will starve during the winter.

Many of the cattle on the islands adjacent to Kodiak, where they have been able to get winter feed without the aid of man heretofore, were dying off in the early fall. It is thought that all will perish during the winter, as the willows and berry bushes were browsed off during the summer and fall. The owners of these cattle could not afford to buy and ship feed owing to the high freight rates on hay from Seattle. The islands are so heavily timbered and the cattle so wild that it was impossible to gather them up and move them to other places where there is pasture and winter feed.

The immediate future of the live-stock industry of Kodiak Island depends largely upon the work of this station during the next few years. As the conditions grow better and the pasture and hay lands become reseeded, there will be greater demand for the surplus stock offered for sale by the station. Settlers and natives will be able to restock their ranges at more reasonable prices from the station than they can buy and ship cattle from the States.

REPORT ON VEGETABLE AND FLOWER GARDENS IN SOUTHEASTERN ALASKA.

By J. E. W. TRACY, *Assistant Superintendent of Seed Testing Gardens, Bureau of Plant Industry, U. S. Department of Agriculture.*

Those vegetables and flowers which grow at all in Alaska grow so profusely and do so well that it is difficult to report on individual cases without continual repetition, as a report from each locality on practically all the plants seen would be the same, namely, the flowers do splendidly, producing fully as large and as bright colored blooms as those in the States, while the vegetables are of excellent quality, being unusually tender and of mild, delicate flavor.

The writer is inclined to believe that the question of gardening in this section of Alaska is an economic one. There is so much hap-

piness and contentment, if not shiftlessness, as far as gardening goes, that satisfactory results are not secured. As a matter of fact, no town was visited where the garden prospects were not very much better during a great part of the season than the average section of the United States, not excluding California. Flowers bloomed profusely and during a comparatively long period; fruit is borne in abundance, yet the natives and the white folks are too lazy to gather it. While at the hotel in Sitka paying \$2 a day we were served bananas (60 cents a dozen), oranges (50 cents a dozen), fresh peaches from southern California (30 cents a pound), summer squash (40 cents a pound), green Italian prunes from Washington State, and many other fruits and vegetables from the States, although as good raspberries as I have ever seen were rotting in the back yard simply because no one picked them. At the experiment station at Sitka cabbage, turnips, beets, peas, lettuce, rhubarb, and many other vegetables were available at reasonable prices, yet they were not purchased because it was easier to purchase direct from the storekeeper.

The same condition occurs throughout the entire section visited. People evidently will not take care of their gardens, although the making and caring for a good garden in Alaska does not take 25 per cent of the labor required in Washington, D. C. It is true the cultivable area is very limited, yet the majority of the homes have back yards of sufficient size to grow an abundance of flowers and a sufficiency of vegetables for the table, such as peas, lettuce, beets, and turnips.

In a great many sections it was surprising to see so many abandoned gardens, and through the weeds one could see self-sown flowers trying to force their way. In many such gardens the weeds were from 4 to 6 feet high, a good indication of what a well-kept garden might produce.

There is a strong prejudice among all the grocymen against Alaskan-grown products. They make all kinds of excuses and much prefer to sell Washington and California grown raspberries at 25 cents, even after they have settled to only half fill the box, than the large excellent berries of home production.

Concerning vegetables of perishable nature, such as beets, cauliflower, lettuce, radish, kale, the merchant does everything to discourage home production and brings all his supplies from the States.

Beets, turnips, rutabagas, and other root crops seemed to be in their ideal environment, it not being uncommon to find turnips 8 inches and rutabagas 12 inches across, very solid, yet juicy, mild, and absolutely free from woodiness. The potatoes are of good size and, notwithstanding all reports, they were found to be of excellent quality and not watery. The average dealer claims that turnips and rutabagas will not keep, but all that were seen brought from the

States were of the poorest quality, being very dry and woody and could not be compared with the Alaskan product. Being in this condition they naturally would keep indefinitely. The argument against potatoes is that the Alaskan product has a larger percentage of water and freezes easier. One of the leading merchants in Sitka told me that his experience covering several years had been that where the States potatoes were stored about 9 inches off the ground they would stand almost any kind of cold while the Alaskan potatoes would freeze and be ruined.

EXPERIMENT STATION AT SITKA.

Only favorable criticism can be made of this station. It is well laid out, well kept, and a good assortment of both vegetables and flowers in well-selected varieties are cultivated. The station itself is located on very low land, some little distance from town. The fact that a good garden yielding such excellent products can be made under such unfavorable conditions emphasizes the possibilities in that section for gardening.

The station is conducting an extensive test of a large assortment of potatoes and cabbages to determine which varieties are the best adapted to the country. This should be a great help to the people in enabling them to secure the best results from their gardens. This work should be extended to include many other vegetables.

SITKA.

There are a number of gardens of varying size in Sitka, and where proper attention has been given them the results were all that could be expected. Vegetables of good quality are produced and many yards are ornamented with flowers of different kinds. Among the latter, perennials, such as phlox (Pl. XI, fig. 1), iris, daisies (Pl. XI, fig. 2), *Rosa rugosa*, and honeysuckle, did exceedingly well, while among the annuals a great range of varieties was noted. Pansies, sweet peas, Shirley poppies, petunias (Pl. XII), centaureas, nasturtiums (Pl. XIII, fig. 1), calendula, marigolds, stock, alyssum, and others were seen in abundance. A truck garden successfully maintained at Sitka was visited. The growth of the different vegetables indicated the possibility of their successful cultivation, and the quality of all was reported to be excellent. On the island of Krusof, across the channel from Sitka, an Indian had a small garden in which he was growing vegetables—rutabagas, turnips, and lettuce being his main crops.

KETCHIKAN.

The vegetable and flower gardens of this place were fully as good as, if not superior to, those of Sitka. Practically every yard that could be used at all for garden purposes had either vegetables or

flowers growing in it. (Pl. XIII, fig. 2.) Among the flowers seen at Ketchikan were digitalis, candytuft, dwarf and tall nasturtiums, pinks, marigold, ageratum, stocks, zinnias, sweet william, single and double poppies, sweet peas, etc. Of sweet peas some were seen that were 8 feet tall. Among the fruits and vegetables there was an abundance of raspberries, currants, gooseberries, carrots, kale, colards, cabbage, and cauliflower. In many gardens were seen Hertsford Market Garden peas, which as a rule grow about 4 feet high. In one garden plants 8 feet high were seen, and most of them had many branches; 11, which bore 118 well-filled pods and 20 blossoms, were counted on one plant. The owner said that on the three rows 20 feet long she expected enough peas to be produced to supply the family during the summer.

SKAGWAY.

Skagway has had many gardens, but about half of them are at present abandoned. Those still cultivated were in excellent condition. Pansies, sweet peas, nasturtiums, and dahlias seem to be the favorites among flowers. (Pls. XIV and XV.) A Japanese has a good garden of about half an acre where he is raising beets, lettuce, radishes, peas, turnips, rutabagas, and cabbage for market. He said he could make more money from his garden than in any other business in Skagway.

LAKE BENNET.

This place was visited on invitation of the president of the railroad, who wished an opinion regarding conditions in that section. Hay was said to cost \$60 per ton, and the problem with him was to grow hay in this section. In my opinion this would not be difficult, as Kentucky blue grass and redbud made excellent growth in the town. Practically nothing was cultivated at Lake Bennet except at the railroad station, where there was a good grass plat and a small flower garden.

PETERSBURG.

Gardening at this point has been practically abandoned, although there were formerly many good-sized gardens which were abandoned for no apparent reason, as everything is said to have grown splendidly. There were seen one small flower garden (Pl. XVI, fig. 1), a small vegetable garden, and a well-kept plat of Kentucky blue grass, redbud, and white clover. Besides these there was a fairly large vegetable garden in which were growing a splendid crop of McLean Advancer peas, Prize Head and Black Seeded Tennisball lettuce, as well as good crops of beets, carrots, parsley, and endive. A very promising bed of celery was seen at this place. The fact that grass grew

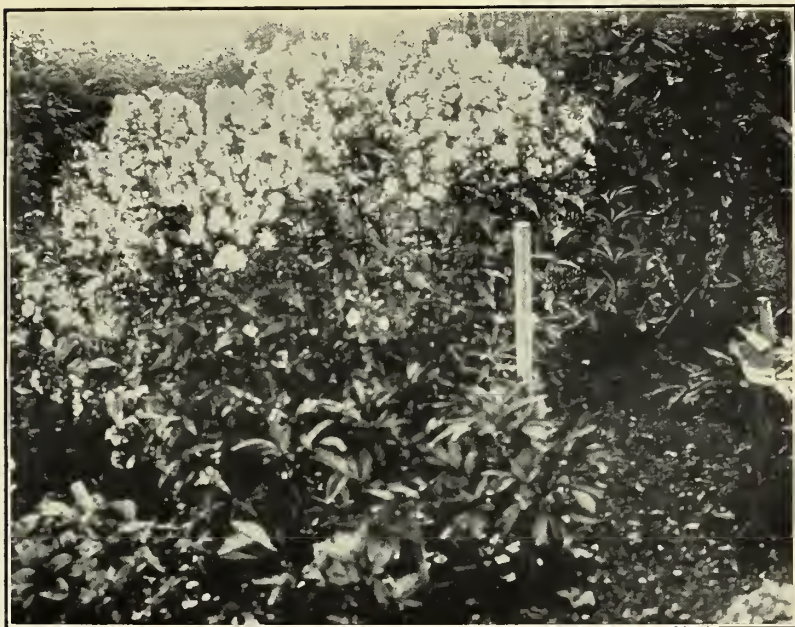


FIG. 1.—PERENNIAL PHLOX, SITKA.



FIG. 2.—SINGLE DAISIES, SITKA.



FIG. 1.—SHIRLEY POPPIES, SITKA.



FIG. 2.—PETUNIAS, SITKA.

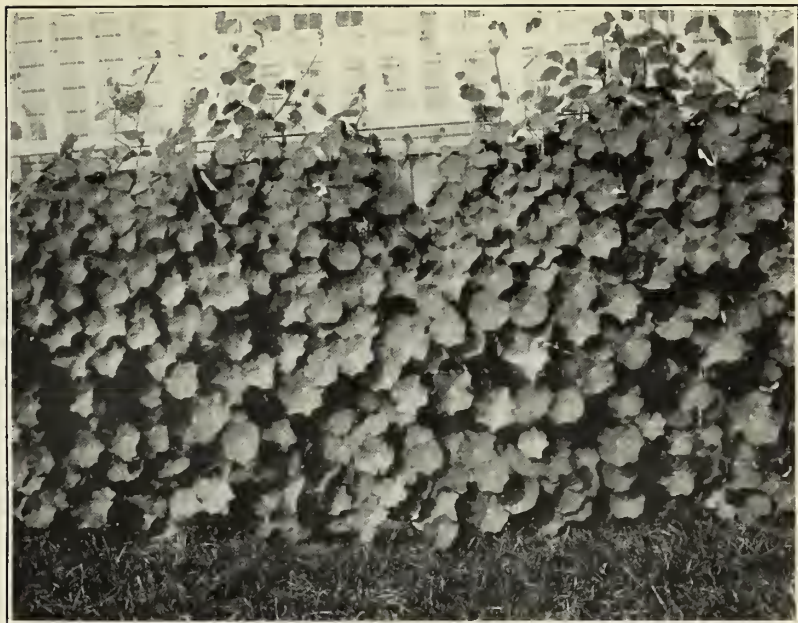


FIG. 1.—NASTURTIUMS, SITKA.



FIG. 2.—VEGETABLE AND FLOWER GARDEN, KETCHIKAN.



FIG. 1.—DAHLIAS AND GLADIOLUSES, SKAGWAY.



FIG. 2.—SWEET PEAS, SKAGWAY.



FIG. 1.—STOCKS, APPLE TREE IN BACKGROUND, SKAGWAY.



FIG. 2.—CALENDULA AND SCABIOSA, SKAGWAY.



FIG. 1.—SMALL GARDEN AT PETERSBURG.



FIG. 2.—WELL-KEPT LAWN, JUNEAU.

so well in some places at this point would indicate that the general lack of it about the village is not caused by unsuitable climatic conditions.

METLAKATLA.

Practically all of the vegetable and flower gardens formerly cultivated in this town have been abandoned. A young native has a good grass plat and flower beds about his house and possibly 3,000 square feet in a truck garden. He is a graduate of the Carlisle Indian School and plans making his living from this garden. At the time of the visit he was growing cabbage, cauliflower, turnips, beets, etc., and he stated that when the natives are at home he sells large quantities of lettuce, radishes, and peas. He has an abundance of raspberries, black, red, and white currants, and gooseberries. A small orchard was on his ground which consisted of twelve 5-year-old trees with trunks about 4 inches in diameter. These included 4 plum, 2 sweet cherry, 2 sour cherry, 2 apple, and 2 crab apple trees. The trees were just beginning to bear and had been sprayed, although he said there had been no indication of insects, but the spraying was done as a matter of precaution.

HAINES.

There is practically no gardening at this place, largely because the town is built on a rocky slope with little soil. The Fort Seward grounds, however, were covered with an excellent lawn. A soldier said that until within the last year they had kept excellent gardens, but interest had been lost in these because steamers brought all kinds of vegetables and nobody seemed to care particularly about growing flowers.

DOUGLAS.

At this town there is practically no gardening at the present time, although there is abundant evidence of former gardens. The leading grocer of the town had a good stock of vegetables which he said were purchased from a Japanese gardener, who had about one-third of an acre in cultivation half a mile from the town.

JUNEAU.

Although this is the capital of Alaska and two trips were made over the entire town in an attempt to locate something in the way of gardening or some effort on the part of the inhabitants to beautify the grounds, practically nothing was seen. In five places in addition to the capitol grounds good stands of Kentucky blue grass, redtop, and white clover were seen. (Pl. XVI, fig. 2.) One small garden was observed which was filled almost entirely with cabbages and cauli-

flower, but in practically the balance of the town there was no sign of present cultivated gardens, although many yards evidently had contained gardens which have since been allowed to grow to weeds. Some Chinese have an excellent truck garden in the outskirts of the town, where they were growing beets, Brussels sprouts, cauliflower, celery, cress, endive, kale, lettuce, mustard, and an abundance of peas, parsley, turnips, and rutabagas. All of these showed indication of making good crops.

LETTERS FROM THE SETTLERS AND REPORTS FROM THE SEED DISTRIBUTION.

C. R. Rieger, Circle, Alaska.—I am wintering 30 head of cattle together with 8 brood sows. They are doing well. I slaughtered 6 head of cattle this fall.

I found the past untoward season brought me much additional labor to provide sufficient forage, necessitating the covering of a large acreage, the stand of native grass being exceptionally light and short. I will devote much time to clearing up ground the coming summer on which to grow dependable forage crops, the native grasses being unreliable when alone depended upon.

My silo, into which I store joint grass, is most satisfactory. I also feed redtop hay and some yellow turnips.

The Petrowski turnip seed which the United States Government sent me through your office proved a great help, growing a heavy crop absolutely without a blemish. All other varieties I grew this season were badly affected with maggots. The seed houses I order from tell me they can not furnish this seed.

John H. Kemp, United States Commissioner, Steel Creek, Alaska.—I used the hellebore sent by you on June 26, saving a lot of cabbage and turnips. We scraped away the earth from the stalk and placed the dry powder around them. In some instances we had to use a second application. I will give you a general idea of our garden and what we raised: 1½ tons potatoes, not a pronounced success because of late seeding; in 1911 the output was 3 tons; 500 pounds of carrots, very fine and large; 200 pounds of beets, very fine; 400 pounds of rutabagas, the largest weighing 7¾ pounds; there were green peas in quantities; 500 pounds of parsnips, large and fine; 200 pounds of onions from seed, large and fine; will never put in a garden without them; 59 pounds of celery, experiment, was large and fine; 400 pounds of cabbage, did not do as well as in 1911, when I raised 600 fine heads; lice attacked the roots this summer; 300 pounds of Swedish yellow turnips, the best turnip ever raised; seed sent from Sweden in 1911; also had a large quantity of flowers of all kinds.

I raise oat hay every year, but this year I had a remarkable crop. I gathered about 7 tons of the very finest hay from about 2 acres of ground. The same ground has had hay raised on it for five years, with an average crop of about 4 tons, but this year some of it was so heavy it would not cure on the ground. As it was too thick, I put up racks with poles about 4 feet from the ground upon which to cure it. I will have plenty of hay for my two horses all winter.

I did not mention lettuce and radishes, as we have them to give away all summer.

H. D. Reese, United States school teacher, Igloo, via Nome, Alaska.—I consider myself the pioneer agriculturist of this locality. There are hot springs 6 miles from here where they have successfully raised vegetables for a number of years, but vegetable-growing conditions at Igloo are typical of this section; you can judge for yourself what it might be by referring to the map.

The land alongside the river valley is very fertile, but too low. This is our most serious drawback, as it keeps the ground wet so long in the spring that we can not

put out our garden until about June 10 because of overflows. The temperature during June, July, and August ranges from 50 to 80° F., and there is so much daylight at this time of the year that everything seems to spring up suddenly. The first killing frosts came about the middle of September, although not severe enough to kill turnips, beets, celery, lettuce, etc.

Last fall we took up such vegetables as turnips, celery, rutabagas, beets, and endive about October 6; cabbage a little earlier. The following is a list of vegetables which have been grown here with success: Turnips, rutabagas, lettuce, radishes, endive, cress, mustard, kale moderately well, celery, beets, potatoes, cabbage, rhubarb, and peas. In the photograph sent with this letter the vegetables shown were not raised on especially favorable conditions for reporting purposes, but are representative of the general run. The largest turnip shown weighed 6½ pounds; the potatoes are fair-sized and turned out well; the beets were about the size of cups. I did not weigh nor measure the cabbage head (Early Wakefield), but it was about the same size as those we raised at my home in Pennsylvania, and some heads were solid enough to burst. The celery was very fine and was raised in the open garden without special nursing. The curly-leaved kale grows very fine. When the endive is taken up for winter storage it is tied before being dug, then lifted up with the shovel, allowing some of the soil to remain on the roots; then it is placed in boxes and stored where it will not freeze. This year we had endive in December. It bleaches and makes a very fine salad.

We sow the celery and cabbage seed in boxes indoors about April 1 and transplant into the garden about the middle of June. We transplant the cabbage indoors once before planting outdoors, and find that this is the only way by which we can produce heads.

Peas grow and develop pods, but do not ripen. Carrots will occasionally do fairly well, but their growth is so uncertain that we make no attempt to raise them. The Finland turnips did very well for us, also the Yellow Montnagny. I am going to try and raise some seed from these turnips, and if I can produce seed I shall raise none but this variety. We like the early Lady Finger radishes. They grow considerably larger and last longer than the Scarlet Turnip radish. We have tried onions for two seasons now and have raised some as large as small hen's eggs, but when it comes to the time for ripening they begin to rot. We have very nice green onions for summer use. We raise the Burbank potatoes, but think some early variety would do much better.

We have now over an acre of ground under cultivation in our school garden, and I am truly surprised at the results.

Father Bernard, of the Catholic Mission for natives here, raised a nice garden last year and asks that some seed kindly be sent him.

Lewis Lloyd, Shungnak, Alaska.—I send you the following report from Shungnak, dated June, 1912. Mr. A. D. Wilcox and the writer have the largest gardens here.

We will have about 2 tons of turnips this year and about 1,500 pounds of potatoes. The potatoes were all sprouted before planting. This has been done for several years, with good results. Our turnips did fine and keep well. We will have lots of fine cabbage, while lettuce and radishes do so well that we can not eat them fast enough. The radishes often weigh 5 ounces apiece.

There are many gardens here now, and this year there will be many tons of turnips raised at Shungnak. There will also be lots of potatoes grown here, besides what Mr. Wilcox and I have grown. Most of the settlers have very poor seed, and should we be able to secure the right kind of a potato for this climate we could raise them for the market.

I am sending you a list of names of persons here who have gardens, but who are not receiving your seeds. Mr. Wilcox and I are helping them all we can with our seeds,

as we raise lots of turnip seeds of the kind best suited to this locality. The Petrowski and the French Montnagny prove to be the best for this climate—you know we are 40 miles north of the Arctic Circle.

James D. Wiest, Fairbanks, Alaska.—I will endeavor to give you an account of what I raised last summer.

I had about 4 tons of nice potatoes and 1,000 pounds of peas. The beans did not do well, as it was too cold and cloudy for them. I do not know how many carrots and beets I had, as I sold them by the bunch all through the summer. I had a dozen hills of summer squash, but most of them rotted before they matured. Cabbage and turnips did not do very well, as the maggots worked on them badly. Cauliflower did first rate. What wheat, oats, and barley I had turned out well, ripening before the frost came. Frost on my land did not set in until September 12, and not very heavy.

I set out 100 tomato plants and had quite a few tomatoes, some of them ripening. I left a bed of Welch onions in the ground over last winter, which lived through the winter. Had an abundance of green onions when no one else had them here.

I sowed a pound each of sand vetch and crimson clover, and that which came up did well, some of the vetch growing 6 feet high and the clover 2 feet high; they both bloomed but did not mature seed. I believe that sand vetch will make a good forage crop for this country.

I took the premium on wheat at the fair this fall, and I believe I should have had the premiums on oats and potatoes. The new potatoes which I wrote you about last year did fine, gathering in 150 pounds from the 5 pounds I raised last year. They are all purple and smooth and just the shape of the Freeman, the potato from which it originated.

Some of the plum, apple, cherry, and crab-apple trees made a good growth last summer—as much as 2 feet—but the wood did not harden. I have about 50 trees in all. Currants, raspberries, and gooseberries did well and should bear fruit next year.

Mrs. Frank Burgees, Valdez trail, via Fairbanks (50 miles), Alaska.—My husband and self are running the Overland Roadhouse, on the Valdez trail, 50 miles out from Fairbanks; also trying to farm. Last year was our first experiment with 2 acres of garden truck, such as potatoes, carrots, parsnips, turnips, rutabagas, White Plume celery, beets, and onions—Yellow Danvers. The soil being new, everything was fine beyond our expectations. We failed with cabbage only, caused by worms in the soil; the green cabbage worm also ate the hearts out of all but five plants which matured. They were good sized, solid, white, crisp, and sweet. The vegetables which are raised in the Tanana Valley are all fine flavored. We find the Government seeds the best we can get.

H. N. Cooper, teacher, Tyonek, Cook Inlet, Alaska.—The seeds you sent me last year for the use of the school and for distribution were disposed of as follows: To white men, 3 sacks; to adult Indians, 2 sacks; to other adult Indians, about a dozen packets of those varieties they asked for; for my own garden, 2 sacks; the remainder, to the children's garden, and a few laid away for next year. However, some varieties are all used up.

Use made of them: One of the white men has a fine little garden. The other two white men did not use their seeds. Of the adult Indians, I think none used the seeds distributed to them. One started a garden in good faith, but his wife died, and the fishing kept him so busy he had no time for a garden. Our own gardens are getting along very well.

Most of the children's gardens do not amount to much because they did not attend to them during the summer vacation. Nevertheless, they will have about 50 cabbages and about 2 sacks of turnips, and some other stuff. Of course, this is not much, but when you consider that there was all kinds of opposition to the children making a garden, it really means a start. The children's parents told them nothing would grow;

that the storekeeper here had tried it years ago and found that Tyonek was no good for vegetables; that the squirrels would eat all the stuff, and besides Indians did not need anything in the vegetable line except potatoes and turnips; besides, it was too early to plant a garden, and frost would kill all the seeds, and then the children would die within a year if they planted something and that something did not grow. I explained patiently that I had plenty of seeds planted in boxes, and that if their little seedlings were killed by the frost, I would immediately give them some plants to replace theirs. I also told them I did not believe they would all die within a year if their plants did not grow. They solemnly assured me that they would.

At first they were keen to get out of school and work out in the nice spring air, but wielding the mattock was awfully hard work, and soon most of them had sore toes, a sick stomach, a splinter in their hand, and even a severe toothache. They were, in fact, as lazy as possible. I had to be an ogre to make them work. The work really was hard, and especially for Indian children in spring, when food is as scarce as can be. Some of them whom I knew could not work on account of being hungry, I gave a piece of fish. This plan was no good. None of the others would work till they had a piece of fish, too. It really amounted to this—that I had to do all the hard digging myself with the mattock, as most of the children are too small to wrestle with this tough sod. Of course, next year those same gardens will be very easy to dig again.

Potatoes do exceedingly well on the side hill. I wish there was some way to obtain seed potatoes for the children. They cost 5 cents a pound here, and, of course, the children have no money with which to buy them. The potatoes that are sent up here from Seattle by wholesale dealers are only culls.

Mrs. Alex Borland, Iliamna, Alaska.—In response to your request for a report on gardening experimental work, I will try to cover the Iliamna Lake district.

Last winter being so very mild the ground was thawed in our garden in April, and we planted potatoes the last of the month. They were slow in coming up and so escaped a frost about the middle of May. We had good-sized potatoes for table use the last week in August, and saved some for seed for another year; many of them attained a marketable size and were quite dry and mealy.

We made a cold frame 2 by 8 feet, in which we started cabbage, cauliflower, celery, Brussels sprouts, and pansies under glass. They all did fairly well, and were just at the transplanting stage when the ashes came. The ashes covered the little plants of beets, carrots, lettuce, etc., and we were afraid they were lost; we had needed rain before and this looked disastrous, but my husband was tireless in his efforts to save our garden, and in a few days the plants sprung up. I never saw a garden grow so fast; there were radishes the size of a teacup and great heads of lettuce like those of cabbage. We had constant rain since July 1 until cold weather, and think cabbages would have headed better if we had had more sun. The tiny rutabaga plants were injured by frost before the ashes came, and then the survivors died. The carrots, turnips, Russian turnips, parsnips, and beets were excellent. Mr. Kinney, our near neighbor, measured a turnip 24 inches round. His garden did very well and, planted on new ground, he raised all the different vegetables mentioned and a few green onions.

Peas did nothing. Kale did well. Kohl-rabi, the Amber Globe turnip, seems to be the best all-around turnip for our soil and keeps well.

The cress and mustard matured early and seeded, although none ripened.

Mr. O. B. Millett was away from home during the planting season, but a neighbor scattered some lettuce and turnip seed and planted potatoes for him, and all did well.

We have one horse, for which we have cured wild hay for the third season, but find it very difficult to do so, due to so much rain. Grass is very plentiful in this section and makes very fine hay.

The volcanic ash ruined our crop of blueberries and low cranberries; the early frost in May killed the garden currants in bloom except where they were protected in the woods. I never saw better currants than the ones produced on these.

Mr. T. Hanmore cleared a large spot and planted a varied garden, but as he was away from home when the ashes first fell, his garden was a disappointment, coming very late and some things not at all.

Mr. Gleason and Mr. Kackley, on Clark Lake, had a fair garden, planting radishes, lettuce, and roots.

The natives at Iliamna village planted some rutabages, but as the teachers were away this summer their garden amounted to nothing.

E. M. Kilbuck, teacher, Akiak Government School, Bethel, Alaska.—Last summer we introduced gardening in this village with the result that a cellar 12 by 80 feet is now well stocked with vegetables such as cabbage, turnips, rutabagas, celery, potatoes, some beets, and winter radishes. These in the main belong to the natives who raised them under our direction, and they are duly proud of their success.

During the summer they had an abundance of radishes, lettuce, and turnips, and some of the finest cauliflower I have ever seen anywhere. We had a few peas and green onions; also many pretty flowers, such as poppies, pansies, asters, nasturtiums, petunias, clover, dahlias, and geraniums.

Last year we tried the round, yellow turnip seed which you sent. I believe you said it was imported. We find it wonderfully fine—large, round, smooth roots and solid and free from blemishes of any kind. We have some with which to raise seed, but if you would send us a few seeds for this year's use we would appreciate it very much.

Thomas W. Hanmore, Iliamna, Alaska.—While the season opened unusually early, there have been but few clear days; there was less frost in the ground here on April 20, 1912, than there was June 15, 1911.

We began planting here last spring on April 25. Potatoes planted April 17 are still coming up at this writing (September 28), while some of the hardier plants produced potatoes as large as goose eggs. The crop taken up the 1st of September was rather uneven, due probably to the pulverized rock distributed over the country by the eruption in the vicinity of Shellikoff Straits on June 6. There has not been a clear day since June 6.

The ash was very fine, hindering the warm meteoric waters in percolating through the ground, also conserving the cold in the ground. As there was no sunshine, nothing grew normally. What vegetables we could uncover did make a normal growth, however, considering the unfavorable season. All native vegetation indigenous to the country was six weeks early.

The birch, willow, alder, and native grasses were checked in their growth by the ash, completely enveloping them. Their growth was either arrested or the leaves killed outright. This seemed to be due to the impeding of air circulation and the fact that the ash formed a nonconductor to heat, rather than to any poison contained in the ash.

I replanted all small seed after June 13. The radishes, lettuce, and mustard made a normal growth, considering the season; turnips and rutabagas are small, but will harvest a partly matured crop. The native vegetation was either affected by the ash and matured early, or lived its natural life until along about the 1st of September, when it began to die off. The trees and grasses above mentioned were about as far advanced on September 1 as they usually are on October 25. There have been bleak and continuous winds, which in part promote early maturity.

To date there has been but one white frost, and that was just heavy enough to nip the potato vines without killing them. Mr. Roehl, the merchant here, has a small potato patch from which he was able to scrape the ashes. He has a normal yield of merchantable potatoes. What few he dug so far yielded from 10 to 14 fair-sized potatoes to the hill (they were cut to one and two eyes apiece when planting). He will probably harvest 30 pounds for every one he planted. My potato patch was on new ground, very full of roots and not well turned over, and the soil has never been sufficiently warmed or aired to expect good results. While I have not seen the

gardens in the Lake Clark district in person, nor those on the north shore of Lake Iliamna, they are said to be as fine as can be grown anywhere in Alaska. In these two latter localities the soil conditions are very favorable; they are mixed with loam and sand on top of a coarse sand and gravel, giving the meteoric waters free play through the soil, carrying warmth and air with it; this also furnishes ideal drainage.

Mr. Johnson and the Duryea brothers, who live a portion of the time on Cottonwood Bay, part of Iliamna Bay, have a full crop of potatoes, rutabagas, and turnips. This locality enables them to use fish fertilizer on their ground. Mr. Johnson's potatoes will yield about 40 pounds to one, and rutabagas will yield over an average crop by about 200 per cent.

My experience, together with what I have seen others do, leads me to believe that a full crop of potatoes, rutabagas, and turnips can be grown anywhere in southern Alaska where there is sufficient shelter from strong winds, on lands near sea level, and where there is a run of fish near by for fertilizing. In the summer of 1890 I planted some potatoes on ground where an old smokehouse had stood, and obtained an enormous yield. This was at Tyonek. In 1891 I planted a garden up on the Susitna, and matured the largest vines and the heaviest yield of potatoes I ever saw. The ground was river silt on an island, and in hilling up the potatoes a large quantity of candle fish was strung along the vines. I was photographed between the rows with vines long enough to lap across the top of my head. I dug as many as 26 potatoes of merchantable size from one hill. I remained at Tyonek for 13 years and 8 months, and never failed to raise a good garden during that time, and fully believe that a good garden can be matured annually at any point on the coast where a plentiful supply of fish can be easily obtained and immunity from the strong winds can be secured.

My experience in maturing oats, barley, wheat, and rye where I used fish was a failure. They grew so rank, the stems fell down early, and most of the strength of the stem would either go into the long trailing stem or it would start a rust and rot the stem.

Peter Murray, Knik, Alaska.—I received the apple trees you sent me, also the raspberry and currant plants; they arrived in good condition. I sprouted the apple trees so that I could set them out on April 29. They made a splendid growth, attaining a height of 32 inches.

The currants and raspberries came later. Three of each kind did well, but the other three died out.

F. R. Falconer, Klukwan, Alaska.—Find inclosed my report for October. We are having a very pleasant open fall.

Since writing you last we have harvested all the garden crop. The potato crop in Klukwan this season beats anything we have ever had. We dug 40 sacks off the same area that yielded me 22 sacks last year. The potatoes are drier and of finer quality, too. The total yield from the natives' gardens was close to 80 sacks, most of them very fine potatoes. Some of the turnips and rutabagas grown in the village were very nice, but the worms did considerable damage. Carrots and peas did well; beets and parsnips fair; and there were a few very nice heads of cabbage. Altogether the result of our efforts along agricultural lines is very encouraging. The Bureau of Education had a man here all summer helping the natives with their gardens, especially attending to the watering of them. Our success is due in a great measure to a liberal use of the garden hose. The school garden yielded 55 sacks of potatoes, 500 pounds turnips and rutabagas, besides lettuce, peas, parsnips, carrots, beets, rhubarb, cabbage, etc. Some strawberry plants set out there, as well as some in my own garden, have made a good stand and should have some berries on them next summer.

The Indians have taken quite an interest in their gardens, and others, who did no gardening this season, are planning to try it next summer. (Pl. XVII, figs. 1 and 2.)

Judging from my observation of the growing crop during the summer, the earlier use of new potatoes, and the increased yield over that of last year, I have quite made up my mind that there is a big advantage in sprouting the seed before planting. I put my potatoes in a warm place to sprout April 13, and started planting May 20. I think next spring I will start them still earlier.

A. C. Goddard, Haines, Alaska.—I wish to thank you for the seed you so kindly sent me last spring. I gave that away, but planted some similar seed with good results, although the garden was not planted until June 3. Carrots, turnips, beets, kohlrabi, Scotch and German kale, lettuce, parsley, peas, and in fact all the vegetables did fine. Buckwheat formed seed, but was frozen. I planted some Lapland barley raised here two years ago from Government seed. It grew well, but was somewhat backward and the grain did not ripen. I planted a beardless barley sent me from Seattle, which grew up two weeks before the Lapland barley. This barley ripened, but about 90 per cent of it was bearded. Timothy, clover, and brome grass grew well, but redtop sown on a wet clay did not grow very well. I used a little fertilizer from the compost heap on the vegetables. The turnips and kohlrabi were affected a little by the root maggot, and some of the turnips were eaten by rabbits.

All the vegetables without exception were tender and succulent, and I intend to raise more of them next year.

Mrs. Wilbur H. Royden, Petersburg, Alaska.—The seeds sent us did well, especially the cauliflower and white turnip. The cauliflower were the best I have ever seen, and we would be pleased to have an extra supply of the seed next year, also the white turnip seed.

We were unable to plant any of the flower seed as we did not have garden to spare, so will not need any of them next year, but will plant what we have.

Mrs. A. E. King, Sunny Point, Prince of Wales Island, Alaska.—I have long intended writing you, giving a little account of our marvelous garden, probably as good a one as could be found in southeastern Alaska. You will probably recall that I wrote you last year asking about fertilizers of different kinds, but before I could send you a sample of the soil the planting season had arrived, and we consequently used our own judgment, trying different kinds in different places as experiments. We tried seaweed, chicken manure, fish, and a commercial fertilizer bought in Seattle. The season was a good one and the whole garden blossomed like a rose.

We had nearly all the vegetables that grow in a temperate climate in greatest profusion, and of excellent quality; and lettuce, peas, and cauliflower could not have been excelled anywhere. But as "pride must always have a fall," I must tell you about the peculiar experience we had with our potatoes.

We planted several different kinds—Gold Coin, Early Ohio, Burbank, Early Rose, Honey-Eye-Rose, and MacGregor, the last two named, very white, medium sized, good-flavored potatoes, and good keepers. These, as well as many of our seeds, and the best we had, came from a seed house of Brandon, Manitoba. Well, the potatoes grew and grew, like "Mr. Finney's turnip," and were fine enough to eat after the middle of August with many to sell. They were not dug for storing in the root house until the weather began to make it necessary to shield them from being frosted. They were properly taken care of, the different kinds by themselves. The man who is interested in the garden is a first-class gardener from Minnesota and I think is far above the average in this respect. To shorten my story, in about four weeks, the potatoes began to turn sweet and taste exactly like frozen potatoes, except that they are firm and solid, cook up dry and mealy, not shriveled like a frozen potato, and have kept well, but the sickish sweet taste prohibited using them, for no one likes



FIG. 1.—KLUKWAN INDIAN SCHOOL.



FIG. 2.—PRODUCTS, KLUKWAN SCHOOL GARDEN.

the taste. Now, can you account for this trouble? It was quite a serious result, after all the expense and hard work. We had over 80 bushels of fine looking potatoes; fortunately we have hogs, so we fed quantities to them.

The soil in our garden is a wash from a creek; looks like good black loam, and has been thoroughly worked and cultivated for many years.

We had several rutabagas, perfect ones, too, weighing 13 and 14 pounds. The potatoes were perfectly sound, weighing 1½ pounds. Cabbages weighed 9 to 10 pounds.

We also had about 90 quarts of red raspberries, but our currants have never done well; perhaps they did not have the proper care.

C. E. Burr, Seward, Alaska.—I used the white hellebore, as you instructed, with good results. I had the finest radishes in the country; also raised the best beets, carrots, and parsnips, also fine rutabagas. Some of my carrots weighed 1 pound each, and some of the beets weighed 2½ pounds with the leaves on. Lettuce and endive did not do so well; the lettuce was attacked in all stages of growth by a soft, yellowish-brown colored fungus which starts a girdle around the root against the lower leaves, and cuts the head from the root of the larger plants, and kills the smaller plants, decaying the center and root, and leaving the leaves green at the outer ends. I do not know what ails it, so please advise me what it is, and the treatment; also how to avoid or protect the plants from the disease. It seems to make no difference as to whether the season is dry or wet, it is just the same, and I have shifted the lettuce patch all over the garden.

I succeeded in ripening five potato balls this season, the first I have ever seen in the country. The first ball was fully ripe the first week in September, and the other four were ripe the second week of September. I am carefully preserving them in separate bunches to experiment further with them next summer.

METEOROLOGICAL REPORTS.

The following tables show in a very condensed form the condition of the weather at the stations named during the year 1912. They have been condensed from daily records into a single line for each month. The stations are arranged alphabetically. The latitude and longitude are given, and if the reader has a map of Alaska at hand, he can readily locate each place. A change has been made the present year from the reports published in former years. Instead of giving the extremes of heat and cold for the month, these tables show the mean maximum and the mean minimum for the month, together with the daily mean. These figures may convey a more correct idea of the climate than do the extremes of heat and cold. The precipitation is recorded in inches for each month, and includes the melted snow as well as rain. The last four columns of the tables give the number of clear days, the number of partly cloudy days, the number of cloudy days, and the number of days on which rain or snow were precipitated in each month.

Condensed meteorological reports.

ALLAKAKET. Latitude 66° 45', longitude 151° 10'. Deaconess C. M. Carter, observer.

Month.	Temperature.			Total precipitation. Inches.	Number of days—			
	Mean maximum. °F.	Mean minimum. °F.	Daily mean. °F.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
January.....	- 5.3	-24.2	-14.8	0.51	12	.....	19	7
February.....	7.0	-16.0	- 4.5	.83	12	.....	17	8
March.....	23.5	3.4	13.4	1.63	8	.....	23	16
April.....	37.0	9.7	23.4	.04	17	12	1	1
May.....	57.0	33.2	45.1	1.40	13	11	7	8
June.....	64.3	38.8	51.6	.46	3	21	6	7
July.....	69.2	45.4	57.3	1.97	9	8	14	11
August.....	61.5	39.9	50.7	2.68	5	13	13	16
September.....	49.0	31.2	40.1	1.14	9	8	13	11
October.....	28.7	14.6	21.7	1.76	8	3	20	13
November.....	3.7	-17.0	- 6.6	.05	18	5	7	1

CALDER. Latitude 53° 8', longitude 132° 27'. John McCallum, observer.

January.....	35.9	25.8	30.8	5.55	10	7	14	13
February.....	42.0	32.2	37.1	11.85	3	9	17	18
March.....	46.1	27.5	36.8	3.30	17	3	11	8
April.....	48.2	31.1	39.6	6.25	13	11	6	16
May.....	57.0	37.6	47.3	6.00	11	8	12	16
June.....	55.7	38.9	47.3	4.23	2	16	12	15
July.....	60.9	41.6	51.2	3.55	13	8	10	12
August.....	58.6	40.7	49.6	4.01	3	20	8	15
September.....	57.9	39.0	48.4	9.80	4	16	10	19
October.....	49.2	35.4	42.3	21.55	.....	13	18	29
November.....	41.2	28.7	35.0	14.85	6	8	16	23
December.....	39.7	27.3	33.5	19.12	.....	9	22	28

CANDLE. Latitude 66°, longitude 161° 50'. R. S. Dimmick, observer.

January ¹	12.1	- 9.2	1.4	.....	11	.....	17	.....
February.....	5.4	-11.7	- 3.1	.....	10	.....	17	.....
March.....	.....	6.7	.....	.....	7	.....	24	.....
April.....	.....	11.0	.....	.....	19	.....	11	.....
May.....	.....	28.2	.....	0.94	13	2	16	6
June.....	.....	35.8	.....	.81	11	5	14	5
July.....	.....	43.0	.....	1.78	5	1	24	15
August ².....	.....	.....	.....	.....	.....	.....	.....	.....
September.....	47.4	30.1	38.8	1.23	10	3	17	8
October ³	29.1	13.4	26.2	.....	5	.....	22	.....
November ⁴	17.0	3.1	10.0	.....	2	.....	25	.....

COPPER CENTER. Latitude 62°, longitude 145°. L. A. Jones, observer.

January.....	18.5	- 1.5	8.5	0.20	12	2	17	2
February.....	19.8	- 2.3	8.8	.24	9	15	5	1
March.....	36.0	13.3	24.6	.11	12	13	6	2
April.....	48.6	20.0	34.3	0	14	16	0	0
May.....	62.9	29.7	46.3	.16	2	25	4	4
June.....	64.9	37.6	51.2	1.60	1	20	9	10
July.....	71.3	43.8	57.6	.56	2	19	10	8
August.....	63.1	37.5	50.3	.82	1	23	7	4
September.....	54.6	33.8	44.2	3.79	2	13	15	10
October.....	37.1	20.9	29.0	.65	.....	14	17	3
November.....	15.7	.3	8.0	.....	3	21	6	.....

¹ For 28 days.² Not reported.³ Four days in October not reported.⁴ Three days no observation.

Condensed meteorological reports—Continued.

CORDOVA. Latitude 60° 35', longitude 146°. Mrs. M. S. Whittier, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	°F.	°F.	°F.	Inches.				
March.....	41.6	30.5	36.0	16.79	5	11	15	19
April.....	48.3	33.2	40.8	4.02	6	18	6	12
May.....	51.9	39.2	45.6	20.29	5	9	17	21
June.....	56.3	44.1	50.2	5.66	2	20	8	16
July.....	60.5	48.4	54.4	4.99	3	13	15	15
August.....	56.7	45.6	51.2	23.16	.....	13	18	21
September.....	52.3	43.4	47.8	49.63	.....	8	22	27
October.....	44.9	37.5	41.2	24.88	2	13	16	27
November.....	41.3	32.6	37.0	5.73	3	5	22	25
December.....	36.7	26.5	31.6	13.47	3	6	22	22

DUTCH HARBOR. Latitude 53° 34', longitude 166° 32'. Emil Ittner, observer.

January.....	35.3	28.1	31.7	4.20	7	6	18	12
February.....	36.8	29.3	33.0	5.12	6	10	13	10
March.....	39.7	30.8	35.2	8.22	9	10	12	13
April.....	43.0	32.5	37.8	5.74	6	10	14	19
May.....	44.7	35.0	39.8	6.72	10	6	15	14
June.....	50.9	38.9	44.9	4.56	8	10	12	7
July.....	54.5	45.2	49.8	3.70	2	11	18	9
August.....	55.3	45.2	50.2	1.52	4	12	15	9
September.....	51.0	42.3	46.6	6.80	4	6	20	21
October.....	45.2	36.1	40.6	10.80	2	8	21	21
November.....	39.0	30.5	34.8	8.26	5	7	18	22
December.....	33.2	24.8	29.0	4.14	9	2	20	16

EAGLE. Latitude 64° 40', longitude 141° 5'. N. R. Meyers, observer.

January.....	2.3	-12.6	5.2	0.06	15	1	15	1
February.....	19.7	- 2.1	8.8	.29	11	5	13	4
March.....	33.3	3.6	18.4	.11	7	8	16	5
April.....	48.5	15.8	32.2	Trace.	13	12	5	.....
May.....	64.6	39.1	47.4	.43	7	8	16	6
June.....	65.9	36.6	51.2	2.09	3	9	18	17
July.....	69.5	39.9	54.7	2.52	4	6	21	14
August.....	66.2	34.9	50.6	2.48	2	15	14	11
September.....	55.9	29.9	42.9	.76	2	5	23	12
October.....	36.5	19.9	28.2	1.66	2	7	22	15
November.....	16.8	1.2	9.0	.24	10	8	12	2
December.....	.9	-16.0	- 7.6	1.10	4	3	24	15

AGRICULTURAL EXPERIMENT STATION, FAIRBANKS. Latitude 64° 50', longitude 148° 9'. J. W. Neal, observer.

January.....	3.7	-11.6	- 4.0	0.10	14	15	2	2
February.....	20.4	- 1.4	9.5	.10	21	2	6	4
March.....	36.0	11.6	23.8	.95	13	5	13	6
April.....	49.9	26.5	38.2	.....	21	8	1	.....
May.....	65.1	38.2	51.6	1.22	10	11	10	10
June.....	65.4	42.4	53.9	3.15	4	10	16	16
July.....	71.2	50.6	60.9	.96	6	5	20	13
August.....	65.4	44.8	55.1	.82	2	14	15	9
September.....	54.8	36.0	45.4	1.16	1	11	18	12
October.....	35.5	18.1	26.8	.54	9	12	10	7
November.....	11.2	- 7.2	2.0	.24	18	8	4	2
December.....	- 1.1	-17.2	- 9.2	.97	9	9	13	12

Condensed meteorological reports—Continued.

FORT LISCUM. Latitude 60° 27' 30", longitude 146° 27' 30". Lieut. E. C. Jones, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	°F.	°F.	°F.	Inches.				
January.....	29.8	20.7	25.2	2.76	9	5	17	11
February.....	35.5	26.6	31.0	3.93	4	10	15	9
March.....	36.6	24.5	30.6	9.63	12	-----	19	15
April.....	44.1	28.8	36.4	.81	16	8	6	5
May.....	49.3	35.5	42.4	5.90	9	8	14	16
June.....	57.3	41.7	49.5	1.01	6	8	16	7
July.....	59.5	46.4	53.0	4.96	5	3	23	19
August.....	55.6	42.8	49.2	7.06	5	3	23	22
September.....	50.3	40.3	45.3	16.64	1	2	27	30
October.....	42.8	31.9	37.4	7.71	6	3	22	17
November.....	33.9	25.4	29.6	6.13	5	1	24	13
December.....	30.0	19.5	24.8	9.85	9	1	21	19

FORTMAN SALMON HATCHERY. Latitude 55° 20', longitude 131° 40'. Fred Patching, observer.

January.....	32.4	20.2	26.3	8.26	8	7	16	16
February.....	42.0	31.2	36.6	13.93	3	7	19	22
March.....	48.0	24.1	36.0	4.41	15	9	7	10
April.....	52.0	32.6	42.3	8.55	4	18	8	24
May.....	61.9	40.3	51.1	6.01	9	14	8	17
June.....	61.5	43.2	52.4	7.53	5	17	8	25
July.....	69.2	48.6	58.9	4.91	12	9	10	19
August.....	63.9	47.7	55.8	5.38	5	12	14	24
September.....	60.3	45.2	52.8	11.89	5	6	19	22
October.....	49.7	40.8	45.2	21.23	2	4	25	31
November.....	41.3	32.3	36.8	20.59	3	3	24	24
December.....	38.0	29.9	34.0	19.19	3	1	27	29

HOLY CROSS. Latitude 62° 20', longitude 159° 50'. L. Sigonin, observer.

January.....	12.7	4.8	8.8	-----	25	-----	6	-----
February.....	14.3	4.1	9.2	-----	20	-----	9	-----
March.....	31.4	17.0	24.2	-----	19	-----	12	-----
April.....	41.5	25.1	33.3	-----	28	-----	2	-----
May.....	56.3	38.5	47.4	-----	20	-----	11	-----
June.....	61.4	43.6	52.5	-----	8	-----	22	-----
July.....	63.5	48.3	55.9	-----	5	-----	26	-----
August.....	58.4	42.9	50.6	-----	1	-----	30	-----
September.....	48.3	37.5	42.9	-----	13	-----	17	-----
October.....	33.3	24.5	28.9	-----	27	-----	4	-----
November.....	18.7	11.8	15.2	-----	14	-----	16	-----
December.....	- 5.2	- 9.8	- 7.5	-----	17	-----	14	-----

JUNEAU. Latitude 58° 18', longitude 134° 24'. C. R. Reid, observer.

January.....	30.7	25.8	28.2	0.54	17	-----	14	9
February.....	39.2	35.4	37.3	7.16	15	-----	14	9
March.....	45.7	30.8	38.2	2.72	20	-----	11	13
April.....	52.9	35.0	44.0	2.93	23	-----	7	18
May.....	61.3	43.4	52.4	4.26	25	-----	6	11
June.....	63.7	45.3	54.5	5.53	-----	-----	-----	15
July ¹	65.3	51.2	58.2	3.60	8	6	11	10
August.....	58.9	46.9	52.9	6.50	11	3	17	13
September.....	56.1	45.1	50.6	9.60	7	5	18	20
October.....	48.0	41.4	44.7	14.80	2	4	25	23
November.....	40.9	32.8	36.8	7.94	7	3	20	19
December.....	36.9	30.6	33.8	13.25	2	2	27	27

¹ For 25 days.

Condensed meteorological reports—Continued.

KENNECOTT. Latitude 61° 30', longitude 143°. H. J. Watkins, jr., observer.

Month.	Temperature.			Total precipitation. Inches.	Number of days—			
	Mean maximum.	Mean Minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
January.....	°F. 13.8	°F. -2.1	°F. 5.8	.....	10	.....	21	.....
February.....	26.3	12.3	19.3	.....	1	.....	28	.....
March.....	32.5	15.8	24.2	.....	11	7	13	.....
April.....	41.3	20.5	30.9	.....	26	1	3	.....
May.....	54.2	33.6	43.9	.....	13	4	14	.....
June.....	57.9	34.8	46.4	.....	7	11	12	.....
July.....	64.5	39.6	52.0	.....	9	10	12	.....
August.....	59.9	36.5	48.2	.....	3	7	21	.....
September.....	52.6	35.9	44.2	.....	1	5	24	.....
October.....	36.8	24.7	30.8	.....	2	.....	29	.....
November.....	24.1	11.9	18.0	.....	15	.....	15	.....

KETCHIKAN. Latitude 55° 25', longitude 131° 35'. A. P. Craig, observer.

May.....	66.6	40.7	53.6	7.15	10	3	18	13
June.....	65.6	42.4	54.0	6.65	9	.....	21	16
July.....	70.6	48.1	59.4	5.60	17	.....	14	11
August.....	64.4	44.4	54.4	4.89	14	.....	17	8
September.....	61.6	42.5	52.0	16.44	15	.....	15	15
October.....	50.1	38.8	44.4	27.78	1	.....	30	25
November.....	42.8	31.1	37.0	18.47	5	.....	25	22
December.....	41.1	29.4	35.2	21.23	4	.....	27	28

KLUKWAN. Latitude 59° 25', longitude 136°. Rev. F. R. Falconer, observer.

January.....	21.2	6.0	13.6	1.55	11	6	14	11
February.....	36.5	22.8	29.6	2.07	6	4	19	16
March.....	44.3	17.3	30.8	Trace.	18	2	11	.....
April.....	53.5	27.3	40.4	.11	13	12	5	3
May.....	63.3	38.5	50.9	.66	13	6	12	7
June.....	63.0	42.1	52.6	1.28	5	5	20	10
July.....	66.7	47.8	57.2	.93	11	3	17	10
August.....	62.4	44.6	53.5	1.06	13	6	12	12
September.....	57.6	41.8	49.7	2.52	9	4	17	14
October.....	45.9	34.7	40.3	4.71	3	3	25	21
November.....	34.3	22.4	28.6	1.02	8	2	20	13
December.....	28.3	16.0	22.2	3.79	7	4	20	20

KODIAK. Latitude 57° 45', longitude 152° 30'. M. D. Snodgrass, observer.

January.....	38.5	33.2	35.9	12.92	1	8	22	30
February.....	39.5	31.2	35.4	8.16	1	18	10	20
March.....	42.2	30.3	36.2	5.28	1	24	6	16
April ¹	² 41.0	² 28.7	² 34.8	6.67	3	9	18	11
May.....	.....	.....	.....	14.59	6	6	19	21
June.....	.....	.....	.....	(³)	4	6	14	10
July.....	.....	.....	.....	(³)	3	24	4	4
August.....	.....	.....	.....	(³)	3	16	12	11
September ².....	.....	.....	.....	(³)	6	14	10	13

MILLER HOUSE. Latitude 65° 41', longitude 143°. Jay F. Kelly, observer.

January.....	4.5	-12.7	-4.1	.....	13	9	9	.....
February.....	19.9	-5.9	7.0	.....	8	5	16	.....
March.....	49.6	5.6	27.6	.....	10	4	17	.....
April.....	54.4	14.5	34.4	.....	26	1	3	.....
May ⁵.....	.....	.....	.....	.....	.....	.....	.....	.....
June.....	62.2	37.9	50.0	.....	2	3	25	.....
July.....	73.9	42.5	58.2	.....	3	.....	28	.....
August.....	69.2	39.1	54.2	.....	4	23	4	.....
September.....	51.4	29.6	40.5	.....	11	19	.....	.....
October.....	32.7	16.6	24.6	.....	.....	.....	.....	.....
November.....	11.9	-4.9	8.4	.....	.....	.....	.....	.....
December.....	-5.5	-19.4	-12.4	.....	.....	.....	.....	.....

¹ Thermometers were broken early in April; consequently no further records were obtained.² For 14 days.³ Rain gage buried in slide of volcanic ash June 6.⁴ Two days total darkness due to clouds of volcanic ash.⁵ Not reported.

Condensed meteorological reports—Continued.

NOME. Latitude 64° 30', longitude 165° 24'. Arthur Gibson, C. E., observer.

Month.	Temperature.			Total precipitation. Inches.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	°F.	°F.	°F.					
January.....	21.5	6.8	14.2	0.63	16	2	13	5
February.....	15.6	2.4	9.0	.20	14	1	14	2
March.....	26.5	10.0	18.2	1.31	5	2	24	12
April.....	33.7	22.2	28.0	.41	13	5	12	3
May.....	48.8	33.4	41.1	.65	9	11	11	6
June.....	53.9	38.6	46.2	.29	9	6	15	6
July.....	59.4	48.5	54.0	2.52	4	4	23	18
August.....	54.9	44.3	49.6	4.81	0	4	27	23
September.....	48.7	36.0	42.4	.98	9	3	18	10
October.....	32.7	23.2	28.0	.77	16	3	12	7
November.....	25.0	15.0	20.0	.42	7	7	16	5
December.....	8.3	-1.7	3.3	.42	15	1	15	6

POINT HOPE. Latitude 68° 30', longitude 166° 50'. Rev. A. R. Hoar, observer.

January.....	2.1				20	2	9	
February.....	-4.2				23	1	5	
March.....	5.1				20		11	
April.....	20.4				27	3		
May.....	32.5				21	2	8	
June.....	40.5				16	3	11	
July.....	54.6				9	2	20	
August.....	56.9				12	3	16	
September ¹	38.5				7	10	13	
October ¹	26.9				8	6	17	

RAMPART. Latitude 65° 30', longitude 150° 15'. G. W. Gasser, observer.

January.....		-12.5		0.13	15	7	9	2
February.....		-7.6		.45	2	11	16	6
March.....		2.4		.81	9	5	17	7
April.....		15.6		.01	19	8	3	1
May.....		34.7		.86	11	11	9	5
June.....	² 70.3	41.8	56.0	3.03	5	9	16	14
July.....	72.6	47.3	59.9	.54	5	7	19	7
August.....	66.1	41.6	53.8	1.52	5	2	24	11
September.....	52.1	33.8	43.0	1.50	0	10	20	11
October.....	31.5	18.9	25.0	1.21	2	3	26	11
November.....	7.2	-5.7	.8	.27	10	7	13	3
December.....	-5.8	-18.5	-12.2	.59	6	2	23	3

RAMPART HOUSE. Latitude 67° 25', longitude 141°. W. B. Reaburn, observer.

January.....	-8.0	-22.8	-15.4	³ 0.0	15	9	7	
February.....	4.4	-14.0	-4.8		8	9	12	
March.....	22.7	-5.9	8.4		7	8	16	
April.....	36.9	3.7	20.3		20	5	5	
May.....	52.0	25.6	38.8		8	15	8	
June.....	64.8	38.4	51.6	1.72	16	8	6	9
July.....	65.5	41.4	53.4	1.38	12	13	6	5
August.....	66.8	40.0	53.4	1.25	4	19	4	5

¹ No record at C. O.² For 23 days.³ Precipitation record incomplete January to May.

Condensed meteorological reports—Continued.

SEWARD. Latitude 60° 6', longitude 149° 26'. W. A. McNeily, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	° F.	° F.	° F.	Inches.				
January.....	¹ 30.9			19.00				
February.....	¹ 32.1							
March.....	41.3	28.9	35.1	5.77	10		18	11
April.....	47.2	32.2	39.7	4.29	13	7	10	12
May.....	52.8	37.2	45.0	8.39	9	9	13	15
June.....	56.6	42.6	49.6	.53	8	8	14	4
July.....	59.8	47.9	53.8	3.10	7	8	16	14
August.....	56.1	45.1	50.6	13.04	7	4	20	23
September.....	55.3	42.1	48.7	13.91	3	7	20	23
October.....	47.1	34.5	40.8	9.29	8	5	18	17
November.....	38.0	29.7	33.8	9.84	7	3	20	20
December.....	29.2	19.6	24.4	9.89	14	2	15	16

SITKA. Latitude 57° 3', longitude 135° 20'. C. C. Georgeson, observer.

January.....	42.2	31.0	36.6	3.18	8	5	18	14
February.....	46.9	34.6	40.8	5.90	5	2	22	19
March.....	47.7	31.1	39.4	5.01	14	2	15	13
April.....	51.0	33.7	42.4	2.67	9	6	15	13
May.....	59.6	42.9	51.2	3.66	5	9	17	12
June.....	58.1	43.9	51.0	3.49	2	4	24	20
July.....	61.9	48.4	55.2	3.84	9	2	22	17
August.....	60.1	46.6	53.4	9.07		2	29	24
September.....	59.3	45.6	52.4	8.27	2	6	22	24
October.....	51.5	41.7	46.6	15.13	2	5	24	23
November.....	45.7	34.2	40.0	9.92	7	1	22	22
December.....	41.6	32.6	37.1	19.87	1	4	26	27

SKAGWAY. Latitude 59° 5', longitude 135°. H. D. Clark, observer.

January.....	26.3	18.4	22.4	0.15	6	12	13	1
February ²	38.1	29.6	33.8	2.00	7	11	11	3

SUNRISE. Latitude 60° 54' 30'', longitude 149° 35'. A. Lawson, observer.

January.....	30.3	17.1	23.7	3.41	11	3	17	15
February.....	38.6	22.6	30.6	5.24	5	4	20	17
March.....	40.9	23.6	32.2	1.20	8	8	15	14
April.....	48.0	28.2	38.1	2.86	11	7	12	12
May.....	55.2	33.7	44.4	6.12	7	5	19	21
June.....	60.2	37.4	48.8	.63	4	11	15	11
July ³								
August.....	51.9	40.9	46.4	3.13	2	7	22	24
September.....	46.9	38.0	42.4	5.44	1	3	26	29
October.....	35.0	27.1	31.0	5.90	7	2	22	18
November.....	29.7	23.4	26.6	8.80	4	5	21	19
December.....	21.4	13.0	17.3	5.40	4	9	18	25

¹ Private observations.² Station temporarily closed after February.³ July not reported.

Condensed meteorological reports—Continued.

TANANA. Latitude 65° 13', longitude 152° 2'. Lena Patterson, observer.

Month.	Temperature.			Total precipitation.	Number of days—			
	Mean maximum.	Mean minimum.	Daily mean.		Clear.	Partly cloudy.	Cloudy.	Rain or snow.
	° F.	° F.	° F.	Inches.				
January.....	6.2	- 6.8	- 0.3	0.08	15	5	11	2
February.....	11.3	- 4.2	3.6	.65	4	10	15	9
March.....	26.2	8.1	17.2	1.16	8	5	18	14
April.....	42.7	19.1	30.9	.02	17	6	7	1
May.....	59.3	36.1	47.7	1.18	13	3	15	12
June.....	63.6	41.4	52.5	2.06	3	9	18	13
July.....	68.6	48.1	58.4	1.59	6	6	19	13
August.....	62.5	43.4	53.0	3.24	3	6	22	18
September.....	51.1	34.4	42.8	1.15	4	12	14	13
October.....	32.1	18.9	25.5	.87	4	16	11	15
November.....	12.1	- 1.1	5.5	.08	13	9	8	4
December.....	- 4.6	-16.6	-10.6	.36	14	5	12	11

VALDEZ. Latitude 61° 7', longitude 146° 20'. E. M. Blade, observer.

January.....	30.2	17.6	23.9	3.04	9	3	19	15
February.....	36.5	21.9	29.2	4.97	6	5	18	13
March.....	39.6	22.8	31.2	10.97	11	5	15	12
April.....	50.7	27.2	39.0	.71	17	5	7	13
May.....	57.2	35.6	46.4	5.45	10	2	18	² 17
June.....	59.7	44.1	51.9	1.23	9	6	14	² 16
July.....	60.7	45.7	53.2	5.10	5	.....	26	18
August.....	55.5	42.0	48.8	7.05	2	6	23	23
September.....	50.6	38.6	44.6	18.74	1	2	27	29
October.....	42.3	31.4	36.8	6.99	7	4	20	21
November.....	33.1	20.8	27.0	2.47	5	8	17	12
December.....	27.3	15.0	21.2	9.14	4	8	19	14

¹ April 21 omitted.² May 27 omitted.² June 2 omitted.

