January, 1953

Report of Progress

January 1 to December 31, 1952

DON L. IRWIN, Director

University of Alaska

ALASKA AGRICULTURAL EXPERIMENT STATION

PALMER, ALASKA

IN COOPERATION WITH THE

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION

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PREFACE

Each calendar year the Alaska Agricultural Experiment Station submits a Progress Report to the University of Alaska and the U. S. Department of Agriculture, the 2 cooperating agencies under which it operates. This 1952 report segregates the work of each department, reporting briefly the progress made on each project currently under investigation, contributions to scientific knowledge or to the public interest and phases of the work to receive special attention during the coming year. Due credit is given to cooperating agencies and to various station personnel where more than one department is involved on a project.

Briefly reported, also, are improvements and additions to physical plant, personnel changes, publications of the station during the year, and sources of financial support.

This technical report is intended for limited distribution to cooperating Territorial and Federal agencies, scientific organizations concerned with research work and to legislative and administrative bodies and personnel directly responsible for the conduct of the work or its financial support. Following this technical report will be a popular style publication interpreting the research data for the general public.

In addition to these progress reports, various informative bulletins, circulars, press releases, articles for publication in scientific journals, and reports and papers for delivery before scientific societies are published each year. This procedure is in accord with the Station policy of interpreting and publishing research information as rapidly as it can be made available.

Close working relations are maintained with the University of Alaska's Agricultural Extension Service, the U. S. Soil Conservation Service, Territorial Department of Agriculture and other allied agencies. The research information obtained by the Station is disseminated through these organizations to groups and individuals with whom they work.

Don L. Irwin

DON L. IRWIN
Director

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ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT: FEDERAL AND FEDERAL-GRANT PROJECTS,

WORK PROJECT NUMBER: AL-1-1

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Soil Classification, Mapping and Management Research

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick

LOCATION: Alaska Agricultural Experiment Station, Palmer, Alaska

COOPERATION: Soil Conservation Service (participated in mapping); Agronomy Department (participated in forage fertilizer studies); Animal Husbandry Department (participated in forage studies); Horticulture Department (participated in potato studies).

OBJECTIVE OF CURRENT WORK: To classify and inventory soil resources in the Matanuska and Tanana Valleys, and in selected sites elsewhere in Alaska; to develop or adapt rapid analytical techniques for anticipating nutrient amendments for soils; to investigate fundamental physical and chemical characteristics of Alaskan soils; to investigate the field response of forage, grains and potatoes to fertilizer amendments, including minor elements.

PROGRESS DURING THE YEAR: Soil classification and mapping (AL-1-1-1, 1-1-2, and 1-1-3) was confined to the Wasilla-Pittman-Big Lake areas where 22,900 acres were classified and mapped. Emphasis on "rapid" testing (AL-1-1-4) was placed on improving existing procedures for greater precision. Preliminary studies of soil moisture characteristics (AL-1-1-6) which affect plant growth and tillage operations were made in the laboratory. In the minor element work (AL-1-1-10) the response of potatoes to varying levels of manganese and magnesium was studied in the greenhouse. One pot-testing (AL-1-1-11) experiment studying fertilizer ratios and amounts was completed and preparation made for initiation of 4 additional experiments.

In cooperation with the Horticulture department (AL-1-2-7) studies of potato nutrition included statistical designs to reveal responses of several varieties to different fertilizer levels, spacings, nitrogen carriers and lime.

Cooperating with the Agronomy department (AL-1-6-5) a factorial trial at 4 locations was used to study the role of nitrogen, phosphate, and potash in cereal nutrition and another factorial used to determine the response of oats and barley to 5 different nitrogen carriers. A nitrogen, phosphate, potash factorial was applied to bromegrass soil as well as an experiment involving very heavy fertilizer applications.

Two small factorials tested the response of "hayflat" vegetation to nitrogen applications.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: A method of increasing forage yields has reduced the land requirements of livestock and dairy enterprises. Soil surveys yield information concerning economic land utilization and the feasability of extending research results into unsettled areas.

WORK TO RECEIVE SPECIAL ATTENTION DURING THE COMING YEAR: Soil survey work (AL-1-1-1, 1-1-2, 1-1-3), will consist of integrating field studies by the Soil Conservation Service with the National Classification system. Continued effort will be made to develop rapid analytical techniques to Alaskan conditions, with special emphasis on correlating test results with crop responses (AL-1-1-4). Permeability studies will be expanded (AL-1-1-6). and chemical studies will be suspended indefinitely (AL-1-1-5). Field plot studies dealing with the fertilizer requirements and cultural management practices of forage, grains, and potatoes will be accomplished in close cooperation with the Agronomy and Horticultural departments; financial support will be allocated under their projects. Greenhouse pot studies (AL-1-1-11) will be expanded in an effort to isolate and characterize limiting soil nutritional factors.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-1-1 (F)

PROJECT TITLE: Soil Classification and Mapping in the Matanuska Valley

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Paul Martin, Neil Michaelson)

LOCATION: Palmer, Alaska

COOPERATION: Soil Conservation Service.

OBJECTIVE OF WORK: To complete a survey and make maps available which summarize the distribution features of a soil classification based on proved criteria. These maps will serve as a basis for study, and for devising and recommending suitable land use management practices.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Extension of survey into areas not yet under cultivation, with particular stress on the Wasilla-Pittman area where recent road construction has opened large acreages of previously inacessible land.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: This survey is basic to other Experiment Station projects. It has revealed that: (a) Important agricultural enterprises in the Matanuska Valley are chiefly supported by two mineral series, Knik and Bodenburg. (b) Successful farm enterprises are supported by deep phases of these series. (c) Shallow phases support part-time enterprises and together with podzol series constitute a major portion of land now available for homesteading and for expansion of agriculture within the Valley. (d) Because of drainage problems, organic soils remain marginal in character. Drainage problems are acute to the extent of eliminating the use of organic soils until local demand for produce makes exploitation economically feasible. (e) In all probability, the results of technical studies on the important mineral soils are interchangeable in application.

Indirect benefits to local agricultural enterprises thus have accrued from this work insofar as the results of studies undertaken in other agronomic projects have been extended in the form of specific recommendations concerning fertilizer practices, crop adaptations, and related information.

PROGRESS DURING THE YEAR: A limited amount of field work was undertaken during 1952 mapping tentative soil series and types within the Wasilla-Pittman and Big Lake areas. Detailed observations also were made of surface physiography and soil parent materials. Some 22,900 acres were mapped within this area during the summer season. Approximately 42 percent of the soils are podzols of medium texture and of moderate to shallow depth (10-30 inches) over glacial till materials. The remaining 58 percent consists ofshallow podzols

over glacio-fluvial gravels and wet soils with adjacent swampy areas.

PUBLICATIONS: Soil surveys of the area are incomplete; no map publication is anticipated at this time.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-1-2 (F)

PROJECT TITLE: Soil Classification and Mapping in the Tanana Valley

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Paul Martin, Neil Michaelson)

LOCATION: Palmer, Alaska

COOPERATION: Soil Conservation Service

OBJECTIVE OF WORK: To complete a survey and make maps available which summarize the distribution features of a soil classification based on proved criteria. These maps will serve as a basis for study, and for devising and recommending suitable land use management practices.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Collecting field notes and assembling data into maps. Field work will be held to a minimum, consisting mostly of reconnaissance studies in areas adjacent to those already mapped.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: This survey is basic to other Experiment Station projects. It has revealed fundamental relationships determined by the geographic distribution of potential agricultural sites in the Tanana Valley. The classification makes possible an intelligent application and extension of the agronomic research results. Indirect benefits to local enterprises thus have accrued from this work, insofar as the results of studies undertaken in other agronomic projects have been extended and applied in the form of specific recommendations concerning fertilizer practices and related information.

PROGRESS DURING THE YEAR: All work on this project was held in abeyance and soil classification in the Wasilla-Pittman and Big Lake areas was given priority.

PUBLICATIONS: None

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-1-3 (F)

PROJECT TITLE: Soil Classification and Mapping in Alaska Exclusive of the Matanuska and Tanana Valleys

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Neil Michaelson)

LOCATION: Palmer, Alaska

COOPERATION: Soil Survey Division, Bureau of P.I., Soils, Ag. Engr.; U.S. Geological Survey.

OBJECTIVE OF WORK: To classify soils in Alaska, exclusive of the Tanana and Matanuska Valleys, preparatory to organizing soil categories under the national system of classification.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Continuation of studies when and where an opportunity is presented. This work will be accomplished in conjunction with travel for administration or other purposes; or in conjunction with other agency projects.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Indirect benefits to local agricultural enterprises have accrued from this work insofar as the results of studies undertaken in other agronomic projects have been extended and applied in the form of specific recommendations concerning fertilizer practices, crop adaptation, and related information.

PROGRESS DURING THE YEAR: An inspection of the Nelchina drainage area co-ordinated reconnaissance survey activities of the Permafrost Section, Military Geology Branch, U.S.G.S. Considerable areas of markedly podzolized soils were observed in the vicinity of Eureka Roadhouse. Developed in sandy glacial materials exhibiting marked shale and calcareous influence, these profiles confirm previous hypotheses concerning soil genesis and taxonomy in the area. Very little agricultural potential was discerned in the area, chiefly because of its high altitude and short growing season. Some grazing areas might be exploited if supplies of winter feed become available.

PUBLICATIONS: None

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-4 (H)

PROJECT TITLE: Soil Fertility Levels as Indicated by Rapid Soil Analysis

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Paul Martin, Margaret Blom)

LOCATION: Palmer, Alaska

COOPERATION: Extension Service and Soil Conservation Service

OBJECTIVE OF WORK: To adapt recognized rapid analytical techniques to Alaskan soils in an effort to develop a method of predicting nutrient deficiencies under field and greenhouse conditions.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Field fertilizer trials with small grains, forage, potatoes, and vegetables on representative soil series will again provide an opportunity to correlate actual yields with values obtained from rapid analysis of carefully selected soil samples.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Because of widespread popular misunderstanding and a lack of application of soil testing, the value of soil test information is exaggerated. Some Alaskan farmers send soil samples to commercial laboratories in the States and follow recommendations that do not agree with experience or research results obtained in Alaska. A local soil testing program is needed urgently, not only to supply information concerning proper soil management practices but to correct misunderstandings that have resulted from an over-extension of experience accumulated in other climates.

PROGRESS DURING THE YEAR: Employing the procedures and facilities developed during the previous year 100 samples sent in from widely distributed areas in the Territory were analyzed. Test results included pH and estimates of available nitrogen, phosphate, potash, calcium, iron, manganese, magnesium, aluminum, ammonia, and copper. Tests for boron and molybdenum were adapted for local use. The precision of calcium test was increased by the use of steric and oleic acid in an ethanol solution to control particle size in the turbidimetric solution. Material has been gathered which is expected to increase the precision of several other existing tests.

Soil samples were taken at planting time and after harvest from each plot in a potato experiment located on two farms where 500 pounds of lime were applied with fertilizer in the row. Determinations of pH were made on each sample.

Lime applications increased the soil reaction on the Dinkel farm (Wasilla) by a highly significant amount, but had no effect on the soil reaction at Newman's (Miller's Landing near Homer). The apparent seasonal change in soil reaction in each location should be investigated.

Seventy-four soil samples were received from the Soil Test Work Group of the National Soil and Fertilizer Research Committee. We were one of many laboratories throughout the United States to report the values we obtained of pH and our estimates of available phosphate, and potash. These results will be used to evaluate the over-all value of rapid soil testing.

PUBLICATIONS: Limited to interagency reports.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROJECT REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-5 (F)

PROJECT TITLE: Fundamental Chemical Characteristics of Alaskan Soils

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Neil Michaelson)

LOCATION: Palmer, Alaska

COOPERATION: Soil Conservation Service

OBJECTIVE OF WORK: To describe Alaskan soil categories in terms of base exchange characteristics and other agriculturally significant chemical properties.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Project discontinued July 1, 1952. Will be reinstated when other problems of higher priority have been resolved.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Estimates of organic matter levels in Alaskan soils and soil materials have facilitated the assessment of their productivity characteristics.

PROGRESS DURING THE YEAR: A technical paper Exploratory Studies of the Fairbanks and Chatanika Soil Series, Tanana Valley, Alaska was completed from the previous year's investigations of physical and chemical characteristics. The data include organic matter content of the profiles of these 2 soils.

PUBLICATIONS: Exploratory Studies of the Fairbanks and Chatanika Soil Series, Tanana Valley, Alaska. Mimeographed copies are available for limited distribution to various agencies.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS.

PROJECT NUMBER AND FUND: AL-1-1-6 (F)

PROJECT TITLE: Fundamental Physical Characteristics of Alaskan Soils

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Allan H. Mick (Neil Michaelson)

LOCATION: Palmer, Alaska

COOPERATION: Soil Conservation Service

OBJECTIVE OF WORK: To find a solution to problems of low soil temperatures and low moisture supplies during the growing season.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Physical analysis of representative samples of agricultural soil series and analogous undisturbed profiles to discover fundamental pore size and particle size distributions; permeability, and moisture and aeration relationships; changes brought about in these characteristics by clearing and management practices and measures to increase yields and preserve the soil as a natural resource.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Low soil temperatures, impeded drainage caused by peculiar pore size distributions and persistant frost, and low moisture retaining capacities are several factors that limit yields in many Alaskan soils. Except for particle size analysis of samples collected by Bennett and Rice in 1913 and a few samples studied by Rockie in 1950, no work has been done in this field. Opportunities for public assistance are great, especially in devising good management practices.

PROGRESS DURING THE YEAR: Three types of apparatus previously used in soil moisture studies were constructed, modified, and evaluated in the laboratory in preparation for a study of soil moisture characteristics. A moisture tension table was used in the determination of soil macroporosity. Porous plaster of paris tension plates were used effectively at moderately high tension values for determining the volume of medium-sized soil pores. A permeameter used as a constant flow and leveling device provided a measure of water percolation rates through the soil.

Soil permeability values are derived from measurements of soil percolation rates and are an essential factor in rating soils as to suitability for crop production. There is need for actual comparative measurements of this moisture characteristic in Alaskan soils. The amount and distribution of soil pore space limits the movement and retention of water and the aeration of plant roots.

The tension table was used primarily to determine pore drainage time for each applied tension value. One hour is sufficient to provide an index of moisture loss at 80 centimeters tension. An individual plaster of paris tension plate for each 3 inch soil core was effectively used to drain soil pores over the range of 0 - 240 centimeters of tension. This technique shows that moisture within the small soil pores is held tightly and can be removed only at high tension.

Percolation rates were found to vary according to the nature of the soil layer sampled. The following table indicates that topsoils will absorb rainfall and reduce runoff when plant roots and other organic matter keep it in an open, porous condition.

Percolation rate in inches per hour. Mean of three hourly measurements of single core samples from the upper three inches of mineral soil.

Soil	Inches of water entering the soil per hour
Woodland	2.3
Grassland	1.2
Mineral soil (low organic content)	0.6

PUBLICATIONS: Limited to interagency reports.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-7 (F)

PROJECT TITLE: Fertilizers for Small Grains

NOTE: This separate project was discontinued July 1, 1952, in favor of closer cooperation under appropriate Agronomy projects. Work of a similar nature will be continued as an integral part of the agronomy projects dealing with the production of grain and forage. Results for the 1952 crop season may be found in the agronomy section of this report.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-8 (F)

PROJECT TITLE: Fertilizers for Forage Crops

NOTE: This separate project was discontinued July 1, 1952, in favor of closer cooperation under appropriate Agronomy projects. Work of a similar nature will be continued as an integral part of the agronomy projects dealing with the production of grain and forage. Results for the 1952 crop season may be found in the agronomy section of this report.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-10 (T)

PROJECT TITLE: Minor Elements

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: Allan H. Mick, W. M. Laughlin

LOCATION: Matanuska and Tanana Valleys

COOPERATION: None

OBJECTIVE OF WORK: To discover the response of crops to treatments involving minor elements.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Project discontinued July 1, 1952. Minor element investigations will be included under the pot-testing project (AL-1-1-11).

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: In the United States, Canada and in parts of Europe, minor elements have limited production of important crops. Applications of small quantities of minor element fertilizer materials have proved profitable. In view of the nature of Alaskan soils, particularly with regard to their alkaline characteristics, minor elements may prove effective in increasing yields and in improving quality. Minor elements may be expected to assume more conspicous roles as farming practices become more intense.

PROGRESS DURING THE YEAR: In March, Knik potatoes were planted in the greenhouse in pots, replicated 6 times with 4 levels of manganese and magnesium (0, 150, 300, and 600 pounds of manganese sulfate and magnesium sulfate per acre respectively). Potatoes which received 600 pounds of either manganese or magnesium sulfate did not emerge, but rotted in the soil. The potatoes grew well with the other treatments and no treatment differences were apparent. Foliar abnormalities observed the previous season, thought to be due to either virus infection or to a nutritional deficiency, did not develop under greenhouse conditions. It is therefore concluded that the field symptoms most likely were due to physiological responses to environmental factors other than soil nutrient levels.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-1-11 (F)

PROJECT TITLE: Soil Fertility Levels as Indicated by Pot-testing Techniques

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: W. M. Laughlin, P. F. Martin, Neil Michaelson

LOCATION: Matanuska Experiment Station

COOPERATION: None

OBJECTIVE TO WORK: To develop a method of predicting nutrient deficeincies in Alaskan soils and to determine if and what inherent deficiencies exist in important agricultural sites and soils.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Factorial experiments involving different levels of the major plant nutrients will be performed as space and time are available.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: In certain western states, pot-testing techniques yield better prediction information than rapid chemical tests. Prediction information from pot-testing will be extremely useful in Alaska.

PROGRESS DURING THE YEAR: A 4^3 factorial with 4 replications involving 4 levels each of nitrogen, phosphate, and potash was set up with Bodenburg soil obtained from the Irwin-Albrecht farm. Romaine lettuce was used as an indicater crop. Barley was planted immediately after the removal of the lettuce, but a poor stand made it necessary to abandon the experiment.

Lettuce responds well to nitrogen and phosphate applications. Potash applications had little influence on growth. Lettuce harvest should occur about 4 weeks after transplanting.

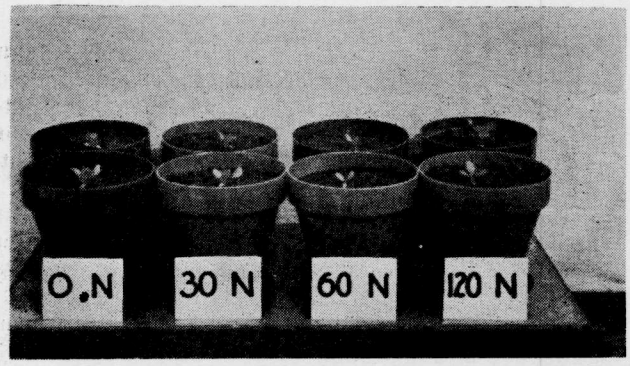
Pots have been filled for similar factorial experiments which will commence in March or April. Four different soils from the Matanuska Valley will be used.

PUBLICATIONS: See accompanying leaflet.

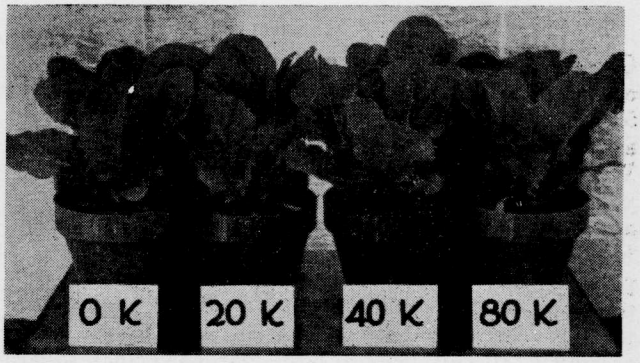
Miscellaneous Extension Leaflet
January 1953

Gardens in Alaska Need Nitrogen & Phosphate!

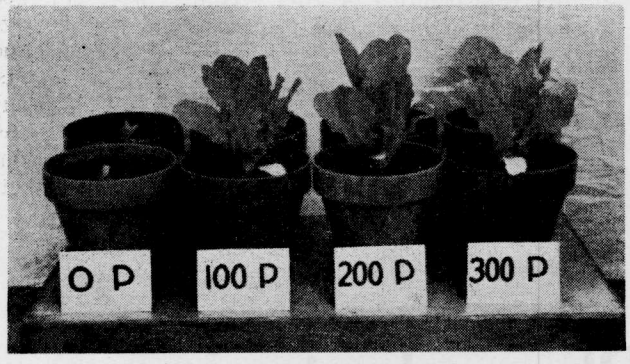
These pictures show one method used by the Alaska Agricultural Experiment Station technicians to track down the fertilizer needs of Alaska's soils. Comparisons below were selected from a large greenhouse experiment where 64 different combinations of the three fertilizer ingredients were tested. They show how first nitrogen, then potash and finally phosphate is varied until the best mixture is found. To make sure weather and insects do not confuse the results of such studies, tests of this kind are made under uniform conditions in a greenhouse. All plants shown are the same age—about six weeks old—and are growing in the same kind of soil. A large sample of topsoil (about 500 pounds for this experiment) was thoroughly mixed before exactly the same quantity was placed in each pot. Differences in the size of plants are therefore not due to soil differences. The crop is Romaine lettuce, a hardy plant especially good for this kind of testing. Study the pictures step by step to see how the conclusions are reached.



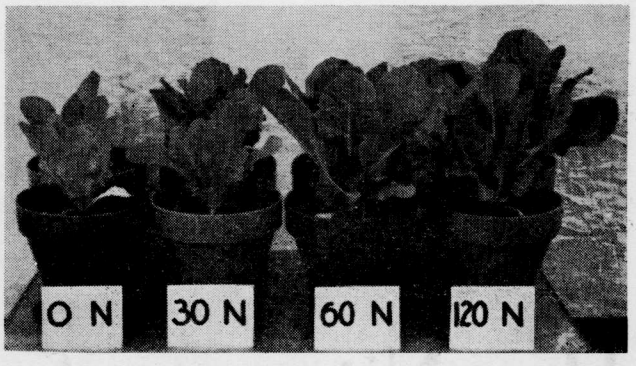
Step 1—None of the above pots were treated with phosphate or potash. Those to which a lot of nitrogen was added (120 N) are as poor as those on the left given no nitrogen. Failure to grow indicates soil phosphate deficiency. Why not blame growth failure to lack of potash? See Step 2.



Step 2—These pots contain the same kind of soil but all were heavily treated with nitrogen and phosphate. Vigorous dark green growth of all plants, even those on the left receiving no potash (O K), shows this soil like many others in Alaska contains plenty of potash.



Step 3—All pots in this series were treated with the same quantities of nitrogen and potash. Note the great response to phosphate from none (O P) to heavy applications on the right. All garden crops require a lot of phosphate. Light colored foliage shows that not enough nitrogen was present.



Step 4—Here all pots were heavily fertilized with phosphate and moderately fertilized with potash. In contrast to Step 1 Romaine lettuce now responds well to nitrogen. Under the conditions of this test, the plants efficiently used available nitrogen applied at the rate of 120 pounds per acre.

Other studies indicate that most gardens in Alaska are growing on soil like this. All need liberal applications of nitrogen and phosphate. Very few need lime or potash. Of course you may use a lot of fertilizer on your garden and still reap only a small crop. A cold site, too many maggots, not enough sunlight, too little water, too much water, a poorly prepared seedbed—all these and many other factors besides a lack of nutrients may cause failures. But your chances of growing a good garden are much better if you use nitrogen and phosphate fertilizers. A lot of backbreaking labor is apt to be wasted if these two nutrients are not generously supplied.

University of Alaska Agricultural Extension Service
cooperating with the U. S. Department of Agriculture

Published in furtherance of the
Acts of May 8 and June 30, 1914

IF YOU BUY—	Before planting broadcast over every 100 square feet & work in	Row application at planting time, for every 10 feet of row, rows spaced— 3-ft.	2-ft.	1-ft.	Total to buy for every 100 square feet of garden.**
	Cups	Cups			Pounds
Mixed fertilizer like 5-10-5 or 4-12-4*	6	1¾	1¼	½	5½
	Cups	Tablespoons			Pounds
Separate carriers					
Ammonium nitrate	1¼	6	4	2	1
or					
Ammonium sulfate	2	9	6	3	1½
or					
Sodium nitrate	1½	7	5	2	2
and					
Treblesuperphosphate	1½	7	5	2	1½

*Use half as much 10-20-10, 10-20-0, or 11-48-0, or similar concentrated mixture. Use twice as much 3-12-8, 3-6-3, or similar low analysis fertilizer.

**In addition buy for each 100 square feet of garden ½ pound of ammonium nitrate, or ¾ pound of ammonium sulfate, or 1 pound of sodium nitrate for side-dressing leafy vegetables.

Grocery, hardware and department stores sell a variety of ready mixed fertilizers. These usually contain from 5 to 15 percent available nitrogen, 10 to 25 percent available phosphate, and 5 to 10 percent soluble potash. When you buy a 100-pound sack of 5-10-5 fertilizer you get 5 pounds of available nitrogen, 10 pounds of available phosphate, and 5 pounds of soluble potash. Read the labels to see how much and what kind of plant foods a ready-mixed fertilizer contains. A 100-pound sack costs from $8 to $10. Bought in smaller packages the same material may cost two or three times as much. If you plan a large garden (2000 square feet or more) you can save money by ordering concentrated fertilizers from your mail-order house or from a bulk dealer. A 10-20-10 mixture contains twice as much plant food as 5-10-5 and costs only a little more.

Because only nitrogen is needed for side-dressing, many gardeners prefer to buy separate carriers for both nitrogen and phosphate instead of a ready-mixed fertilizer containing all three nutrients. This is especially true in Alaska where most soils do not need the potash contained in a complete mixture. Suggestions concerning kinds and amounts of fertilizer to buy and when to spread it are listed in the table above. About half the fertilizer should be broadcast and worked into the seedbed and half spread in the row at planting time. Row applications should be a half inch or so to one side and a little below the seed or transplant.

Separate carriers may be mixed in the proportions shown in the righthand column before applying. After mixing, for example, 1 pound of ammonium nitrate and 1 1/2 pounds of treblesuperphosphate, the broadcast rate is 2 3/4 cups per 100 square feet of garden, followed by an application (where rows are spaced 3 feet apart) of 13 tablespoons for every 10 feet of row.

Leafy vegetables like chard, celery, cabbage, cauliflower, kale and broccoli should be side-dressed two weeks or so after transplanting or after seedlings have emerged from the ground. Use the rates outlined for separate carriers. Spread the fertilizer on top of the ground and along the row an inch or so away from the plants. Transplanted crops will get off to a faster start if a cup of starter solution is poured around each plant after setting out. Make a starter solution by stirring one tablespoon of nitrogen fertilizer and two of phosphate fertilizer in one gallon of water.

Use Nitrogen & Phosphate in Your Garden and ---

KEEP WEEDS DOWN WITH SPRAYS . . . . . COMPOST GARDEN WASTES
IRRIGATE DURING DRY SPELLS . . . . CONTROL MAGGOTS AND CUTWORMS

ALLAN H. MICK, Soil Scientist
Alaska Extension Service

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-2

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Horticultural Crop Investigation

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M.F.Babb, C.H.Dearborn, Arvo Kallio, A.S. Buswell

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Division of Fruit and Vegetable Crops and Diseases (participated in tests of potatoes, lettuce and small fruit varieties); United States Forest Service (participated in tests of ornamentals); several state experiment stations (participated in potato and small fruit breeding); several commercial companies (participated in weed control work related to potato and vegetable culture); Agricultural Engineering Dept. (participated in potato culture and vegetable forcing projects); Soil Science Depart (participated in potato and vegetable culture projects); several farmers (cooperated in potato variety tests).

OBJECTIVE OF CURRENT WORK: (1) Potato breeding for an earlier maturing, higher yielding, disease resistant variety for Alaska. (2) Potato cultural investigations involving fertilization, weed control, top-killing, planting distances and storage methods. (3) Vegetable cultural investigations involving a study of direct seeding versus transplanting for certain crops and nutritional requirements of such crops as beets and onions. (4) Winter forcing of vegetables. (5) Testing of ornamentals for adaptation and hardiness. (6) Tree and small fruit testing for hardiness and the breeding of small fruits. (7) Vegetable variety testing to secure better adapted varieties and crops for Alaska.

PROGRESS DURING THE YEAR: AL-1-2-4 (R) The potato selection #57.44-3-46 has been given the name "Knik" and released to potato growers through the Alaska Certified Seed Growers Association. AL-1-2-7 (P) Present results indicate that such chemical weed control sprays as Chloral I.P.C., I.P.C., or T.C.A. may prove satisfactory in Alaska. Spacing-fertilizer studies indicated that significant increases in yield were obtained from applications of 45 and 67.5 pounds of available nitrogen in a 1-4-2 formula on 5 varieties of potatoes (Knik, Teton, Kennebec, Arctic Seedling and Selection 114.43). Greater yields also were obtained from closer spacing (up to 9 inches) provided heavier applications of fertilizer were made. In aseries of fertilizer tests the new variety Knik generally outyielded other standard varieties and displayed superior resistance to scab. Lime application on newly cleared fields reduced potato yields. At Fairbanks, calcium nitrate was inferior to ammonium nitrate, urea and ammonium sulfate as a potato fertilizer. Potato quality, as influenced by fertilization, was

evaluated by laboratory cooking tests, home cooking tests and the use of 95% ethanol. It was found that the 3 methods gave closely comparable results and that the use of 95% ethanol is a much more rapid method of evaluation than actual cooking tests.

AL-1-2-9 (F) Forcing stocks of rhubarb were propagated for increase and 5 new varieties added to the collection. Seedling stocks of 6 varieties of asparagus were established to test their hardiness for culture in Alaska. Tentative plans have been made for the construction of a suitable forcing structure. AL-1-1-10 (F) Care of tree and shrub stocks on hand was continued and several were transplanted from the nursery area to the Palmer Station grounds where they will serve the double duty of providing landscape material and provide a test of hardiness. New accessions of 6 species of Malus, 12 species pf Prunus and 1 each of Acer, Eleagnus, Fraxinus, Lonicera and Pinus were added to the collection either through exchange with other horticulturists or by private collection. Seed of several new accessions have been stratified for planting next spring. AL-1-2-11 (F) New apple varieties added to the collection included Early McIntosh, Greendale, Macoun, Ogden, Close, Young America Crab, Redfield, Redhook, Milton, Redford, Alton, Dunning, Lodi, Sweet Bough, Melba and Crimson Beauty. Trees of Red Duchess and Yellow Transparent, known to be at least semi-hardy in Alaska, were planted in experimental designs calculated to enhance their natural hardiness. Fruit trees blooming 3 years after setting included Golden Aniversary, Sylvia, Red Siberian and Dolgo Crabs. Of these, the first 3 varieties set fruit which matured. Sandcherry and the Dakota Amber cherry also set fruit in 1952 which failed to mature. AL-1-2-12 (F) A strawberry breeding program was initiated with crosses being made between virus-free plants of the variety Marshall and one of the Sitka Hybrids known locally as Donovan. Of the 2,412 plants obtained, 1,284 were set in test plots and the remainder are being held for setting in the spring of 1953. The collection and testing of potentially hardy strawberry varieties from Alaskan sources was further developed by growing and setting 1,319 seedlings from 18 sources. Studies of weed control in strawberries were initiated in which "Premerge" gave good control between rows. There were also indications that Chloral I.P.C. may prove useful in weed control in strawberries. Raspberry breeding was initiated by crosses between the variety Washington and Cuthbert, Ruddy and Latham. The variety Durham was crossed with Sunbeam, Ruddy and Ranere. New varieties added to the test plots included Milton, Wilder, Dixie and Mandarin Growth regulators are being tested on raspberries to determine whether they can induce earlier dormancy and increase winter-hardiness. The currant varieties Long Bunch Holland, Red Dutch, Victoria and Perfection, which have proved to be hardy in the Matanuska Valley were propagated by cuttings. AL-1-2-13 (F) Active work on the main objectives of this project will be initiated during the coming year, but greenhouse space was utilized late in the season this year for increasing seed stocks of 73 varieties and strains of beans which in previous tests had shown a measurable degree of adaptation to Alaskan conditions. AL-1-2-14 (F) Systematic lettuce variety trials were concluded and, if possible, the results soon will be published. Systematic cabbage variety trials were continued with the result that Bonanza has already been selected by several growers for their main crop. Wisconsin Ballhead appears to offer some promise as a storage variety which will greatly prolong the period during which locally grown

cabbage will be available to the public. Broccoli variety tests indicated that Waltham #29 is superior to other varieties for Alaska. Selfed seed was obtained from crosses made in 1951 and further selections will be made from this hybrid material. Screening tests were conducted of new vegetable varieties in comparison with standard varieties and this information will be used as a basis for recommendations to growers.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The potato breeding program has resulted in the development of a new potato variety which was given the name "Knik" (formerly known as selection 57. 44-3-46). This has been released to growers during the past year through the Alaska Certified Seed Growers Association. Lettuce variety trials have demonstrated that Cornell #456 is the heaviest yielding and most satisfactory early-maturing variety. A U.S.D.A. selection #3310 has proved desirable as a late-maturing lettuce variety and its introduction to growers is being considered. Cabbage variety trials have shown that Bonanza is superior variety which can be used both for fall market and for storage and that Wisconsin Ballhead offers promise as a storage variety to prolong the market season for locally grown cabbage.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Special attention will be given to potato breeding and the testing of 3 potato selections (10. 44-2-46, 47. 44-3-47 and 6. 47-1-50) under consideration for introduction to growers in 1953, AL-1-2-4 (R); to fertilization, spacing, weed control and top-killing studies in potatoes, AL-1-2-7 (P); to nutritional studies, planting practices and chemical weed control in the more important truck crops, AL-1-2-3 (T); to the maintenance and propagation of ornamentals for landscape use, AL-1-2-10 (F); to the collection and propagation of tree fruits of potential value to Alaska, AL-1-2-11 (F); to the testing, breeding and weed control in small fruits, especially strawberries, raspberries and blueberries, AL-1-2-12 (F); to variety testing and culture of greenhouse crops for Alaska, AL-1-2-13 (F); and to vegetable variety testing and breeding, especially with lettuce, cabbage, broccoli, beans, rutabagas and carrots, AL-1-2-14 (F).

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-4 (R)

PROJECT TITLE: (Revised) Potato Breeding

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. H. Dearborn, Arvo Kallio and M. F. Babb

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: State Experiment Stations, individual foundation stock seed growers and grower-cooperators

OBJECTIVE TO WORK: To select or breed 1 or more potato varieties better adapted to Alaskan growing conditions than Arctic Seedling in the following respects: 1. Higher yield of U. S. #1 tubers to the acre. 2. Earlier maturity of tuber with attractive skin that shows a minimum of bruising and "feathering" at digging. 3. Very shallow eye and stolon cavity which will markedly reduce losses in culinary preparation. 4. Smaller vine type to facilitate in the digging operation. 5. Tuber and vine resistance to physiological and pathological diseases affecting potatoes in the Territory.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: The performance of the new variety Knik, formerly selection No. 57.44-3-46 from the breeding stocks, will be watched closely since commercial growers will have this variety in 1953 for the first time. Close cooperation between the Station and foundation seed growers will be maintained to assure the commercial grower a continuing source of disease free potatoes. Three potato selections 10.44-2-46, 47.44-3-47 and 6.47-1-50 will be distributed to foundation stock growers for increase in 1953. The first 2 selections set tubers earlier and develop them more rapidly in some areas than Knik or Arctic and therefore may be desirable for early harvesting. Variety 6.47-1-50 is a small-topped, high-yielding, high-quality potato classified in the same maturity group as Arctic Seedling and Knik. Seedling potato plants will be produced from seeds obtained from crosses made in 1952 with special emphasis on lines having scab resistant parents. Potato crossing will be continued to incorporate scab resistance, tougher skin, higher quality and earlier tuber development into the more productive varieties chosen from the yield trials. Screening tests will be made at Fairbanks and Matanuska of as many potentially scab resistant varieties and selections as can be assembled Cooperative potato variety and seedling trials with farmers in the agricultural areas of the Territory will be continued. A study will be initiated on the effect of photoperiods and temperature on the growth and development of the potato.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: As a result of this project a new variety of potato has been developed, introduced to the public and named "Knik" (pronounced kenick). The foundation stock seed growers, in whose hands the Knik now rests, have a demand for over 5 tons of it which indicates potato growers are going to test this introduction. The potato breeding program has stimulated many growers to demand and grow disease-free stock.

PROGRESS DURING THE YEAR: Careful handling of the breeding and increase blocks coupled with a rigid rogueing program eliminated black leg in the 1951 and 1952 crops. Particular care in disenfecting cutting knives appears to have controlled the spread of ring rot since none has been observed in the 1952 crop.

In breeding for earlier tuber development and scab resistance a wide range of parental material was employed since the compatibility of the desirable seedlings and varieties was not known in this environment. Seeds were obtained from 4 desirable crosses and from selfing or out-crossing of 34 families out of 97 represented in the planting. A high percentage of flowers on the non-seeders aborted. The beginning of the flowering season coincided with the period of maximum day temperatures for the growing season. Hand pollination was followed by 72 hours of wet weather in which 1.33 inches of rainfall was recorded. Analysis of the pattern of fruitfulness in the breeding block indicated that parentage was more influential in seed set than environment. Pollen sterility is being investigated.

Five varieties; Beauty of Hebron, Progress, Russet Sebago, Satapa and White Cloud were added to the breeding stock through the cooperative efforts of Stateside workers. None of these varieties appeared to be outstanding in single-row plots but each will be planted at Matanuska and Fairbanks in 1953 along with 36 or more named varieties. Among the 75 varieties tested for early harvest in 1951, only 25 were placed in the simple lattice design of 4 replicates in 1952. Similarly only 16 varieties and seedlings were retained from the 52 tested in the late harvest experiment of 1951. These were arranged in a simple lattice of 4 replications in 1952. The collection of data from these studies has not been completed at this date.

At Fairbanks 25 varieties and selections were tested in a simple lattice of 4 replications. A hard frost in late August coupled with a severe infestation of scab reduced the yield of U. S. #1 tubers to zero for some varieties. The tubers of Ontario and Knik showed the greatest resistance to scab while the highest yield of U. S. #1 size tubers, irrespective of scab, was produced by Kennebec, 47.44-3-47 and 6.47-1-50. Teton and Arctic produced, respectively, approximately 1/4 and 1/10 the yield of tubers of U. S. #1 size as the preceding 3 varieties.

Potato variety trials with grower-cooperators in the Matanuska Valley and on the Kenai Peninsula indicated that varieties perform very differently in the various farming districts of these areas. Even among the higher yielding varieties, as measured at Matanuska, yield differences in the cooperative trials ran as high as 300 percent. Premerge weed killer used at the rate of 2 gallons per acre in 18 gallons of water as a complete cover spray gave complete control of all broadleaved weeds.

PUBLICATIONS: Knik, a new potato for Alaska (Manuscript) Kinds and Varieties of Vegetables for Alaska 1952 (News Release)

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-7 (P)

PROJECT TITLE: Potato Culture and Storage Investigations

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M. F. Babb, C. H. Dearborn, A. Kallio, A. H. Mick, W. M. Laughlin, C. I. Eranton

LOCATION: Fairbanks and Matanuska Experiment Station

COOPERATION: Chemicals for weed control and top killing studies were made available by: American Cyanamid Co., San Francisco, California; American Chemical Paint Co., Ambler Pennsylvania; Atlas Powder Co., Wilmington, Delaware; Carbide and Carbon Chemical Corp., Yonkers, N. Y.; Dow Chemical Co., Midland, Michigan; E. I. DuPont de Nemours, Wilmington, Delaware; Naugatuck, Connecticut. Soil Science Department and Anchorage Potato Chip Co. cooperated in the nutritional studies. Lambert brothers (farmers on the Kenai peninsula) cooperated in minor element study.

OBJECTIVE OF WORK: To determine the nutritional requirements of potatoes as regards type, quantity, time of application, and cultural practices to include the proper date, rate and method of planting; to improve tillage methods; harvesting practices for potato production; to determine the nutritional value of potatoes produced under these various cultural practices.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Quackgrass grows bountifully in this environment and is becoming a nuisance in many potato-producing soils. Quackgrass control with chemicals will be continued in an attempt to make the land suitable for vegetable production. The potato will be studied from the standpoint of chemical effect on yield, quality, and sprouting in storage.

Varying the distance between potato seedpieces in the row and also the rate of fertilizer has shown that heavier yields can be obtained with closer spacing and heavier fertilization. Potato seedlings and varieties will be studied in factorial designs involving 3 seedpiece spacings and 3 rates of fertilizer application. Chemical versus mechanical topkilling studies will be continued to determine the relative merits of several chemical and mechanical methods.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Chemical control of broad-leaved weeds, particularly chickweed and lambsquarter's has become a gratifying reality. The dinitro weed killer "Premerge" used as a complete cover spray at the rate of 6-8 quarts in 18 gallons of water per acre gives complete control. It was observed that the troublesome weeds at digging are those that emerge with the potatoes and since these are eliminated by the spray the digging operation has been materially facilitated. Homesteaders and commercial potato growers have taken advantage of the results of the spacing-

fertilizer study initiated in 1951 in which closer spacing of seed pieces than had been the general practice in the Territory resulted in significant increases in yield, Heretofore, only the rate of fertilizer had been varied.

PROGRESS DURING THE YEAR: Attention was focused on the control of quackgrass in potatoes since premerge is not effective other than as a temporary measure before the potatoes emerge. Neither yield nor quality of the tubers has been adversly affected by dinitro weed killers but chemicals such as T.C.A., C.M.U. and Maliac Hydrazide that control quackgrass affect yield of potatoes. Nine treatments in 4 replications were studied on the variety Knik. The treatments were 7, 14 and 29 pounds of M.H. per acre; 2.5 and 3.75 pounds of C.M.U. per acre; T.C.A. 33 pounds, T.C.A. 33 pounds plus 7 pounds of M.H., T.C.A. 33 pounds plus 14 pounds of M.H. and the untreated check. The sprays were applied at 178 gallons per acre with spray shoes directing the spray against the row under the potato foliage.

C.M.U. apparently separated in the spraying operation since the first 2 replicates of each rate destroyed all vegetation. Weed control was poor on the other replicates. Maleic Hydrazide arrested plant growth at all concentrations and reduced yields significantly. (Yield records from potatoes in storage have not been taken to date). T.C.A. alone dwarfed the potato tops, prevented further development of quackgrass and caused some reduction in yield below that of the check plots.

These results together with screening tests of other chemicals indicate a possible control with Chloral I.P.C., I.P.C. or T.C.A.

Potatoes were grown for the top-killing work but early frosts killed the tops before the usual digging period.

Spacing-fertilizer studies with the variety Knik in 1951 indicated that this variety was most productive of marketable tubers when planted at the 9-inch spacing. The quality of tubers as measured by the specific gravity test decreased with increasing tonnage per acre.

The quality of potatoes from the 1951 variety fertilizer test were evaluated by 3 methods: laboratory cooking tests, home cooking tests, and the use of 95% ethanol. In the laboratory, potatoes were both steamed and boiled and then rated according to mealiness and darkening. Employees and associates at the Station were given potatoes for home cooking and requested to report back their opinions of quality. The 95% ethanol test used was described by E. J. Wheeler of Michigan State College; potato samples were immersed in alcohol and their quality rated by relative shrinkage and darkening. Statistical analysis revealed close agreement between the 3 methods of evaluating quality. The use of 95% ethanol enables much more rapid evaluation than actual cooking tests.

At the Fairbanks Station a large factorial field test was heavily and uniformly infested with scab. Rated on general appearance and proportion of tuber surface covered with lesions, the newly released variety Knik appeared more resistant than either Teton or Arctic Seedling.

In four fertilizer field tests Knik outyielded Arctic Seedling at both the Matanuska and Fairbanks Stations and at Wasilla; in the Homer area, Arctic Seedling yielded 15.8 tons per acre compared to 13.5 tons for Knik.

At the Fairbanks Station, a 4^2 factorial field design compared the responses of 4 varieties to 4 kinds of nitrogen carriers applied in equivalent quantities; phosphate and potash were included in the treatment in the ratio of 1-4-2, respectively. At this site, marked by poor growing conditions during the season and by heavy scab infestation, urea, ammonium nitrate and ammonium sulfate proved equally good. Calcium nitrate was an inferior nitrogen carrier. Because factors other than fertilizer treatments confounded yield responses, it is considered that a definitive comparison of potato variety response to nitrate and ammonia nitrogen is still lacking.

At 3 sites - Fairbanks, Matanuska, and Wasilla - - 45 or 67.5 pounds of available nitrogen per acre (applied in the row with phosphate and potash in a 1-4-2 ratio) gave economical increases over 30 pounds per acre. Five varieties - Knik, Teton, Kennebec, Artic Seedling and 114.43 -- reacted in a similar manner to increasing rates of fertilizer application although the magnitude of response varied according to site and spacing.

With respect to spacing, larger yields generally were obtained from close spacing provided heavy fertilizer applications were made. Little or no yield increases were obtained from close spacing as compared to wide spacing in the row when only 30 pounds of nitrogen per acre was applied. Heavy fertilization, therefore, should be associated with close spacing practices and vice versa.

To discover the calcium requirements of potatoes growing in newly cleared fields, lime was included in the fertilizer treatments of experiments near Homer and Wasilla. In both field tests, 500 pounds of lime per acre reduced yields. It is concluded that the calcium supply of soils at these sites was adequate.

PUBLICATIONS: Circular 18, Chemical Weed Killers and Their Use. Circular 13, Fertilizer Recommendations for 1952.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT; FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-8 (T)

PROJECT TITLE: Vegetable Culture, Storage and Processing Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M. F. Babb, C. H. Dearborn, A. Kallio, W. M. Laughlin

LOCATIONS: Matanuska and Fairbanks Experiment Station

COOPERATION: Filtrol Corporation, 3250 East Washington Blvd., Vernon, California

OBJECTIVE OF WORK: Cultural investigations on the more important vegetable crops to increase earliness of maturity and/or total yields. Storage and processing investigations to determine proper methods of storage and/or processing of the crops and varieties of vegetables of economic importance in Alaska.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: The test of transplanting versus direct seeding of cabbage in the field will be continued. Chemical weed control studies on lettuce, beets and crucifers will be continued. The effect of method of planting, rate of fertilizing and variety on keeping quality of cabbage for storage will be initiated.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The results of 2 years study show that cabbage produced in the field from greenhouse-grown transplants matures earlier than cabbage seeded directly in the field. This results in earlier maturity and usually in higher prices to the grower. Even more important, this lengthening of the plant growing season makes it possible to produce storage types of cabbage such as Wisconsin Ballhead.

We have learned from these studies that the producer of greenhouse-grown plants has a greater damp-off hazard than he would under similar Stateside production. We have learned also that these damping-off organisms are controlled effectively by thorough and repeated waterings with Semesan.

PROGRESS DURING THE YEAR: Plants of 3 varieties of cabbage (Golden Acre, Midseason Market and Oakview Ballhead) have been grown from seed in the greenhouse and transplanted to the field during the past 2 years. Yields of these plants have been compared with those of similar plants grown from seed sown directly in the field. Transplanted plants matured earlier in both years and produced denser heads than those grown in the field from direct seeding. Extension of the plant growing season by using transplanted seedlings makes it possible to grow late maturing varieties of cabbages for storage. This lengthens the period during which locally grown cabbage is available to the consumer.

Weed control studies with transplanted crucifers indicate that Chloral I.P.C., potassium cyanate or C.M.U. may be effective against chickweed. All broad-leaved weeds except lambsquarters were controlled in beets by spraying the plants in the 5-leaf stage of growth with common salt at the rate of 2 pounds per gallon of water per 216 square feet of row.

PUBLICATIONS: Chemical Weed Killers and Their Use, Circular 18.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-9 (F)

PROJECT TITLE: Vegetable Forcing Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M. F. Babb, Arvo Kallio, and C. I. Branton

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Agricultural Engineering Department

OBJECTIVE OF WORK: To determine the most suitable varieties and methods for the winter forcing of such crops as rhubarb, asparagus, witloof, etc., and to investigate the possibilities of building suitable forcing structures wholly from native materials or of using existing greenhouse structures for the purpose.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Tentative plans have been made for construction of a suitable forcing cellar during the coming summer. If this can be accomplished, it will be possible to make preliminary tests of forcing stocks already on hand or that can be grown during the coming growing season.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Except for the collection and propagation of stocks of rhubarb for forcing, it has been impossible to initiate work on this project. See the foregoing paragraph for explanation.

PROGRESS DURING THE YEAR: All rhubarb forcing stocks at both the Matanuska and the Fairbanks stations were lifted and divided for increase. Three new named varieties (Sunrise, Large Victoria and Chipman Red) and 2 seedling varieties were added to the Matanuska Station stocks. Six varieties of asparagus (Brunschweiger, Danish Giant, Washington #500, Mary Washington, Paradise and Minnesota 4-way cross) were planted to test their hardiness as forcing stocks or for ordinary culture.

PUBLICATIONS: None

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-10 (F)

PROJECT TITLE: Variety Testing and Culture of Ornamentals

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M. F. Babb, Arvo Kallio and A. S. Buswell

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: United States Forest Service

OBJECTIVE OF WORK: To determine the hardiest and most suitable types of ornamental plants for Alaskan conditions and to develop methods for their culture.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: With the prospect that the lawn area surrounding the new laboratory-office building in Palmer will be seeded in 1953, it is planned to lift and line out the seedling stocks remaining in the nursery beds to provide landscaping material. By this method it will be possible to landscape the area and at the same time test these ornamentals for hardiness. A relatively large number of accessions have been obtained during the past 2 years. These are being stratified this winter and will be sown in the nursery beds this coming spring.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: We have advised in the landscaping of the Kodiak Island Naval Base, the Mt. Edgecombe Hospital in Southeastern Alaska, the Elmendorf Air Base and Ft. Richardson at Anchorage as well as many other projects both public and private. The Alaska Forest Service and the Soil Conservation Service recently have asked for and received assistance in their attempts to grow their own seedling trees for distribution in Alaska.

PROGRESS DURING THE YEAR: For the past 2 years, work on this project has been limited mainly to the preservation of materials on hand and keeping records on survival. However, seed of new accessions obtained by exchange with other stations, through local collections and from the Alaskan Forest Service during 1951 were stratified last winter and sown in nursery beds this spring. The same practice is being followed with new accessions obtained during 1952. (See next page for lists of trees and shrubs which have survived).

PUBLICATIONS: None.

TREES AND SHRUBS RAISED FROM SEED SOWN IN SPRING OF 1952

Acer ginnala
Eleagnus commutata
Fraxinus lanceolata
Lonicera tartarica
Malus baccata
Malus communis pumila
Malus floribunda
Malus ioensis
Malus sieboldii
Malus theifera
Pinus contorta
Prunus americana
Prunus besseyi
Prunus dimissa
Prunus maacki
Prunus melanocarpa
Prunus nana
Prunus nigra
Prunus padus
Prunus sp.
Prunus triloba
Prunus tomentosa
Prunus virginiana

TREES AND SHRUBS RAISED FROM SEED PLANTED IN 1950

Acer glabrum
Amorpha fragrans
Amorpha fruticosa
Buddleia alternifolia
Buddleia davidii
Calluna vulgaris
Caragana arborescens
Caragana microphylla
Cornus stolonifera coloradensis
Cotoneaster acutifolia
Cotoneaster lucida
Cotoneaster melanocarpa laxiflora
Crataegus ambigua
Crataegus rivularis
Empetrum nigrum
Forestiera neo-mexicana
Larix decidua
Ligustrum vulgare
Lonicera bella alpida
Lonicera bella candida
Lonicera bella rosea
Lonicera billardi
Lonicera gibbiflora
Lonicera gibbosa
Lonicera nervosa
Lonicera permixta
Lonicera sp.
Lonicera tartarica lutea
Lonicera tartarica sibirica
Lonicera virginalis alba
Lonicera xylosteoides
Maclura pomifera
Picea abies
Pinus aristata
Pinus ponderosa
Phellodendron amurense
Physocarpus intermedius
Physocarpus monogynus
Ptelea angustifolia
Ptelea orophylla
Rhamnus cathartica
Rhamnus chloraphora
Rhamnus oleoides
Rhamnus saxatilis
Rhus aromatica
Ribes aureum
Rosa maximowieziana
Shepherdia argentea
Symphoricarpos albus
Symphoricarpos occidentalis
Ulmus americana
Viburnam lantana

SURVIVING TREES AND SHRUBS PLANTED AS NURSERY STOCK IN 1950

Acer ginnala
Amelanchier alnifolia
Betula pendula
Caragana arborescens
Caragana pygmaea
Cornus aurea
Cornua baileyi
Cotoneaster acutifolia
Cotoneaster integerrima
Fraxinus lanceolata
Juniperus chinensis var. pfitzeriana
Juniperus communis var. hibernica
Lonicera tartarica
Lonicera - Red selection
Malus baccata
Malus:
- Betchels' Crab
- Hopa Crab
- Red Silver Crab

P.E.I. 160,145
P.E.I. 168,937
Pinus mugo
Populus:
- Northwest
- Norway

Shepherdia argentea
Sorbus americana
Spirea van houttei
Ulmus americana
Ulmus pumila
Viburnum lantana

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-11 (F)

PROJECT TITLE: Tree Fruit Variety Testing and Culture

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M. F. Babb, Arvo Kallio, and A. S. Buswell

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: None

OBJECTIVE OF WORK: Variety tests coupled with cultural investigations to determine the potential hardiness of tree fruit varieties and the possibility of fruit production in Alaska.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: The search for potentially hardy fruit stocks and fruit varieties will be continued. During the past year new contacts have been made with other horticulturists who have promised to supply materials which, in their opinion, are worthy of trial in Alaska. Some of these, as seed, have arrived and have been stratified preparatory for spring planting. The preservation and care of fruit stocks already on hand will be continued.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Fruit growing as practiced in the States would appear to be impossible in any part of Alaska. However, there is an intense interest in its possibilities, and it may well be that even though we cannot expect to raise standard varieties of such fruits as apples, plums, and cherries, we may be able to raise reasonably acceptable substitutes for them such as crab apples, wild plums and wild cherries or cherry X plum, etc., hybrids. From the interest shown by the public in this project, it would appear that settlers in Alaska find the lack of a constant and readily accessable supply of fruit one of the most discomforting adjustments they have to make.

PROGRESS DURING THE YEAR: Tree fruit plantings were increased by 16 varieties of apples and the Adams Elderberry during the past year. The new varieties were: Early McIntosh, Greendale, Macoun, Ogden, Close, Young America Crab, Redfield, Redhook, Milton, Redford, Alton, Dunning, Lodi, Sweet Bough, Melba and Crimson Beauty. These were set in the usual manner in the tree fruit nursery. In addition, 18 trees each of Yellow Transparent and Red Duchess were purchased for experimental purposes as follows: 2 trees of each variety were set in "rock wells" in which the lower part of the well was filled with large rocks covered by smaller stones, gravel and top soil in which the trees were set; 4 trees of each variety were planted in a horizontal position in the face of a bank to simulate the method by which Russian investigators claim to be able to raise fruit even within the Arctic Circle; the remainder of the trees were planted espalier fashion near buildings and around a penshaped structure erected for the purpose.

An appended list shows the tree fruit varieties still surviving. And since a large proportion of these now have lived through 3 winters and 4 growing seasons it furnishes some evidence, even if slight, that they possess a certain degree of winter hardiness. Of this list, the Golden Aniversary, Sylvia, Red Siberian, Transcendent and Dolgo Crabs bloomed this spring and the first 3 of them bore fruit. The Sandcherry and Dakota Amber cherry also set fruit this year but the fruit failed to mature.

INVENTORY OF TREE FRUIT PLANTINGS: 1952

APPLES

Variety	Year Set	Variety	Year Set
Red Astrachan	1950	New Victory	1949
Red Bird	1950	Almata	1949
Yellow Transparent	1949	Wealthy	1949
Red Duchess, Dwarf	1950	Renown	1951
Yellow Transparent, Dwarf	1950	Early McIntosh	1952
Red Duchess	1949	Bowyer No. 3	1951
Yeager Sweet	1949	Heyer #12	1951
Mantet	1949	Reward	1951
Erickson	1949	Crimson Beauty	1952
Victory	1949	Macoun	1952
Beacon	1949	Ogden	1952
Red Van Buren	1949	Close	1952
Minn. #790	1949	Redfield	1952
Fireside	1949	Redhook	1952
Prairie Spy	1949	Milton	1952
Minn. #978	1950	Redford	1952
Oriole (Minn. #714)	1950	Alton	1952
Redwell	1950	Dunning	1952
Haralson	1949	Lodi	1952
Minnetonka Beauty	1950	Sweet Bough	1952
Trail Crab	1950	Melba	1952

CRAB APPLES

Transcendent Crab	1949	Red Fleshed Crab	1949
Golden Anniversary Crab	1949	Siberian Crab	1949
Florence Crab	1949	Adam Crab	1951
Hibernal Crab	1949	Osman Crab	1951
Red River Crab	1949	Red Siberian Crab	1951
Piotosh Crab	1949	Rescue Crab	1951
Trail Crab	1950	Sylvia Crab	1951
Dolgo Crab	1940	Young America Crab	1952

Variety	Year Set	Variety	Year Set
	PLUMS		
Dura Plum	1949	Prunus Americana Plum	1950
Bounty Plum	1949	Dropmore Blue Plum	1951
Underwood Plum	1949	Mandarin Plum	1951
Pipestone Plum	1949	Waneta Plum	1949
Minn. No. 101 Plum	1949	Toka Plum	1949
South Dakota No. 27 Plum	1949	Wild Plum	1949
Mt. Royal Plum	1949	Myrobalan Plums	1951
Red Coat Plum	1949	P.E.I. 160145	
Dietz Prune	1949	P.E.I. 168937	
Superior Plum	1949		
Kahinta Plum	1949		
Hansen's Special Hybrid Plum	1949		
Greenville Plum	1950		
Apricot		Elderberry	
Scout Apricot	1949	Adams Elderberry	1952
	CHERRIES		
Sapalta Cherry-plum	1949	Korean Cherry No. 20	1949
Opata Cherry-plum	1949	Korean Cherry No. 99	1949
Sapa Cherry-plum	1949	Korean Cherry No. 57	1949
Mongolian Cherry	1951	Korean Cherry No. 60	1949
Brooks Cherry	1950	Compass Cherry	1950
Sandcherry	1949	Brooks Sand Cherry	1949
Chokecherry	1950	Dakota Amber Cherry	1949
Convoy Cherry	1949	Hansen's Super Bush Cherry	1949
Black Beauty Sandcherry	1949	Oka Cherry Hybrid	1949
Western Chokecherry	1949	Compass Cherry	1949
		Nanking Cherry - Minn. No.20	1950
	NUT TREES		
Black Walnut	1952	Hickorynut	1952
Butternut	1952		
	BILBERRY		
Amlanchier alnifolia			

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-12 (F)

PROJECT TITLE: Small Fruit Variety Testing, Breeding and Culture

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C.H. Dearborn, Arvo Kallio, M.F. Babb

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Oregon, Geneva, N. Y., and Beltsville Md. Experiment Stations

OBJECTIVES OF WORK: Variety tests to determine the hardiness and suitability of such small fruits as strawberries, raspberries, blueberries, currants, gooseberries, Nanking cherries (Prunus tomentosa), sand cherries, sand cherry x Prunus tomentosa hybrids, etc. for culture in Alaska or for use as parental lines in crosses designed to create hardy varieties. Investigations of cultural methods and fertilization of small fruits as influencing their hardiness and the possibilities of their culture in Alaska.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Strawberry seedlings set in the field in 1952 will be classified into groups according to winter survival if there are any plants that survive. Some fruits of all plants will be examined for market quality particularly for the development of red external and internal color and density of flesh. Plants will be grown from achenes from crosses of Donovan X Catskill and Donovan X Robinson. A new bed of commercial strawberry varieties will be set and given winter protection to provide material for further crossing with the Sitka strains that possess some winter hardiness. A planting also will be made of a few selected varieties of raspberries, blueberries, blackberries and grapes. Weed control studies with strawberries will be continued. The study of influence of growth regulators on winter survival also will be continued.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The demand for a good strawberry far exceeds the supply in Alaska. Domestic berries are variable in size, pale red, soft, white-fleshed and generally hollow inside. Hybridization was begun in 1951 to develop a winter-hardy plant that will produce desirable berries. A strong interest among the home gardeners and commercial growers has developed regarding a new berry, but the program is still too young to estimate the results.

PROGRESS DURING THE YEAR: Virus-free Marshall strawberry plants introduced from Oregon were crossed with a domestic strawberry designated as Donovan after the homestead from which it was obtained. Of the 2,412 plants obtained, 1,284 were set in the field. The remaining 1,128 plants were too small to be set in the field wo were held in pots in cold storage for the 1953 planting season.

Achenes gatheredfrom numerous homesteads in the Matanuska Valley in 1949 were planted ans reset to the field. There was a total of 1,319 plants from 18 sources.

Chickweed developed rapidly but was controlled between the rows with Premerge. Preliminary tests indicate that chickweed can be controlled with Chloral I. P. C. Potassium cyanate gave fair control but caused some injury to the strawberry plants.

A planting of Marshall and Donovan plants in the greenhouse revealed that the failure of Donovan fruits to develop red color is not directly related to low temperature as has been proposed. Where the 2 varieties were planted side by side in the greenhouse Marshall developed berries characteristic of the variety in the States whereas, Donovan fruits were pale red as in the outdoor environment. Another contrasting feature is that Marshall fruits freely and develops none or very few runners whereas Donovan fruits freely and develops an abundance of runner plants at the same time.

Of the 23 raspberry varieties set in 1950, the following 10 varieties have survived best: Chief, Cuthbert, Durham Everbearing, Indian Summer, Latham, Ruddy, Sunbeam, Sunrise, Ranere and Washington. Notes taken on the cultivated raspberries in 1950 and 1951 indicated the desirability of crossing Washington and Durham with several other varieties. Seeds were obtained from crosses between Washington and Cuthbert, Washington and Ruddy, Washington and Latham. Durham was crossed with Sunbeam, Ruddy and Ranere. Washington and Indian Summer will be crossed with the native raspberry, if possible, in 1953 to incorporate earliness of flowering, early leaf drop and winter hardiness. A planting of new varieties will be made in 1953 including such varieties as Milton, Wilder, Dixie and Mandarin.

Growth regulators are being tested on raspberries to determine whether winter hardiness can be attained by inducing early dormancy in the fall or by prolonging the dormant condition in the spring.

Currant cuttings were made from heavy-yielding varieties that have survived at the Matanuska Station for over 15 years. The group includes Long Bunch Holland, Red Dutch, Victoria and Perfection.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-2-13 (F)

PROJECT TITLE: Vegetable and Flower Production in Greenhouses

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M.F.Babb, C.H.Dearborn, Arvo Kallio and A.S. Buswell

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: None

OBJECTIVE OF WORK: To determine the most suitable crops and varieites for greenhouse culture in Alaska and the influence of such factors as fertilization, watering practices, time and methods of planting, light duration and intensity on production. Secondariiy, it is considered important to investigate the possibility of winter crop production in greenhouses and the possibilities of using such structures for the winter forcing of crops such as rhubarb, asparagus, etc., to supplement the rather scanty supply of fresh winter vegetables.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Present plans call for the initiation of studies on the greenhouse production of vegetables during 1953. Primary attention will be given to the culture of those crops which are commonly grown in greenhouses in Alaska where the outdoor culture of such crops as tomatoes, cucumbers, peppers, etc., is not possible.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The main greenhouses at the Station in Palmer were not completed until this year and the single small greenhouse at the Matanuska Experiment Station has been fully occupied during the past 2 years with breeding stocks and propagation material. Thus, to date there has been opportunity for but 1 limited varietal test of tomatoes and cucumbers at the Matanuska Experiment Station. Results of this test have been reported previously.

PROGRESS DURING THE YEAR: Construction of the main greenhouses at the Station in Palmer was completed during the past summer and the ground beds filled with soil. This work was completed too late to permit the growing of such crops as tomatoes and cucumbers so the space was utilized for increasing seed stocks of 78 varieties of beans. These beans are a portion of the collection made some years ago at the Cheyenne Horticultural Field Station. Many of them are from the old Shoemaker-Tracy collection and some of them are from a collection made in the Southwest (Arizona, New Mexico, So. Colorado) from various Indian tribes. The entire collection, numbering several hundred varieties was grown in the open at the Fairbanks Experiment Station last year and these 78 lines were those that matured seed -- thus showing promise of superior earliness of maturity.

PUBLICATIONS: None.

PROJECT NUMBER AND FUND: AL-1-2-14 (F)

PROJECT TITLE: Vegetable Variety Testing and Breeding

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: M.F.Babb, C.H.Dearborn, Arvo Kallio, and A.S. Buswell

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Division of Fruit and Vegetable Crops and Diseases

OBJECTIVE OF WORK: Variety testing in an attempt to find vegetable varieties and even crops best adapted to culture in Alaska or that have characteristics making them valuable as parental material in a breeding program designed to produce adapted varieties.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Vegetable variety testing of those crops of importance to Alaskan agriculture will be continued at both the Fairbanks and the Matanuska Experiment Stations. In cooperation with the Extension Service, screening tests of these crops also will be conducted with growers in the principal agricultural areas of Alaska.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: A systematic study of lettuce varieties has shown that Cornell #456 and a U.S.D.A. selection #3310 are, in general, the heaviest producing varieties for the Matanuska and Tanana Valleys. Cornell #456 develops a small, conical, very dense head ideal for general retail trade. Selection #3310 develops a larger, rounded, less dense head and matures somewhat later. It is ideal for contract sales to institutions, hotels and the armed forces. It would be a valuable variety for Alaskan growers if it could be introduced and a commercial source of seed made available. Its introduction is being considered at the present time.

Cabbage variety trials have demonstrated that the variety Bonanza produces a greater tonnage per acre than Glory of Enkhuizen, the standard variety previously grown, and that Wisconsin Ballhead offers some promise as a late-maturing type for storage.

Cabbage variety trials also have demonstrated that cabbage root maggots can be controlled effectively with Chlordane using tractor-mounted hooded spray shoes, thus eliminating much of the former labor of hand methods of application.

PROGRESS DURING THE YEAR: Systematic lettuce variety trials were concluded during 1952 with tentative conclusions as outlined in the preceding paragraph.

Systematic cabbage variety trials were continued during 1952, but since several of the varieties still are in storage, only tentative conclusions can be drawn concerning their value. Bonanza appears to be exceptionally well-adapted in both the Matanuska and Tanana Valleys. It has the unique characteristic of forming a dense head relatively early in the growing season and thus can be grown as a mid-season variety, but its longstanding characteristic makes it possible to delay cutting until late fall when it can be put into storage. It is generally considered that late-maturing, or storage types of cabbage cannot be grown successfully in Alaska. Present results indicate that Wisconsin Ballhead may prove to be adapted. If these results are substantiated by further tests, this variety could be used to prolong the season during which locally-grown cabbage would be available for market.

A replicated test of broccoli varieties included the following: Waltham #7, Waltham #11, Waltham #29, Texas #107, Morse's Medium Early, Morse's Late and Freezers Green Sprouting. As in the 1951 tests, Waltham #29 produced the most desirable broccoli during 1952. An attempt was made to obtain selfed seed of this variety for breeding purposes, but no selfing occurred although bumblebees were introduced into the cages. Seed from crosses made in 1951 was planted and records of earliness of maturity kept. None of the plants from these crosses flowered as early as the commercial variety, Freezers Green Sprouting, but selfed seed was obtained from several plants.

Single plot tests of numerous varieties of vegetables were made to determine their relative adaptation to the Alaskan environment. Crops thus tested included: turnips, rutabagas, kohlrabi, cauliflower, cabbage, Brussels sprouts, snap beans, peas, beets, carrots, parsnips, pumpkins and summer squash. Suitable records were kept of the performance of all varieties.

PUBLICATIONS: The results of these tests will be made available to the public by a revision of the "List of Recommended Vegetable Varieties" issued in 1952 through the Territorial Extension Service.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-3

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Animal and Dairy Production

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: William J. Sweetman

LOCATIONS: Matanuska, Fairbanks, Palmer and Petersburg, Alaska

COOPERATION: Bureau of Dairy Industry and Bureau of Animal Industry; Agricultural Engineering and Agronomy Departments; Matanuska Valley Breeders Association.

OBJECTIVE OF WORK: A stable dairy industry is needed in Alaska and this depends to a considerable extent on the development and maintenance of cows posessing the ability to produce large amounts of milk. A breeding research program is needed to develop superior germ plasm and this germ plasm should be made available through artificial insemination to the farmers in the Territory. Improved methods of raising dairy calves are needed to raise all dairy replacements. Better methods of harvesting and storing are needed to preserve forages for all animals.

PROGRESS DURING THE YEAR: Raising Dairy Calves (AL-1-3-1 (H): Six calves were fed powdered skim milk to 60 days plus Alaska grains and bromegrass hay. Six more were fed the same ration but with the addition of aureomycin at the rate of 7.2 grams per 100 pounds of grain. The first 90 days calves fed aureomycin gained at the rate of .86 pounds per day while the other group gained at the rate of .74 pounds per day. However, at 120 days there was no difference in the rate of gain between groups. The Value of Extra Light on Milk Production and Reproduction (AL-1-3-2 (R): Cows supplied additional light maintain production better than cows supplied no extra light during the short winter days. Thirty-two cows produced 45,198 pounds of milk during 2 months when they received extra light. The same cows produced 43,756 pounds of milk without the extra light. This difference in production was almost all due to production falilling off faster while cows were in the dark. Group I (cows changed from dark to light) declined 13.5 percent and 15.9 percent respectively during the 60 day period. Group II (cows changed from light to dark) declined 22.9 percent and 27.6 percent respectively. Dairy Cattle Breeding Investigations (AL-1-3-3 (R): We now have 2 Holstein bulls and 1 Red Dane that have proven themselves capable of transmitting high producing ability to their daughters. The old bull formerly kept at Fairbanks now has 18 daughters that have a mature equivalent average production of 13,312 pounds of milk and 475 pounds of fat. The dams averaged 13,493 pounds of milk and 462 pounds of fat. The

Holstein bull No. 2595 has 11 daughters in 6 different herds that have completed their first lactation records. Their mature equivalent average production for 10 months was 12,512 pounds of milk and 482 pounds of fat. The dams' production was 9, 556 pounds of milk and 382 pounds of fat. This is an increase of 2,956 pounds of milk and 100 pounds of fat. These daughters are producing almost as much milk and fat in their first lactations as their dams do as mature cows. The Red Dane bull No. D-583 has 7 daughters that have completed their first 10-month lactation records with a mature equivalent average production of 10,880 pounds of milk and 449 pounds of fat. Their dams' average production as mature cows was 7,734 pounds of milk and 357 pounds of fat. This is an increase of 3,146 pounds of milk and 92 pounds of fat. Cows bred artificially in the Matanuska Valley in 1952 numbered 734. There were also 20 cows bred at Kenai, 25 at Anchorage and 20 at Fairbanks in the Experiment Station herd. The conception rate has been much lower in 1952 than in 1951--about 50 percent for 9 months of 1952 as compared with 61 percent in 1951. The conception rate for the period of the shortest day to the longest day is nearly 8 percent below the period of the longest day to the shortest day. Feeding Fur Animals in Alaska (AL-1-3-6 (T): One year's work indicates that the antibiotic aureomycin when fed to female mink during their breeding, gestation and suckling periods at a level of 8 grams per ton of feed promotes better general health, faster development and increased weight of young. Results of 2 year's work with pink salmon waste and 1 year's work with chum salmon waste indicate that mink rations containing up to 80 percent of these products can be fed successfully to female mink and their young from January 1 until June 15. Alphatocopheryl acetate will effectively control the "yellow fat" disease normally experienced among young mink receiving rations high in salmon products, when added to the ration at a level of 40 mgs. per pound of ration fed. The Breeding of Fur Animals (AL-1-3-7 (T): Blue and white foxes will maintain good health on a ration composed of 65 percent chum salmon waste, 18 percent dry mix, 2 percent wheat germ meal and 15 percent water. On this ration no losses occurred in the Station herd between weaning and pelting. Results of 1 year's work indicate that although marten usually breed in August as well as July, mating attempts should be started the fore part of July. The breeding work to date with blue, white and mutation blue foxes indicates that, with the possible exception of the mutation factor, there is no true genetic segregation of the blue and white colors and that it may be impossible to fix any of the different color phases to breed true. The Effect of the Addition of Manganese to Alaska grown Grains (AL-1-3-9 (F): Pullets raised on range until the beginning of egg production show no differences in egg production or mortality rate when fed Alaskan grown grains without the addition of manganese. The Production Cost of Dairy Beef Steers Raised on Minimum Grain and Maximum Use of Roughage and Pasture (AL-1-3-10 (P): Steers can be wintered on silage alone and make excellent gains when put on pasture the next summer. Steers and heifers were put on mountain range in the summer of 1952 for the first time. Their average weight when put on the range was 424 pounds and 623 when they were removed. Their average daily gain was 2.26 pounds per animal. Feed Production, Processing and Preservation (AL-1-3-11 (P): Good quality barn-dried bromegrass hay will produce as much milk as silage. But it still takes more acreage to produce the hay necessary. Two cows on barn-dried bromegrass hay produced 2,472 pounds of milk in a 90-day period and the same cows produced 2,470 pounds of milk on silage. It took 2 acres of second cutting bromegrass barn-dried hay to produce this milk but only

1.6 acres for the silage. Oats-and-peas make a better silage than hay. Station cows consistently have produced more milk while on silage than while on hay. Pasture and Range Improvement and Management (AL-1-6-6 (F): Pasture renovation will increase yields for a period of 2 to 3 years. If we had a legume that would live through the winter these yields probably would be increased still more. In a year when spring is very late, as it was this past year, heavy application of nitrogen in the spring will provide as much or more pasture as a split application in spring and summer. Limited studies in the fall of 1952 showed that oats-and-peas can be used to extend the grazing season considerably. One acre of oats-and-peas planted late and pastured after September 1 yielded 61.1 standard cow days of pasturage under a system of rationed grazing. This pasture probably is better for oats-and-peas- since it eliminates waste by tramping.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Artificial insemination definitely is successful in Alaska. The first heifers from these bulls have completed their first lactation. Holstein bull 2595 now has 11 daughters with mature equivalent production of 12,512 pounds of milk and 482 pounds of fat. Their dams produced 9,556 pounds of milk and 382 pounds of fat. The Red Dane bull D-588 has 7 daughters with mature equivalent records of 10,880 pounds of milk and 449 pounds of fat. Their dams produced only 7,734 pounds of milk and 357 pounds of fat. This is a 31 percent increase in milk for the daughters of the Holstein bull and 41 percent increase for the Dane daughters.

Nearly all these heifers are being raised for herd replacements and herd expansion.

Dairy beef steers will make very good gains on woods pasture and on mountain range pasture. Steers and heifers on mountain range averaged 2.26 pounds of gain per day.

WORK TO RECEIVER SPECIAL ATTENTION DURING COMING YEAR: Work will be continued on the nutritional differences between barn-dried hay and silage for both bromegrass and oats-and-peas. We will also try to compare oats-and-peas with bromegrass when preserved as hay and as silage. Additional emphasis will be placed on pasture crops to extend the grazing season.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-1 (H)

PROJECT TITLE: Raising Dairy Calves

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: William J. Sweetman, Arthur L. Brundage and Harold R. Black

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Bureau of Dairy Industry

OBJECTIVE OF WORK: To develop efficient rations and methods of raising dairy calves in Alaska and to compare several rations for growing calves as measured by weight gains, health and efficiency of feed utilization.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Continued emphasis will be placed on finding additional substitutes for milk. Skim milk still is difficult to obtain. Buttermilk and various commercial calf feeds will be used.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Several rations have been developed that will raise calves in Alaska on a minimum of whole milk. These rations now are being used by many farmers.

PROGRESS DURING THE YEAR: Six calves were fed skim milk powder for 60 days, plus Alaska grains and grass hay. Six more were fed the same ration with the addition of aureomycin at the rate of 7.2 grams per 100 pounds of feed. For the first 90 days, calves receiving aureomycin gained .86 pounds per day and the other group gained .74 pounds per day. However, at 120 days, there was no difference in gain between groups. One group of calves was started on a ration of 3 parts whey powder and 1 part linseed meal with aureomycin added. During extreme cold weather it was impossible to raise calves on this ration because all calves developed scours. A few died and the rest were changed back to a skim milk ration.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-2 (R)

PROJECT TITLE: The Value of Light for Increasing Milk Production

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: William J. Sweetman, Arthur L. Brundage and Harold R. Black

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Bureau of Dairy Industry

OBJECTIVE OF WORK: To determine whether lengthening the period of light to which Alaskan cows are exposed during the winter favorably affects milk production and increases conception rate.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: We will keep milk cows under either light or dark conditions for the entire winter instead of changing as we had previously. There probably is considerable carry-over of effect and this will be eliminated.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The trend seems to be for production of cows receiving only normal light to decrease faster than for cows supplied extra light. Heifers have more heat periods when supplied with extra light.

PROGRESS DURING THE YEAR: An experiment consisting of 2 groups, each containing 16 cows was run for 120 days during the winter. Production of each group fell off faster while they were in the dark than while they were supplied with extra light. These groups were changed during the middle of the winter so that all 32 cows had the same amount of time under each light condition. The total production for all cows in the light was 45,198 pounds and 43,756 pounds in the dark. This difference in production is due entirely to the greater percentage of decline while in the dark. The percentage decline for all 32 cows for 60 days while in the dark was 22.2 percent and 19.7 percent while in the light. Group I (cows changed from dark to light) declined 18.5 percent and 15.9 percent respectively. Group II (cows changed from light to dark) declined 22.9 percent and 27.6 percent respectively.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-3 (R)

PROJECT TITLE: Dairy Cattle Breeding Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: William J. Sweetman, Arthur L. Brundage and Harold R. Black

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Bureau of Dairy Industry

OBJECTIVE OF WORK: To improve the producing ability of Alaska dairy cattle, a breeding research program is needed to develop superior germ plasm and this germ plasm should be made available to the farmers of Alaska through artificial insemination.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: With the help of the Extension Service, considerable effort will be made to get more farmers to keep milk production records and have their cows tested each month.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: In the past 4 years, 2,130 cows have been bred artificially in the Matanuska Valley. During the past year, 20 cows were bred at Kenai and about 25 at Anchorage. Heifers from these matings now are coming into production and are much better than their dams.

PROGRESS DURING THE YEAR: The old Holstein bull from Fairbanks has been used in the artificial breeding program for about 1 year. He now has 18 daughters that have a mature equivalent average production of 13,812 pounds of milk and 475 pounds of fat. Their dams averaged 13,498 pounds of milk and 462 pound of fat. Holstein bull 2595 has 11 daughters that have completed their first lactations. Their mature equivalent average production for 10 months is 12,512 pounds of milk and 482 pounds of fat. Their dams' production was 9,556 pounds of milk and 382 pounds of fat. The heifers show an increase of 2,956 pounds of milk and 100 pounds of fat over their dams. These daughters are from 6 different herds. They produced as much milk and fat during their first lactation as their dams did as mature cows.

The Red Dane bull D-588 has 7 daughters that have completed their first lactation of 10 months with a mature equivalent average production of 10,880 pounds of milk and 449 pounds of fat. Their dams averaged 7,734 pounds of milk and 357 pounds of fat. This is an increase of 3,146 pounds of milk and 92 pounds of fat for the daughters. One Red Dane-Guernsey cross in the Station herd has produced 7,005 pounds of milk and 310 pounds of fat at 2 years and 2 months of age. Her purebred sister from the same cow produced 4,954 pounds of milk and 247 pounds of fat at 3 years and 1 month of age. Both records are for 10 months.

In the 4 years of artificial breeding experience in Alaska, the months of December, January, February, April, May and June have shown the lowest conception rate. On all the first 3 services in these months only 50.1 percent of the cows conceived. The conception rate for the other 6 months was 57.7 percent. Rate of conception might be associated with the length of day. Except for March these months range from the shortest day to the longest. Right after the longest day the conception rate goes up about 10 percent and stays up until the first of December. March is only slightly better than the mean of the year. February is the poorest month of the year.

Some old cows that are hard to get with calf will conceive if bred quite late in the heat period. Some old cows that were in heat in the morning were bred that same afternoon and again the next morning. By using the Holstein bull on one breeding and the Dane on the next breeding we were able to tell which breeding was effective. In several cases conception was to the late breeding.

PUBLICATIONS: Report of Progress in Artificial Insemination and Herd Improvement.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-6 (T)

PROJECT TITLE: Feeding Fur Animals in Alaska

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: James R. Leekley

LOCATION: Experimental Fur Station, Petersburg, Alaska

COOPERATION: N. R. Ellis and Charles E. Kellogg of the Bureau of Animal Industry, Washington, D. C. assisted in designing the 2 mink experiments reported herein.

OBJECTIVE OF WORK: To carry on feeding experiments, with fur bearing animals, designed to determine the value of raw, fresh and processed fish, fish waste, by-products of fish canneries and cold storages, and such sea mammals and their by-products as are available in Alaska.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Mink Experiment No. 24, starting the first week of February and terminating about the first week of July, will further study the use of flounders, pink salmon waste and chum salmon waste and the use of antibiotics in rations containing high percentages of fish products. There are 88 female mink available for this experiment.

An experiment running through the summer and fall months from weaning until pelting time will carry the young mink through their growing and furring-out period. It will be designed to continue our study of salmon waste in the diets of young mink and gain additional information on the use of antibiotics in high fish rations during that period.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: One year's work indicates that the antibiotic aureomycin when fed to female mink during their breeding, gestation and suckling periods at a level of 8 grams per ton of feed promotes better general health, faster development and increased weight of young.

Results of 2 years' work with pink salmon waste and 1 year's work with chum salmon waste indicate that mink rations containing up to 80 percent of these products can be successfully fed to female mink and their young from January 1 until June 15.

Alphatocopheryl acetate will effectively control the "yellow fat" disease normally experienced among young mink receiving rations high in salmon products, when added to the ration at a level of 40 mgs. per pound of ration fed.

The large number of cotton pelts produced indicated that the rations as fed on Experiment 23 were deficient or some unknown factor or malady was present which was not controlled by alphatocopheryl acetate or aureomycin.

PROGRESS DURING THE YEAR: Mink feeding experiments were continued with the objectives of (1) comparing 4 different frozen fish diets supplemented with aureomycin during the breeding, gestation and suckling periods (2) determining the role of vitamin E in preventing "yellow fat" disease and (3) studying the effect of aureomycin on young mink. Significant findings are as follows:

(1) A diet including 80 percent frozen chum salmon waste produced the largest proportion of kits (4.05 per litter). Diets based on 70 percent frozen flounders or 84 percent frozen pink salmon waste less heads were inferior but equally good. A diet of 80 percent pink salmon waste including heads was poorest from the standpoint of reproduction (possibly because of poor conception).

(2) Pink salmon waste without heads and chum salmon waste were superior to frozen flounder or salmon waste including heads in maintaining the health of mink mothers and litters.

(3) Feeding pure aureomycin at the rate of 8 grams per ton of ration promoted health of kits and mothers on all diets. Only 4 kits were lost on aureomycin supplemented diets as compared to 18 on non-supplemented rations. Aureomysin-fed kits average 17 percent heavier at 7 weeks old.

(4) Alphatocopheryl acetate fed at the rate of 40 mgs. per pound of ration was fairly effective in controlling "yellow fat" disease in mink kits.

PUBLICATIONS: A manuscript, "Salmon Cannery Waste, Its Possible Use in the Diets of Ranch Mink" by James R. Leekley, Raymond G. Landgraf, Jr., Jeanne E. Bjork and William A. Hagevig has been submitted to Washington for publication.

PROJECT NUMBER AND FUND: AL-1-3-7 (T)

PROJECT TITLE: Breeding of Fur Animals (Cross breeding of various fur animals for hybrid vigor, mutation fixation, and fur quality).

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: James R. Leekley

LOCATION: Experimental Fur Station, Petersburg, Alaska

OBJECTIVE OF WORK: To cross blue foxes, Arctic white foxes, and mutation blue foxes in order to determine their dominance and color variations, and possibly produce a new mutation blue fox; to increase the quality of the Station mink herd by the introduction of high quality mink purchased in the States and wild mink trapped in various localities in Alaska; to obtain consistant reproduction of marten.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Only 10 female blue, white, mutation and different color phase foxes have been kept for breeding purposes in 1953. Insofar as possible with the animals available the newly developed color phases will be used in an attempt to determine the color expectancy from such breeding.

When the marten production status is determined for this coming spring, half the males will be housed adjacent to females and runways constructed between the pens so they can run together at all times. This type of pair mating never has been tried at this Station although reports from several fur farms in the States indicate that they are having some success using this system.

The wild Tundra mink herd will be bred in a manner similar to that carried on in the past to build up the herd and introduce this strain into the pastel and a few of the Station dark mink.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Blue and white foxes will maintain good health on a ration composed of 65 percent chum salmon waste, 18 percent dry mix, 2 percent wheat germ meal and 15 percent water. On this ration no losses occurred in the Station herd between weaning and pelting.

Results of 1 year's work indicate that although marten usually breed in August as well as July, mating attempts should be started the forepart of July.

The breeding work to date with blue, white and mutation blue foxes indicates that, with the possible exception of the mutation factor, there is no true genetic segregation of the blue and white colors and that it may be impossible to fix any of the different color phases to breed true.

PROGRESS DURING THE YEAR: Thirteen female foxes were kept for breeding purposes in 1952. These animals varied in color and breeding from pure dark blue to pure white, pure mutation blue, and hybrids, or combinations of these 3 color phases. Sixty-eight pups were raised to maturity from 9 females. Litter size varied from 4 to 11 pups. Various breeding combinations produced offspring which were dark blue in color, light blue, blue mutations (having white blaze on face and 4 white feet), very light blue mutations, pure white, and white mutations. The white animals which carry the mutation color factor for white face and 4 white feet are only distinguishable when the animals are 2 to 3 weeks of age until about the middle of October: from that time on the white color covers up the mutation markings. One of the most interesting litters was produced by a very light mutation-marked female mated to a white mutation-marked male. Of 9 pups, 4 were mutation-marked whites and the other 5 were very light blue mutations. Another interesting litter was produced by a hybrid blue mutation white nosed female bred to a pure white male. Out of the 11 pups produced, 3 were dark blue in color, 3 were hybrid mutations, and 5 were very attractive medium blue mutations with light underfur, 4 white feet, white face, and a white ring reaching nearly around the neck. Several of these latter animals had 1 blue eye and 1 very pale milky-colored eye.

The fur trade has said that if it were not for the existing poor demand for long-haired fur, the pale blue mutation skins would bring very good prices. However, it is questionable that this color phase can be fixed so that it will breed true.

De spite the fact that 12 female marten were bred during July and August of 1951 no young were born in 1952. This is difficult to understand considering that our marten herd maintained good health throughout the year. One old wild-caught female died on September 12 from what is believed to have been a bladder infection. This past breeding season our female marten were divided into 2 groups of 12 animals each, equalized on the basis of age and past production. Mating was started on July 8 on 1 group and terminated September 15. On the other group mating was started August 1 and terminated September 15. Five of the females started in July mated on a total of 11 times while no observed matings took place among those females whose breeding season was started on August 1.

Six pure and 9 hybrid kits of the wild Tundra mink were raised to maturity. However, 6 females born in 1951 failed to breed this past year. Two pure Tundra males were raised for the first time this year and will be available for breeding purposes in 1953. The Station herd now comprises 20 pure and hybrid Tundra females and 4 males.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-9 (F)

PROJECT TITLE: The Effect of Different Levels of Manganese in the Diet of Hens and Pullets

PERIOD COVERED BY REPORT: January 1 to December 31,, 1952

SUPERVISORY LEADER: William J. Sweetman

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: None.

OBJECTIVE OF WORK: To determine if Alaskan grown grains are inadequate in manganese for egg production.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: This project has been discontinued because the entire laying house has been turned over to ventilation studies.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Pullets raised on range to 5 months of age and fed Alaskan grown grains do not show manganese deficiency during a complete laying year.

PROGRESS DURING THE YEAR: Pullets raised on range up to time of egg production do not show any evidence in manganese deficiency. Five pens of hens fed Alaskan grown grains without additional manganese produced 19.5 eggs per month per hen; 5 pens of hens receiving additional manganese produced 19.1 eggs.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-10 (P)

PROJECT TITLE: The Production Costs of Dairy Steers Raised on Minimum Grain and Maximum Use of Roughage and Pasture Under Alaskan Conditions

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: William J. Sweetman, Arthur L. Brundage and Harold R. Black

LCCATIONS: Matanuska and Fairbanks Experiment Stations

OBJECTIVE OF WORK: To determine costs and best methods of raising dairy steers.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: We have shipped several steers to Fairbanks to test the feasibility of wintering steers on roughage in that area using a pole-type shelter. We hope to be able to test the gains of steers on range pasture again this summer.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUUPORT: Many steers are being raised for beef by using maximum roughage and pasture. Dairy farmers usually sell the bull calves to farmers not yet in dairy production.

PROGRESS DURING THE YEAR: Eight steers were wintered through 1951-52. The average weight on November 1 was 444 pounds and was 536 pounds by June 1. The average daily gain during the winter was .43 pounds. These steers were fed identically with those raised the 2 years previously, except that 1 pound of grain was fed daily to supplement roughage which was in short supply.

Range on mountain pasture was tried for the first time in the summer of 1952. Six steers and 4 heifers were put on the range June 20 and left there until September 15. Their average weight when placed on the range was 424 pounds and 623 pounds when removed. This was an average gain of 199 pounds. The daily gain was 2.26 pounds per animal.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT; FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-3-11 (P)

PROJECT TITLE: Feed Production, Processing and Preservation

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: William J. Sweetman, Arthur L. Brundage, Harold R. Black and C. I. Branton

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Bureau of Dairy Industry, Agricultural Engineering and Soil Science Departments of the Alaska Experiment Station

OBJECTIVE OF WORK: To determine the relative efficiency of preservation, cost of preservation and feeding value of forages (grasses and legumes preserved as barn-dried hay and silage).

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Emphasis will continue to be placed on harvesting forages as barn-dried hay and silage.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Research has shown that it is almost impossible to make field-cured hay late in the season so that now most farmers are making their oats-and-peas into silage and growing a limited amount of bromegrass. The first cutting of bromegrass is made into hay, and the last crop into silage. Demonstration of a forage chopper for harvesting silage at the Station has resulted in the purchase of 6 choppers in the Matanuska Valley this past year.

PROGRESS DURING THE YEAR: It is harder to make silage from bromegrass than from oats-and-peas. Feeding results will be in direct proportion to the quality of silage and hay made. This past year's results are similar to those of the previous 2 years, except that the hay was of better quality, hence it was nearly as good as silage for producing milk. However, hay still is not as efficient as silage. The total yield of milk for 2 cows for 90 days was 2,472 pounds on barn-dried hay and 2,470 pounds on silage. It took 2 acres to produce enough hay for this amount of milk but only 1.6 acres to produce the silage. Therefore, the silage was 25 percent more efficient than barn-dried hay.

Oats-and-peas processed as silage, again, provided more milk than the same crop processed as barn-dried hay or as field-cured hay. At the Matanuska Station 3 cows on silage for 90 days gave 5,452 pounds of milk. The same cows on barn-dried hay gave 5,224 pounds of milk. On an acre basis, this was 4,595 pounds of milk per acre for barn-dried hay and 5,425 pounds for silage. Similar results were obtained in an experiment at the Fairbanks Station. Cows produced 4,325 pounds of milk on barn-dried hay and 4,477 pounds while on silage. This was 5,233 pounds of milk per acre for barn-dried hay and 5,596 pounds for silage

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-4

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Agricultural Engineering

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: C. Ivan Branton

LOCATION: Alaska Agricultural Experiment Station, Palmer, Alaska

COOPERATION: Horticulture (participated in potato top killing experiments); Animal Husbandry (participated in poultry ventilation studies); Agronomy (participated in cereal drying and storage investigations); Plant Pathology (participated in planning post preservation experiment); Agricultural Economics (participated in planning land clearing experiment).

OBJECTIVE OF CURRENT WORK: The development of a stable agricultural economy in Alaska is contingent upon a great many factors; however, the following are important requirements involving the application of engineering principles to agriculture. A practical economical set of farmstead buildings must be developed. Extremes of weather present the problem of providing sufficient insulation for agricultural purposes at a cost which an enterprise will support. This problem is being investigated under a project to develop methods utilizing local timber supplies for construction of buildings which will be functional, furnish adequate protection, and yet be economically sound. To avoid untimely replacement of buildings, structural deterioration must be kept to a minimum by proper construction, ventilation and vapor-sealing.

Alaskan agriculture is handicapped severly by lack of a cereal production program. Preliminary data indicates that adequate cereal grain production can be developed only when the artificial drying of grains is practiced. This problem is under investigation and if solved in an economically feasible manner should enable farmers in the Territory to produce their own cereal grains. Local production of mixed feeds could keep a large amount of money in the Territory which now leave in payments for transportation and feed. Cereal production also might permit the economical production of some meat products and expansion of the poultry industry on a profitable basis.

One of the principle agricultural enterprises in Alaska is potato production. Improvements in handling procedure and in storage may increase the economic returns to the farmer.

PROGRESS DURING THE YEAR: Uses of Native Materials for Agricultural Buildings: Sawdust-insulated, experimental structures of rough-sawed lumber continued to outperform a standard unit constructed with 1/2 inch of fiber board, 2 inches of commercial batt insulation, shiplap, paper and siding. All sawdust has dried in place to below 16 percent moisture. A cold-roof design plus vapor-sealing appears to have solved the problem of ice dams and interior dripping.

Preservative Treatment for Fence Posts: Fence posts of 4 native species were harvested for an experiment which will include 4 preservative treatments.

The capillary pull-up treatment which must be performed when posts are green was completed and treated posts stored.

Poultry House Ventilation Studies: Within a group of 4 experimental laying pens 2 utilizing supplemental heat, highest production was obtained for the second coonsecutive year in an insulated, draft-free pen using a ventilating fan and no supplemental heat.

Potato Vine Killing: A mechanical vine beater was planned and contructed. However, it was not tested due to an early frost.

Cereal Grain Drying and Storage: As in 1951, all field samples of grain taken tested above 20 percent moisture indicating a need for mechanical drying. Results of storage experiments with 7 experimental bins of barley indicate that grain stored at an initial moisture content of 18 percent probably will maintain germination and feeding quality in the Matanuska Valley.

All grain produced at Fairbanks Station was dried in the column type batch drier. Costs for fuel and electricity were less than $4.00 per dry ton.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: An understanding of the need for and proper use of a vapor-seal to protect insulation and structural materials from the harmful effects of moisture will result in large savings for heating and for building maintenance. Several local buildings have been constructed in a manner similar to the best-performing experimental cabins. The absence of icicles and ice dams on the roofs of experimental structures indicate great potential savings in maintenance of roofs, and both exterior and interior finishes.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Chemical and mechanical methods of potato vine killing will be used to remove the vines prior to digging.

Comparative performance data on the 13 buildings constructed for a study of the use of native materials is to be continued. Poultry ventilation research has been expanded by the addition of 4 new pens. It is anticipated that an experimental grain drier will be built using a 1 ton commercial feed mixer as a base. Storage studies to observe the effect of moisture content on germination and spoilage of cereal grains are being continued. Nine additional 50-bushel bins are in use this season.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-4-1 (F)

PROJECT TITLE: Investigations to Develop Improved Structures, Equipment and Methods of Handling and Storing White Potatoes

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. Ivan Branton, M.F. Babb and C.H. Dearborn

LOCATION: Matanuska Experiment Station

COOPERATION: Horticulture Department

OBJECTIVE OF WORK: To reduce potato weight and quality losses from the field through storage and to reduce handling costs in field operations.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Major emphasis during the coming year will be placed upon study of the effect of killing vines to induce early maturity of tubers. It is hoped that a suitable treatment may reduce feathering of the tubers and eliminate some of the damage caused during digging. It is intended to use an additional mechanical method of vine-killing during the coming season which will be similar to the action of the commercial beaters. Mechanical methods of vine-removal previously used have been cutting and burning.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The operations to date under this project have produced data indicating that certain chemicals useful for top killing but injurious to the tubers in other areas may not produce effects which would interfere with the sale of potatoes in Alaska. Vine nuisance can be economically minimized using top-killing spray applied with weed-killing equipment.

PROGRESS DURING THE YEAR: A single row experimental top beater was constructed in a local machine shop. It was patterned after a machine belonging to 2 local farmers, Mr. Holstein and Mr. Bradley. In it were incorporated a height adjustment and commercial rubber flails. Although negotiations for the construction of the machine started in May it was not available for trial in September when an early freeze killed the potato vines.

Potato vines were killed by frost in some sections of the Valley on August 28. Remaining potato vines were killed by a series of frosts between September 5 and September 8. This unexpected freezing killed all the potato tops on plots prepared for top-killing experiments, so that no data was obtained this season. Study and analysis of data taken in 1951 will be continued.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-4-2 (T)

PROJECT TITLE: Studies to Investigate the Length of Useful Service Obtained From Treated and Untreated Fence Posts Cut From Alaskan Species of Timber.

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. Ivan Branton

LOCATION: Matanuska Experiment Station

COOPERATION: Plant Pathology Department

OBJECTIVE OF WORK; To investigate certain preservative treatments for wood fence posts of various native species, and to compare the serviceable life of treated and untreated posts under Alaskan weather, soil and bacteriological conditions.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: This is a project on which the results will be determined by observing deterioration and failure of fence posts over a period of several years. During the coming year lots of dry spruce, dry cottonwood, dry birch, and dry poplar will be treated with a cold soak in pentachlorophenol in oil and with two coats of creosote in oil (brushed on). The soil around one lot will be treated with copper sulphate. All treated and check posts will be set in regular fence lines, with replications following one another.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: None to date.

PROGRESS DURING THE YEAR: All posts needed for the experiment were cut, and prepared. The "pull-up" treatment using a water solution of Copperized CZC was applied to all posts where it was required by the experimental plan. Other posts were peeled, piled and stored for treatment in 1953.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-4-3 (BJ)

PROJECT TITLE: Determination of the Insulation and Ventilation Requirements of Farm Structures and the Development of Improved Methods of their Construction Under Alaska Climatic Conditions.

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. Ivan Branton and W. J. Sweetman

LOCATION: Matanuska Experiment Station and Palmer laboratory

COOPERATION: Animal Husbandry Department

OBJECTIVE OF WORK: To develop economically feasible methods of constructing, insulating, vapor sealing, and ventilating agricultural structures in Alaska, using native materials and labor supplies to the maximum extent possible.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Under this project 2 related but different investigations are underway. One phase consists of investigating methods of utilizing local lumber in building farm structures suitable to Alaska. Data on power consumption, temperature, and air resistance on 13 structures built with experimental wall sections of native material will be collected during the coming season.

In connection with ventilation requirements for poultry houses, a unit consisting of 4 pens has been added to the previous experimental arrangement providing a total of 8 comparable pens. The new (4 pen) unit is ventilated by the same method as the single experimental pen in which the highest production was observed for 2 previous years. All pens are insulated and vapor-sealed. Two pens are equipped with supplemental heat and 6 pens are not.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Alaskan farmers, local builders and engineers have shown intense interest in data from the xperimental houses constructed of native material. As a result most new construction in the Matanuska Valley is more effectively vapor-sealed and insulated. Several farmers have constructed buildings using similar construction methods and the principles of vapor-sealing and insulating as employed on the more effective experimental cabins.

PROGRESS DURING THE YEAR: The 2 phases of this project under which work is being done will be discussed separately.

Uses of Native Materials for Agricultural Buildings: Sawdust in walls dried down to a level of sixteen percent, which is below the moisture level at which structural deterioration would be expected.

An experimental structure of rough-sawed lumber, 6 inches of sawdust insulation, and a vapor-seal required less energy to maintain at a temperature of 70° F. than the standard house constructed with 1/2 inch of fiber board insulation, 2 inches of commercial batt insulation, shiplap, paper and siding.

Icicles, ice dams and interior dripping problems have not developed in any of the experimental houses although these problems are common in most older Alaskan houses. This favorable feature is attributed to a "cold-roof" design plus interior vapor-sealing.

Some records of the past season were incomplete due to meter failure. Prior to the current season all houses were equipped with new electric watthour meters.

Ventilation of Agricultural Structures: Egg production in 4 insulated and vapor-sealed experimental pens varied. The highest production for 5 out of 8 months occurred in a fan-ventilated, unheated pen. Production in this pen exceeded average production of the 4 pens by 6 percent for the 7 month period under consideration.

To further check these results a 4 pen unit was constructed during the summer and equipped with a ventilation system and air delivery comparable to the pen which has produced highest for the past 2 seasons. All 8 pens are insulated in a similar manner and have identical loading.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-4-4 (F)

PROJECT TITLE: Cost of Land Clearing and Economic Utilization of Native Forest Products.

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. Ivan Branton and H. A. Johnson

LOCATION: Matanuska Experiment Station

COOPERATION: Agricultural Economics

OBJECTIVE OF WORK: To develop land clearing methods which may be adapted to Alaskan conditions of topography, soils, forest cover and agricultural use.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: It is not expected that work can be started on this project during the year since a considerable amount of operating money would be required to properly set up the project.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: No work has been done on the project to date.

PROGRESS DURING THE YEAR: The planned work was cancelled because of priority placed on other projects.

PUBLICATIONS: None.

PROGRESS DURING THE YEAR: Moisture contents of several samples of grain taken from the threshing machine at Matanuska Station were as follows: (percent dry basis)

Barley:	26.6;	22.7;	24.0;	29.8
Oats:	25.5;	21.9;	22.3;	34.2
Wheat:	20.7;	21.3		

All barley and oats tested during the 1952 harvest season required drying for safe storage. The wheat was not dried and, to date, is not heating.

Grain Drying Data A series of 3 drying tests on barley were made in the column-type batch drier at Fairbanks. The data obtained supplements that taken on oats and wheat during the 1951 season. The average operating cost for drying barley from 30 to 12 percent moisture (dry basis) was $0.23 per ton for electricity and $3.40 for coal or a total cost of $3.63 per dry ton of barley.

Grain Storage Experiment Seven 50-bushel bins of barley were stored at the following moisture contents:

Bin No.	Initial Moisture Content (Dry basis)	Final Moisture Content (Dry basis)
1	28.4	26.4
2	25.6	26.7
3	21.3	21.1
4	25.0	27.1
5	19.7	17.4
6	16.3	16.0
7	26.7	27.0

The bins were filled after freezing weather had started and all cooled down continually, until they reached a low of from 3 to 7 degrees Fahrenheit in December. As the outside temperature raised, they warmed slowly to a point above freezing which was reached sometime between March 21 and May 13. Bin temperatures of 40° F. were not reached until June 3. The 2 bins containing grain with the highest moisture content started heating in July. One bin was emptied when the grain reached 113° F; however the other bin was not unloaded. The grain temperature in the latter bin reached a maximum of 130° then receded. The grain had been treated with 10 pounds per ton of a commercial chemical grain preservative. Two similar bins at a moisture content of slightly below 24° F. warmed but did not exceed 100° F.

Germination: Samples of grain taken before any of the grain had heated but after 6 months storage show that storage at low temperatures had reduced the germination of some samples. Samples stored at 20 percent moisture or below were only slightly affected; however, samples containing an initial moisture content of 24 percent or more showed less than 70 percent germination. Tests will be made to determine the percentage germination at the conclution of the experiment.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-4-5 (F)

PROJECT TITLE: Handling and Storing High Moisture Content Cereal Grain

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: C. Ivan Branton

LOCATIONS: Matanuska Experiment Station and Fairbanks Experiment Station

COOPERATION: Agronomy Department

OBJECTIVE OF WORK: To determine the most practical method of drying cereal grains in Alaska for feed and seed production and also to determine the optimum moisture content of grains for maximum retention of viability.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Storage studies are being continued to determine the safe moisture content for storage of barley. Temperature measurements are being recorded twice monthly in 16 experimental bins each of approximately 50-bushel capacity. Three replications of 4 moisture levels are as follows:

Initial Moisture Content of Stored Grain
Percent (dry basis)

Replication 1		Replication 2		Replication 3	
Bin A	26.0	Bin F	26.6	Bin # 3,	26.5
Bin B	24.6	Bin E	24.0	Bin # 2,	24.0
Bin C	22.9	Bin G	22.4	Bin # 4,	22.2
Bin D	17.3	Bin H	18.5	Bin # 5,	19.4

The remaining 4 bins are filled with oats at the following moisture level.(percent dry basis): Bin J - 20.6; Bin 1, 14.7; Bin 6, 19.6; and Bin 7, 19.5.

An inexpensive oil-fired heat source and a fan have been purchased for use with an experimental grain drier. It is planned to construct a 1-ton capacity batch-type experimental drier using a commercial feed mixer as a container for the grain and as an agitator. Hot air will be forced through a screened area on the mixer. Recirculated air may be used to increase efficiency.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Experiment Station staff made moisture determinations for Alaskan seed growers when requested during this period. No commercial or private grain driers exist in the Territory; however, some seed growers dried their grain to a safe keeping level by placing it in sacks in their homes. Results of unreplicated storage trials on barley indicate that, under temperature conditions at the Matanuska Experiment Station, a moisture content of 18 percent (dry basis) may be sufficiently low to prevent heating and/or loss of viability of seeds.

Chemical Additives: Two commercial chemical grain preservatives were used at a rate of 10 pounds per ton of grain. With trials in only 3 bins, it was not possible to detect any difference between the grain which was treated and grain that was not treated. The treated and untreated bins were initially at 24 percent moisture (dry basis).

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

WORK PROJECT NUMBER: AL-1-5

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Agricultural Economics

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Hugh A. Johnson

LOCATION: Alaska Agricultural Experiment Station, Palmer, Alaska

COOPERATION: Informal cooperation with other Departments of the Station and with other government agencies.

OBJECTIVE OF CURRENT WORK: To analyze the relationships of production practices to the enterprise costs and returns of farming in Alaska and to provide information to farmers interested in improving their farming conditions; also to analyze the present and potential market for products of Alaska's farms that present products may be fully utilized and that future production may be geared to the market needs of the period.

PROGRESS DURING THE YEAR: Collection of farm management information was curtailed drastically due to labor shortage. Only 31 dairy records and 15 potato records were taken in the Matanuska Valley. Six records were taken in the Tanana Valley. A short report comparing these records with those from other years was made. Collection of information on monthly purchases of selected foods by city housewives was continued through August. This completed field work on the consumer preference project under AL-1-5-1(R). Analysis was continued on this study as time allowed. A study of grocery costs in four Alaska cities was continued. Several reports of a service nature were prepared for various groups and agencies.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Information gathered this year indicates that agriculture in Alaska still is in a state of flux. Farm families still are entering dairying as rapidly as they can get land cleared and cattle grown. Some dairymen are overextended in livestock numbers related to forage-producing ability. Several analyses of the Alaska agricultural picture were made for various groups during the year. Requests for results of our research program have been increasing steadily, indicating that our conclusions and recommendations on economic problems are being accepted and used. Besides the several informal reports, a manuscript Dairy and Potato Farm Organization in the Matanuska and Tanana Valleys, 1951 was prepared for mimeographing. A manuscript, Family Farm Agreements

for Alaska was prepared for printing as an Extension bulletin. A manuscript, Alaska Agriculture, Present and Potential was prepared for printing as an Experiment Station bulletin. A short report on the agricultural potential of the Haines-Skagway area was prepared for the Alaska Development Board.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Farm costs and returns analysis will be expanded again in the Matanuska and Tanana Valleys to include information on minor enterprises and will be extended to the Kenai Peninsula.

Marketing work will involve completing the consumer preference survey begun in 1951, continuation of the grocery cost survey, and beginning a study of practices followed by farmers in marketing perishable vegetables and potatoes. This latter project will be conducted by a man now being recruited for joint work in research and Extension. A new project to study problems of land acquisition and ownership in development of agricultural communties in Alaska will be started. This project should provide further guides to solution of problems encountered by new settlers in present settlement areas and also in new areas to be opened to settlement in the future.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT: FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-5-1 (F)

PROJECT TITLE: Basic Economic Study of Farm Management and Production in Middle Alaska

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Hugh A. Johnson

LOCATION: Alaska Agricultural Experiment Station, Palmer, Alaska

COOPERATION: Informal cooperation with other departments of the Station and with other government agencies.

OBJECTIVE OF WORK: To assemble and analyze farm management and production data essential to more effective use of resources on established farms and to the sound guidance of settlement and development of new agricultural areas in Alaska.

TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: A farm management research specialist was hired late in 1952 to continue the survey work which had been sharply curtailed over a year before. He will continue the farm management survey in the Matanuska and Tanana Valleys. He will expand the survey coverage in these areas to include minor enterprises with special emphasis on cultural practices and their relation to yields. He also will expand the coverage to farmers and homesteaders on the Kenai Peninsula.

IMPORTANT CONTRIBUTIONS SUCH AS PUBLIC BENEFITS OF THE PAST 3 YEARS WHICH JUSTIFY CONTINUED SUPPORT: Due to the curtailment of field work during 1952, no comparisons are available on the minor enterprises. The data gathered, however, indicates that agriculture in Alaska still is in a state of flux. Several dairymen have increased their herds up to and beyond the limits of their capacity to produce forage. Grain production is limited to the acreages required for crop rotations. The average acreage devoted to silage continues to increase and the acreage in grains for hay to decrease. Few cash crops are grown on commercial dairy farms. The potato enterprise apparently still provides a sound rung on the transition ladder bridging the time between the beginning as a small truck farm and arrival at the climax exterprise of dairying. A few specialized potato farms seem to be developing and indicate that they will continue. Generally, however, there is a steady drift from small vegetable acreages into specialized potato production and from potatoes into dairying. This shift probably would be intensified were low-interest, long-term credit available for land clearing, construction of buildings and purchase of livestock and machinery.

A few specialized vegetable farms are being developed, but, in most cases, the truck crop phase is an early step toward a more extensive type of agriculture.

PROGRESS DURING THE YEAR: Due to the necessary curtailment of this work in 1952, earlier overall plans had to be held in abeyance. Effort was made to save the continuity of individual farm records in the interim and time was found for 31 dairy farm records and 15 potato farm records in the Matanuska Valley. Six records were taken in the Tanana Valley. Since the new specialist has been on the job, he has analyzed these records and has prepared a short report tying the limited information from 1951 to the data for previous years.

PUBLICATIONS: A short report, Dairy and Potato Farm Organization in the Matanuska and Tanana Valleys, 1951 was prepared for mimeographing and early distribution. A manuscript, Alaskan Agriculture, Present and Potential, was prepared for publication as a Station bulletin. This bulletin is designed to answer questions from prospective settlers about agriculture in the Territory.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS,

PROJECT NUMBER AND FUND: AL-1-5-2 (R)

PROJECT TITLE: Markets for Alaska's Agricultural Products

PERIOD COVERED BY THE REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Hugh A. Johnson

LOCATION: Alaska Agricultural Experiment Station, Palmer, Alaska

COOPERATION: Informal cooperation with other Departments of the Station and with other government agencies.

OBJECTIVE OF WORK: To assemble and analyze information concerning the nature and adequacy of marketing, processing, storage, transportation, and other services available to present and prospective farmers in Alaska; to indicate desirable improvements in such facilities and services; and to measure the anticipated potential market for agricultural produce in Alaska.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: The consumer preference study begun in 1951 will be completed. The grocery cost survey will be continued. We are in process of hiring a marketing man who will work part-time in extension marketing. His first research probably will be a study of marketing costs and practices on local perishable vegetables.

IMPORTANTANT CONTRIBUTIONS SUCH AS PUBLIC BENEFITS OF THE PAST 3 YEARS WHICH JUSTIFY CONTINUED SUPPORT: Our marketing work during the past year has been designed to provide background information on size of market, demand and need for better marketing practices. Several reports have been prepared as background information to groups or agencies interested in particular phases of the market or of marketing. Requests for results of our research program have been increasing steadily, indicating that our conclusions and recommendations are being accepted and used.

PROGRESS DURING THE YEAR: Tabulation of the mail questionnaires on the consumer preference study has been completed. Analysis is progressing slowly, as time allows. The grocery cost survey has been continued, although the frequency of data collection was reduced from monthly to quarterly beginning in September. A survey was made of the agricultural production and market potential in the Haines-Skagway area at the request of the Alaska Development Board. Service work in the form of reports and conferences related to planning work of various government agencies continued to be an important function during the year.

PUBLICATIONS: None. A manuscript, Family Farm Agreements For Alaska, was prepared for publication as an Extension Service bulletin. Several other reports were prepared but none were published.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-6

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Field Crops Investigations

PERIOD COVERED: January 1 to December 31, 1952

SUPERVISORY LEADER: H. J. Hodgson

LOCATIONS: Matanuska and Fairbanks Stations, Research Laboratory at Palmer, and various locations in areas of agricultural potential in Alaska

COOPERATION: Informal cooperation with other Departments of the AAES; Bureau of Plant Industry, Soils and Agricultural Engineering.

OBJECTIVES OF CURRENT WORK: (1) To develop varieties of forage crops which are more winterhardy, higher yielding, and otherwise agronomically acceptable and to establish foundation seed supplies; to test introduced forage species and strains for adaptability to Alaskan environments; (2) to develop varieties of cereal crops for Alaska with earlier maturity, higher yields, disease resistance, and resistance to lodging, and to establish foundation seed supplies; to test all available introductions for production and/or value as breeding material; (3) to determine optimum cultural practices for forage and cereal crops with regard to yield, maturity, winter survival, and nutritive value of forage or grain; to test various grass-legume associations for hay and pasture; (4) to develop a system of weed control in field crops for Alaska; (5) to evaluate native and cultivated grasses and legumes under various grazing and management systems and to determine the most satisfactory means of increasing pasture yields.

PROGRESS DURING THE YEAR: Forage Investigations: AL-1-6-11, Testing was continued on the breeding behavior of selected plants of Medicago falcata and M. sativa. The percentage of hard seeds in open pollinated seed of 213 plants of M. falcata varied between 22 and 98 with a mean of 75 illustrating the importance of thorough seed scarification in this species. A replicated clonal nursery of 149 M. falcata selections was established to facilitate clonal evaluations under uniform conditions and to produce sufficient seed for more thorough progeny testing. Various types of segregating progenies were found to exhibit markedly different winter survival. Backcrosses using M. falcata as the recurrent parent would be expected to produce the hardiest progeny because the M. falcata genotype would be most rapidly recovered using this type of breeding. However, for some unknown reason, this backcross results in very poor seed set. Self-fertility among 149 selections of M. falcata ranged from 0.0 to 1.707 seeds per flower tripped. Partial winter survival was found in some biennial sweetclover strains and it again was demonstrated that some varieties will produce high yields as an annual silage crop if weed competition can be reduced.

Alaskland, a new red clover variety, was increased and will be released in 1953. Yields of red clover as an annual silage crop were satisfactory but not as high as those of sweetclover. Alaskland red clover was the only variety of 8 tested to exhibit winter survival at Matanuska and it was superior to any other at Fairbanks. Strain trials were established in 1952 at both stations involving 36 entries of alfalfa, 12 of alsike clover, 11 of white clover, and about 150 of field peas. Southern-type strains of bromegrass winterkilled during the second winter while northern-type strains survived in almost perfect stands. Six northern strains averaged 3.46 tons dry matter per acre in 2 cuttings at Matanuska. About 100 selections each of bromegrass and timothy were made from breeding nurseries for progeny testing. Engmo timothy from Norway exhibited excellent hardiness, vigor, and leafiness and preliminary increase will be undertaken in 1953. Grass strain trials were begun including 16 entries of bromegrass, 20 of timothy, 7 of turf grasses, and a number of miscellaneous species. AL-1-6-12 A bromegrass-timothy-Alaskland red clover mixture was the best of those tested. New grass-legume mixture tests were seeded. With regard to yield of dry matter and protein per acre and protein content of the herbage, oat-pea mixtures containing 60-80 pounds of peas and harvested at relatively early stages of maturity were found to be best. No responses in seed yields of Canadian Commercial bromegrass were found resulting from method of seeding, date of last fall clipping, or nitrogen levels though clipping after September 1 resulted in about 75 percent winterkilling. Freezing of immature seed of most forages adapted to Alaska did not reduce germination significantly provided 30-35 days elapsed between pollination and freezing. Nitrogen and phosphorous were found to increase dry matter yields and protein content of bromegrass. Ammonium nitrate, ammonium sulfate, and calcium nitrate gave about equal effect on yields of bromegrass while urea was poorer and calcium cyanamide produced a very poor response. Native "hayflat" vegetation (chiefly Carex sp.) responded to nitrogen applications but not to phosphate and potash.

Cereal Investigations, AL-1-6-3 - Approximately 200 barley, 500 oat, 100 wheat, and 80 flax varieties were evaluated in rod-row tests at the Matanuska and Fairbanks Stations. Edda barley was outstanding at both locations but Golden Rain oats was exceeded in yield by several varieties, particularly at the Fairbanks Station. Several selections of a Diamond X Khogot cross were nearly as early as Khogot and far superior in agronomic and quality characteristics. Selections were made from 6 oat crosses, and barley and wheat hybridization programs were planned. Flax did not mature at the Matanuska Station. Varieties recommended for Alaska were superior to Canadian entries in the plantings of the Uniform Alcan Cereal Trial grown in Alaska. Malting quality tests indicated that both Edda and Olli barley were satisfactory when grown at 3 locations in Alaska. Milling and baking studies revealed that Khogot was not acceptable as a milling wheat. AL-1-6-5 - Both nitrogen and phosphate applications increased yield of cereals. The greatest yield response was attributed to nitrogen applications. There was no increase apparent from the addition of potash. No differential response was obtained with nitrogen applied in 5 different carriers. Seeding in early May resulted in higher yields than later plantings. Preliminary evidence indicates that higher rates of seeding than previously recommended for barley and oats might prove profitable but this must be investigated further. AL-1-6-10 - Approximately 450 varieties were saved for further

evaluation from the 6,430 entries of the World Collection of Wheat grown in single 4-foot rows at the Matanuska Station. The 320 entries saved from the World Collection of Oats were grown in single rod rows at 2 locations. About 250 were saved for additional testing for forage and grain yields. The most promising varieties from the World Collection of Barley were included in yield trials at 2 locations.

Weed Control: AL-1-6-9 - Dow Selective, a dinitro compound, appeared to be the most valuable chemical for post-emergence selective weed control in forages. Sprays applied when weeds and forages were small gave best results. Chloro-IPC and Premerge, a dinitro compound, were most promising as pre-emergence sprays. In cereal crops Dow Selective and Premerge were most promising for control of annual weeds when applied at early stages of growth. Yield increases of about 65 percent above non-treated plots were obtained as compared to an 84 percent increase from hand weeding. Applications of 2,4-D again resulted in abnormalities in the grain crop though good control of lambquarters was obtained. Premerge was the most promising chemical tested for pre-emergence sprays on cereal crops. The fact that the same chemicals are effective on most of our common annual weeds while not affecting either cereal or forage crops will allow farmers to control weeds in grain fields seeded down to grasses and legumes.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Two papers, Seed Production Possibilities on Grasses and Legumes in Alaska and Influence of Fertilizers on the Crude Protein Yields of Bromegrass Pasture in the Matanuska Valley, presented at the American Society of Agronomy and Soil Science Society of America meetings in Cincinnati, Ohio, in November 1952.

Circular 14, Recommended Varieties of Field Crops for Alaska is being revised to reflect research conducted under this work project during the past two years.

Several farmers have begun using spraying recommendations for weed control with satisfactory results.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Special emphasis will be placed on further evaluation of selected varieties from the World Barley, Oat, and Wheat Collections, and the hybridization of selected varieties of wheat and barley (AL-1-6-3); investigations of nitrogen and phosphate fertilizer applications on cereal crops and rates and dates of planting of cereals (AL-1-6-5); management of pastures (AL-1-6-6); a more extensive testing of the most promising chemicals for controlling weeds in cereal and forage crops (AL-1-6-9); growing the remainder of the World Collection of Wheat if seed is available (AL-1-6-10); investigations of breeding behavior of selected plants of alfalfa, timothy, and bromegrass; further selection of desirable plants; testing of introduced forage crop strains; cytological studies on grasses and legumes; seed increase of outstanding strains (AL-1-6-11); grass-legume associations; seed production; storage of root reserves and hardening in legumes; effect of management on yield and quality of forage and longevity of stands; nutritional requirements of forage crops; seed production (AL-1-6-12).

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-3 (H)

PROJECT TITLE: Cereal Crop Breeding

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: R. L. Taylor, and J. C. Brinsmade

LOCATIONS: Matanuska and Fairbanks Stations, Research Laboratory at Palmer, and/or other locations which may be defined later

COOPERATION: Division of Cereal Crops and Diseases (BPIS & AE); other Federal, and Territorial agencies and Dominion Experiment Station, Beaverlodge, Alberta, Canada

OBJECTIVE OF WORK: To develop and release to growers in Alaska improved varieties of cereal crops

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Selection from the oat crosses grown in 1952 will be tested further for agronomic desirability. Crosses of selected varieties of barley and wheat will be made. Barley crosses will be directed toward developing an early, high yielding, lodging and disease resistant, smooth awned variety. The goal in wheat crosses will be a variety as early or earlier than Khogot having more desirable agronomic and quality characteristics. Promising varieties retained from the World Collection of Oats will be tested for forage value and grain yield.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Seed of Edda barley and Golden Rain oats was released to Alaska farmers for planting in 1951. These varieties, superior to any previously recommended, have been widely grown and fully accepted by the growers. A new wheat variety is in the preliminary stages of increase. Research accomplished under this project contributed to varietal recommendations included in the revision of Circular 14, Recommended Varieties of Field Crops for Alaska.

PROGRESS DURING THE YEAR: Approximately 200 barley, 500 oat, 100 wheat, 80 flax varieties were evaluated in rod-row tests at the Matanuska and Fairbanks Stations. Average yields of cereals at both stations were somewhat above 1951 levels. Edda barley was an outstanding yielder, averaging 67.2 and 81.2 bushels per acre at the Matanuska and Fairbanks Stations, respectively. These yields were not significantly exceeded by any other barley variety tested. Golden Rain oats averaged 81.8 and 85.4 bushels per acre at the same locations. Several oat varieties performed better than Golden Rain this year, particularly at the Fairbanks Station. No wheat varieties have been found with the much-needed earliness. Several selections from a Diamond X Khogot cross matured nearly as early as Khogot and were far superior in agronomic characteristics. Two of these were selected for preliminary increase; 1 of these will be selected for release on the basis of additional yield and quality determinations. Flax did

not mature at the Matanuska Station and the data from the Fairbanks Station was not available for this report. Available experimental evidence indicates that flax will produce a satisfactory yield of high quality grain and fiber under most Alaskan farming conditions. However, in view of the uncertain maturity, severe weed competition and lack of commercial outlets for the crop, either now or in the forseeable future, the expense of additional experimentation on flax cannot be justified at this time and, therefore, this work will be discontinued.

The F_2 generation of the crosses of Vicland, Cherokee, and Eaton with Golden Rain and Climax oats was grown in a space-planted nursery at the Matanuska Station. Promising segregates were harvested for further evaluation. Ten varieties of barley and 9 of wheat were selected for hybridization and planted in the greenhouse in November. The crosses to be accomplished were planned to develop varieties possessing a better combination of desirable agronomic and quality characteristics than the parental varieties.

The Uniform Alaska Cereal Trials were planted at 10 locations. Environmental hazards destroyed almost 1/2 of these experiments during the growing season. The test at Soldotna was frosted in early September and only the barley matured sufficiently at Homer. Edda barley and Golden Rain oats were outstanding yielders at all locations which were harvested. This series of experiments probably will be discontinued in the future because more benefit will be derived from a series of demonstration plots of recommended varieties at selected locations in the Matanuska and Tanana Valleys and limited tests of earliest available varieties on the Kenai Peninsula.

Three plantings of the Uniform Alcan Cereal Test, organized in cooperation with the Dominion Experiment Station at Beaverlodge, Alberta, were made in Alaska. The test on the Kenai Peninsula was frosted in early September and was not harvested. Complete results of these cooperative experiments have not been compiled as yet but the data from those tests grown in Alaska indicate that the varieties recommended here yielded higher than the Canadian entries.

Complete chemical analyses were made on grain samples from 4 locations of the Uniform Alaska Cereal Trials grown in 1951. Results indicate that the recommended varieties in Alaska are at least equal in feeding value to cereals grown in the United States and are fully acceptable as livestock feed. Additional protein analyses on the 1951 crop support this conclusion insofar as protein content is concerned.

Malting tests with Edda and Olli barley grown at the Matanuska and Fairbanks Stations and at Homer in 1951 indicated that both varieties produced satisfactory malts regardless of the location where grown. Additional tests with Edda barley indicated that nitrogen applications of 45 pounds per acre increased barley nitrogen but decreased malting quality.

Samples of Ceres, Khogot, Victory, and Saunders wheat grown at the Matanuska and Fairbanks Stations in 1951 were tested for milling and baking quality. Ceres and Saunders were about equally satisfactory in bread-baking quality, Victory decidedly inferior, and Khogot of questionable quality. In addition, Saunders and Khogot were tested for quality of whole wheat flours. Khogot was slightly superior to Saunders but both were inferior to standard varieties.

PUBLICATIONS: Cereal varietal recommendations in Circular 14 (Revised) Recommended Varieties of Field Crops for Alaska which will be available for distribution early in 1953.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-5 (P) (Rev. 12/28/51)

PROJECT TITLE: Cereal Crop Culture

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: R.L. Taylor, H.J. Hodgson, A.H. Mick, W.M. Laughlin, and J.C. Brinsmade

LOCATION: Matanuska and Fairbanks Stations and/or any other locations which may be defined later

COOPERATION: Division of Cereal Crops and Diseases (BPIS & AE) and other Federal, and Territorial agencies.

OBJECTIVE OF WORK: To determine the optimum method of culturing recommended cereal crop varieties under Alaskan conditions including methods of seeding, rate and date of seeding, fertilizing, and other cultural practices that appear to need investigation; to investigate the nutritional requirements of cereal crops; and to determine the effects of certain cultural practices on nutritional valuss of grain.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Emphasis of fertilizer experiments will be concentrated on the response of cereals to varying levels and combinations of nitrogen and phosphate fertilizers. Very little effect has been noted from the addition of potash. This work will be conducted in cooperation with the Soil Science Department and will be limited to 1 cereal to allow more adequate evaluation of the response to nitrogen and phosphate applications. The work on rates and dates of seeding will be conducted in separate experiments to measure more accurately the effect of each factor on cereal yields.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Investigations under this project have aided formulation of the current fertilizer recommendations for cereals. Early planting of cereals at a high rate of seeding results in increased grain yields.

PROGRESS DURING THE YEAR: The fertilizer experiments reported here were conducted by personnel of the Soil Science Department. All factorial combinations of 0, 20, and 40 pounds per acre of nitrogen, 0, 40, and 80 pounds per acre of phosphate, and 0, 40, and 80 pounds per acre of potash were compared on plots of Edda barley, Golden Rain oats, and Khogot wheat at each of 4 locations. Marauding cattle seriously damaged the Fairbanks upland plots just prior to harvest. The planting at Homer failed to mature, but total dry matter yields were highest at this location. Nitrogen applications increased total dry matter yields at all locations except Homer, averaging 7 and 12 percent, respectively, above the check for rates of 20 and 40 pounds per acre. Total dry matter yield increases for phosphate applications were 6 and 3 percent for rates of 40 and 80

pounds per acre, the greatest increases occurring at Homer. Wherever cereals matured, grain yields followed the same trend as dry matter yields. Potash applications had no effect on yeilds of either dry matter or grain.

Urea, cyanamide, ammonium sulfate, ammonium nitrate, and calcium nitrate were compared as nitrogen carriers at 0, 20, and 40 pounds per acre on plots of Golden Rain oats and Edda barley at the Matanuska Station. There was no difference in the response of these varieties to the carriers, all applications of nitrogen resulted in increased grain yields. The rate of increase averaged 20 and 30 percent, respectively, for rates of 20 and 40 pounds per acre.

Date and rate of seeding experiments were conducted at the Matanuska and Fairbanks Stations, using Edda barley, Golden Rain oats, and Khogot wheat. The variability associated with the experiment at the Matanuska Station precluded definite conclusions. Planting in early May consistently resulted in higher yields. The previously recommended seeding rate of 100 pounds per acre appeared to be sufficient for Khogot wheat. In a separate experiment conducted at the Matanuska Station no increase in yield was gained by seeding either Khogot or Victory wheat at higher rates. For barley and oats, higher rates of seeding tended to result in increased yields. The data from the Fairbanks experiment were not available for this report.

In cooperation with the Entomology Department 7 insecticides were tested for control of wireworms in plantings of barley, wheat, and oats at the Matanuska Station. No data could be taken on effectiveness of these chemicals in controlling wireworms because no wirewom damage was noted in either the experimental plots or in the surrounding area. None of the treatments caused any visible damage to the cereals.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-6 (F)

PROJECT TITLE: Pasture and Range Improvement and Management

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: H. J. Hodgson, William J. Sweetman and Arthur L. Brundage

LOCATIONS: Matanuska and Fairbanks Stations

COOPERATION: Agronomy and Animal Husbandry Departments; Bureau of Dairy Industry

OBJECTIVE OF WORK: To determine the yield of native range, cultivated pastures (annual and perennial) under different grazing and management systems, and their effect on maintenance of stands of grasses and legumes in the Matanuska and Tanana Valleys; to determine the effects of different methods of grazing management on nutritive value of forage as measured by milk production and beef production; to measure the comparative feed production in the form of hay, grains, and pasture; to determine the value of renovation and reseeding permanent pasture sod to increase yields.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Considerable emphasis will be placed on comparisons of grazing systems to ascertain methods for maximum efficiency of utilization of available pasturage. The 2 major systems to be studied are rationed grazing, whereby the animals are restricted to an area sufficient to meet their needs over a 24-hour period or less, and continuous grazing whereby the animals are allowed free access to a relatively extensive area for periods of a week or more at a time. Emphasis also will be placed upon the use of these 2 grazing systems in utilizing oats-and-peas pasture in August and September, when bromegrass pasture is at its low stage of productivity. Continuous observation of the grazing animals will be employed at frequent intervals to ascertain the effects of management upon their behavior, especially in regard to time spent grazing, chewing cud and loafing.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Renovation has been found to increase pasture yields even though legume stands winterkill during the first year. Through disking and reseeding appear to overcome the sod-bound condition for a period of 2-3 years. Application of nitrogen to bromegrass pasture will result in greater grazing yields than no nitrogen at all. Heifers and steers will make very good gains on native range pasture. Ten head, all 10 months old, averaged 199 pounds gain in 90 days on mountain range.

PROGRESS DURING THE YEAR: Grazing experiments conducted with milking dairy cattle, indicated that 160 pounds of nitrogen per acre on bromegrass pasture increases grazing yield over that obtained with application of only 80 pounds

per acre or with no nitrogen at all. Under the conditions prevailing last summer full application of 160 pounds of nitrogen in the spring was more effective than split applications of 80 pounds in the spring and 80 pounds in the summer. Production in standard cow days per acre was as follows: Check (no nitrogen) 50.0, 80 pounds spring application 51.7, 160 pounds split application 64.8, 160 pounds spring application 73.0.

Estimates of dry matter production on these pastures were made by clipping 4 representative quadrats 50 square feet in area from each pasture just before the cattle were turned on. Clippings were dried and samples were saved for protein determination but these data are not yet available. Estimated pounds of dry matter per acre were as follows: Check (no nitrogen) 875, 80 pounds spring application 1605, 160 pounds split application 3277, and 160 pounds spring application 2912. Dry matter yields almost doubled each time the amount of nitrogen doubled. In pounds of dry matter produced the split application of 160 pounds of nitrogen exceeded the spring application of 160 pounds by a slight amount while in standard cow days the positions were reversed. The fact that yields of standard cow days and pounds of dry matter per acre did not increase in the same proportion possibly may be a result of incomplete utilization of forage produced under the higher nitrogen rates.

Limited studies were made of the feasibility of grazing oats-and-peas under a system of rationed grazing. This system essentially consists of moving an electric fence up the field twice a day a distance calculated to meet the animal requirements for 12 hours. Using this system 1.27 acres of oats-and-peas provided optimum grazing for 15 milking dairy cows for 7 1/2 days. Calculated in terms of cow days, it provided 61.1 standard cow days per acre, or nearly as much as the high producing bromegrass pastures which were grazed intermittantly throughout the grazing season. The animals were continuously observed one day from the time they entered the pasture after the morning milking to the time they left the pasture for the afternoon milking. Their time as a group was divided as follows: grazing 68.5 percent, standing and chewing cud 3.0 percent, lying down and chewing cud 15.0 percent, standing and loafing 5.1 percent, lying down and loafing 8.3 percent.

A comparison was made between rationed grazing and uncontrolled grazing on second growth bromegrass. The field was divided into 2 equal parts of 1.46 acres each. Each part provided grazing for 8 animals for 10 days. The part managed under rationed grazing yielded 37.9 standard cow days per acre and the part managed under the uncontrolled system yielded 36.5 standard cow days per acre. An observation similar to the one above was conducted on a very wet and cold day midway in the trial. The controlled group spent their time as follo grazing 55.6 percent, standing and chewing cud 25.5 percent, lying down and chewing cud 0.8 percent, standing and loafing 18.0 percent, lying down and loafing 0.2 percent. The uncontrolled group spent their time as follows; grazing 80.3 percent, standing and chewing cud 11.1 percent, lying down and chewing cud 0.0 percent, standing and loafing 8.6 percent, lying down and loafing 0.0 percent.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-9 (F)

PROJECT TITLE: Weed Control

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: H. J. Hodgson and R. L. Taylor

LOCATIONS: Matanuska and Fairbanks Stations

COOPERATION: Bureau of Plant Industry, Soils and Agricultural Engineering (Division of Weed Investigations)

OBJECTIVE OF WORK: To develop a system of controlling annual and perennial noxious weeds on Alaska farms.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: The most promising chemicals over the past 2 years will be tested more extensively and new chemicals will be evaluated in preliminary tests.

MORE IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: It has been demonstrated that commercially available herbicides can be used satisfactorily to control annual weeds in cereal and forage crops in Alaska. TCA at rates of 50 pounds per acre or more has controlled quackgrass effectively.

PROGRESS DURING THE YEAR: Chemical Weed Control in Forages - Eight post-emergence sprays were applied over 9 forage species at 4 weekly intervals at the Matanuska Station in 1952. Sprays used were Aero Cyanate at 10, 20, and 30 pounds per acre, Dow Selective at 2, 4, and 8 quarts per acre, and the amine salt of 2,4D at 0.5 and 1.0 pounds acid equivalent per acre. All sprays were applied with a knapsack sprayer in 120 gallons of water per acre. Sprays applied when weeds were very small gave best control of weeds. Dow Selective at 4 and 8 quarts was effective on most weeds at the early stage of growth but at rates used it had no effect on wild buckwheat (Polygonum convaluulus). Aero Cyanate at 20 and 30 pounds gave good control of chickweed (Stellaria media) and wild buckwheat, but the higher rate also damaged legumes considerably. It had no effect on other weeds. Shepherds purse (Capsella Bursa-pastoris) and lambsquarters (Chenopodium alba) were controlled by 2,4D, and horn spurrey (Spergula arvensis) was damaged somewhat while severe damage to legumes resulted. Dow Selective appears to be the most promising post-emergence spray but more work is needed on rate of application.

Aero Cyanamid at 200, 400, and 800 pounds per acre, Premerge at 2, 4, and 8 quarts per acre, Sodium Trichloroacetate (TCA) 90%, IPC and Chloro-IPC at 4, 8, and 12 pounds per acre were applied as pre-emergence sprays over 6 forage species in about 100 gallons of water per acre. Of these, Chloro-IPC and Premerge warrant further testing relative to rates of application. The

former was notable for its persistance in controlling chickweed and eliminating wild buckwheat. The latter gives better control of lambsquarters but chickweed grew later in the season in Premerge treated plots.

Chemical Weed Control in Cereals - Seceral rates of 4 herbicides were applied at 2 dates in post-emergence weed control experiments with cereals. The first application was made when the grain was 3-5 inches in height and the other when the crop had reached a height of 8-12 inches. The early treatment gave consistently better results. Two dinitro formulations, Dow Selective and Premerge, were the most promising compounds tested. Excellent control of chickweed and lambsquarters was obtained using Dow Selective at the rate of 1 1/2 gallons per acre and nearly as good control with the 1/2 gallon per acre rate of Premerge. This heavy application of Dow Selective caused severe leaf burning on wheat, but the plants recovered completely. Chickweed was satisfactorily controlled by Aero Cyanate at the 20-pound per acre rate with the 15-pound per acre rate being nearly as effective. This chemical had no noticeable effect on lambsquarters. Lambsquarters was controlled by the amine from of 2, 4D at rates of 1 pound per acre or higher, but these rates also caused some visible abnormalities to the growing crop. Plots which were handweeded at the time of the earliest treatment averaged 84 percent higher in yield than the check. Other significant yield differences include a 67 percent increase over the check for the 1 1/2 gallon rate of Dow Selective and 61 percent increase for the 1/ gallon rate of Premerge.

Seven herbicides were evaluated as pre-emergence treatments for weed control in cereals. The spray treatments were applied 5 days after the crops were planted. Premerge was the most promising chemical tested. Almost complete control of lambsquarters and chickweed was obtained when Premerge was applied at the rate of 2 gallons per acre and partial control was obtained with rates as low as 1 gallon per acre. Chloro-IPC controlled chickweed when applied at the rate of 6 pounds per acre, but had no effect on lambsquarters. This rate of Chlore-IPC caused some stunting and abnormal development of cereals, particularly oats. None of the other chemicals tested performed satisfactorily in controlling weeds. Yield differences were not significant in these experiments, but plots receiving Premerge tended to be higher-yielding, those receiving the 2-gallon per acre rate averaging 39 percent higher than the check plots.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-10 (H)

PROJECT TITLE: Evaluate United States Introduced and Developed Strains of Cereal Crops for Adaptation to Subarctic Conditions

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: R. L. Taylor

LOCATIONS: Matanuska and Fairbanks Stations and/or any other locations which may be defined later

COOPERATION: Bureau of Plant Industry, Soils and Agricultural Engineering (Division of Cereal Crops and Diseases and Division of Plant Exploration and Introduction) and other state, Federal and Territorial agencies

OBJECTIVE OF WORK: To evaluate thoroughly all available strains of cereal crop varieties when grown under subarctic conditions for growth habit, date headed, date ripe, plant height, yield of grain and straw, seed quality, stiffness of straw, reaction to prevailing diseases, and other characteristics which may have an influence on the adaptation or use of these varieties for experimental or commercial purposes.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: If seed is available, the second half of the World Collection of Wheat will be grown in single rows at the Matanuska Station near Palmer. Promising entries selected from the first portion of the World Wheat Collection will be grown in single rod rows at the Matanuska and Fairbanks Stations for further evaluation and comparison with standard varieties. As many as possible of the varieties retained from the World Collections of Barley and Oats will be included in yield trials.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: There has been no direct contribution to public benefit arising from this work to date. Varieties have been selected that show promise as adapted varieties and as breeding material, but further evaluation is necessary.

PROGRESS DURING THE YEAR: The most promising varieties retained from the World Collection of Barley in 1950 were included in yield trials at the Matanuska and Fairbanks Stations. These compared favorably with standard varieties in regard to yield, maturity, and lodging resistance. The 320 entries retained from the World Collection of Oats were grown in single rod-rows at the Matanuska and Fairbanks Stations. Approximately 250 were selected for further evaluation for grain and forage yield. The varieties saved from the World Collection of Flax were grown in single rod-rows at the Matanuska and Fairbanks Stations. The planting at the Matanuska Station failed to mature seed and the data from the Fairbanks Station was not available for this report. Approximately half (6,430 entries) of the World Collection of Wheat was grown in single 4-foot rows at the Matanuska Station, with about 450 being retained for further evaluation. This seed was made available through the Division of Cereal Crops and Diseases and the Division of Plant Exploration and Introduction.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-11 (A)

PROJECT TITLE: Forage Crop Breeding

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: H. J. Hodgson and W. B. Wilder

LOCATIONS: Matanuska and Fairbanks Stations

COOPERATION: Division of Forage Crops and Diseases (BPIS & AE), Soil Conservation Service and other agencies

OBJECTIVE: To develop through introduction, hybridization, and selection superior varieties of native and introduced grasses and legumes (alfalfa, red, alsike and white clover, sweetclover, smooth bromegrass, timothy, and others that may be of economic value) for production of forage and seed and for special uses under Alaskan environmental conditions, and to produce foundation seed of these varieties for release to farmers; to conduct cytogenetic investigations on native and introduced grasses and legumes.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Major alfalfa work will consist of: (1) evaluation of the breeding behavior of selected plants through progeny testing; (2) selection of desirable phenotypes of both Medicago falcata and M. sativa; (3) testing of introduced varieties of M. sativa which are hardy in northern United States and Canada; (4) cytological studies on M. falcata and hybrids with M. sativa; (5) seed increase of M. falcata.

Testing of introduced varieties of smooth bromegrass (Bromus inermis), timothy (Phleum pratense), red clover (Trifolium pratense), alsike clover (T. hybridum), white clover (T. repens), sweetclover (Melilotus species), and various miscellaneous forage species. Evaluations of selected plants of bromegrass and timothy will be made through testing open pollinated progenies.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Alaskland, a new red clover variety, has been increased. About 900 pounds of seed are available for release to farmers in 1953. This variety originated from several introductions made in 1929. A new timothy strain is in the early stages of increase.

PROGRESS DURING THE YEAR: Alfalfa - Selected clones of M. falcata were found to vary significantly in their combining ability for forage yield, vigor, hardiness, and growth habit on the basis of the first year's data. Those producing the most outstanding progenies will be made up into experimental synthetic varieties in future years. A new progeny test, including 144 selections, was seeded in 1952 but severe weed competition existed and it is doubtful whether satisfactory stands were obtained.

Some Ladak plant progenies which were established at Fairbanks in 1951 showed good winter survival and made a satisfactory growth in 1952. However, many of the parent plants in the breeding nursery winterkilled. Additional progeny tests were established in 1952.

Hard seed percentages were determined for 213 clones of M. falcata; the mean percentage was 75 with a range of 22 to 98. This emphasizes the need for thorough seed scarification in this species. Sufficient variability appears to exist to allow progress in selection for a low percentage of hard seeds.

All varieties seeded in the Uniform Grazing Alfalfa Trial winterkilled at both Fairbanks and Matanuska. A new test of introduced varieties including several new experimental synthetics from northern states was seeded in broadcast plots at both Stations whereas all such tests heretofore have been seeded in drilled rows.

A replicated clonal nursery of 149 M. falcata selections was established in the spring of 1952. This will facilitate evaluation of selections under more uniform conditions and provide adequate amounts of seed for progeny testing. Additional nurseries of this nature are planned.

Four introductions of creeping rooted alfalfa from Swift Current, Saskatchewan, Canada, and 13 segregating progenies were established in a space-planted nursery in 1951. Survival during the first winter ranged from 0 to 55 percent. Survival was very poor in progenies resulting from backcrosses of F_1 hybrids to the M. sativa parent: when sister F_1 hybrids were sib-mated it was relatively good. Surviving plants of these progenies will be allowed to go through a second winter after which selections will be made on the basis of agronomic characteristics.

In 2 separate cases attempted backcrosses of the sativa X falcata hybrid to the falcata parent resulted in very low seed set (.06 seeds per flower pollinated in one case). It is this backcross in which desirable gene recombinations for winterhardiness and desirable seed characteristics, especially resistance to shattering, most likely would be found. Cytological studies have revealed that our M. falcata is diploid, 2n = 16, whereas the sativa parents used in crosses presumably were tetraploid, 2n = 32. Plants resulting from cross pollinations have not been examined cytologically but they are assumed from various plant characteristics to be triploid hybrids. It is not understood why backcrosses to the diploid parent result in a very low seed set while backcrosses to the tetraploid parent result in fairly good seed set.

Self-fertility studies were made on 149 selections of M. falcata. Self-fertility ranged from 0.0 to 1.707 seeds per flower tripped, with a mean of .446. The resulting seed will be used to establish S_1 progenies for evaluation of parent clones. Inbreeding may be a useful tool in achieving homozygosity for certain plant characteristics, especially in this diploid species.

No seed was harvested either on selected plants or in increase blocks at Matanuska as a result of damage to breeding nurseries by marauding cattle and unfavorable weather during flowering which severely inhibited insect activity. At Fairbanks a good set of seed was obtained but it did not mature.

Sweetclover - Of the 5 biennial strains of sweetclover seeded broadcast in a barley nurse crop in 1951 at Matanuska, Arctic and Alpha gave a reasonably good survival, Madrid and Brandon Dwarf were poor, and Redfield was intermediate. These plots were damaged severely by drift from roadside spraying operations and no reliable second year yield or agronomic data could be obtained. A similar trial was established in 1952 and winter survival, yields, and agronomic data will be noted in 1953.

It appears that competition furnished by a nurse crop tends to retard biennial sweetclover varieties in their development resulting in some winter survival while removal of competition results in flowering and an annual habit in response to photoperiod.

Trials of sweetclover varieties in drilled rows again demonstrated that, where weed competition is not too severe, high yields of silage can be obtained. In general, biennial varieties gave the best yields at Matanuska and, of these, Spanish and Madrid were outstanding, yielding 2.5 and 2.2 tons of dry matter per acre, respectively. Hubam, Evergreen, Spanish, and Madrid were equally good at Fairbanks.

Red Clover- Increase of a new strain of red clover was accomplished. It has been named "Alaskland" and will be released to growers in 1953. Alaskland traces to 3 introductions from Russia and Siberia made in 1929.

No survival was found in red clover varieties seeded in drilled rows in 1951 and harvested late the same season. Only 1 of 8 varieties seeded broadcast in a barley nurse crop exhibited any survival at Matanuska. Alaskland, previously referred to as Siberian or Russian red clover, survived about 50 percent. The space-planted nursery of Alaskland red clover winterkilled completely. Drilled and broadcast trials of 25 red clover varieties were established in 1952. Fifteen of the varieties included are from Scandinavian countries. Yields in the drilled trial (annual type management) ranged from 0.8 to 1.8 tons of dry matter per acre at Matanuska; yield data are not available from the Fairbanks trial. Yields per acre at Matanuska were decreased and varietal differences minimized as a result of damage by marauding cattle when the clover was 4-6 inches tall. In the broadcast trials seeded at Matanuska and Fairbanks, good stands of most strains were obtained and reasonably good evaluation of a very wide range of germplasm should be possible in 1953. Several of the strains from Scandinavian countries exhibited a first year growth habit remarkably like that of Alaskland.

Alsike Clover - Twelve alsike clover strains of which 5 are from Scandinavian countries, were seeded in a broadcast trial with a barley nurse crop. At Matanuska the nurse crop was removed when mature after which the clover made a growth of 6-10 inches. At Fairbanks the nurse crop and excessive weed growth were mowed and removed to reduce severe competition. Winter survival, yields and other agronomic data will be recorded next year.

White Clover - White clover strain trials were seeded in the same manner as the alsike clover trials mentioned above. Several hundred plants collected from roadsides and old pastures and fields in the Matanuska Valley were space-planted in a nursery to determine whether appreciable variability in winterhardiness existed.

Field Peas - About 150 introductions of field peas were grown in observational trials. The most promising were retained for further study.

Bromegrass - Of the 12 strains comprising the Uniform North Central Bromegrass Nursery seeded at Matanuska in 1950, the 6 southern-type strains winterkilled during the winter of 1951-52 while the 6 northern-type strains survived in almost perfect stands. No significant yield differences among the northern strain were found in 1952 although Mandan 404 and Manchar were highest. The mean yield of the 6 varieties was 3.46 tons of dry matter per acre in 2 cuttings. All strains were fetilized with 80 pounds of N and 40 of P_2O_5 in the spring and 60 pounds of N after the first cutting. Sixteen strains comprising the Uniform Western Bromegrass Nursery were seeded in broadcast plantings in 1952 at Matanuska and on upland and bottonland at Fairbanks. No data are available on these to date. In addition, a drilled row planting was established at Matanuska to evaluate seed production of these strains.

About 100 clones which combine good seed and forage characteristics were selected from the bromegrass breeding nursery established in 1951. Most selections were advance generation segregates from Bromus inermis X B. pumpellianus crosses. Almost all plants of the 15 named varieties included in the nursery produced very few seed culms and it is possible that this may be a response to photoperiod. Progeny testing of all selections of which seed is available will begin in 1953.

Timothy - All varieties except one of Norwegian origin showed marked winter injury of the space-planted plants in the timothy breeding nursery established in 1951. This strain, Engmo, showed very little injury, very good vigor, and was very leafy. On the basis of these observations, preliminary increase of this variety will be begun in 1953. About 100 plants were selected on the basis of vigor, leafiness, spike characteristics, maturity, and freedom from disease. These will be progeny tested in future years. Broadcast strain trials were seeded at Matanuska and Fairbanks in 1952 and winter survival and other data will be obtained in 1953. Nine of the strains tested are from Scandinavian countries.

Turf Grasses - Seven turf grasses and 1 mixture were seeded in the spring of 1952 and each was subjected to 3 clipping schedules to determine which are most satisfactory for lawns, intense management such as golf greens and tees, and purely stabilization turf. All performed satisfactorily during the first season, but no conclusions are possible until performance of subsequent years is obtained.

PUBLICATIONS: Paper, Seed Production Possibilities on Grasses and Legumes in Alaska, presented at the American Society of Agronomy meeting, Cincinnati, Ohio, November, 1952. Forage varietal recommendations in Circular 14 (Revised) Recommended Varieties of Field Crops for Alaska which will be available for distribution early in 1953.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-6-12 (P) (Rev. 12/28/51)

PROJECT TITLE: Forage Crop Production

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADERS: H. J. Hodgson, W. B. Wilder, J. E. Osguthorpe, W. M. Laughlin, and M. Blom

LOCATIONS: Matanuska and Fairbanks Stations

COOPERATION: Division of Forage Crops and Diseases (BPIS & AE) and variou Federal, and Territorial agencies

OBJECTIVE OF WORK: To determine the cultural practices most conducive to securing high yields of high quality forage and seed of the species recommended for use in Alaska including annual cereals and legumes used for forage; to investigate the nutritional requirements of forage crops.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Work conducted under this project has resulted in contributions to fertilizer recommendations and to information on management of bromegrass for hay and pasture

PROGRESS DURING THE YEAR: Grass-legume Mixtures: Yield data for the grass-legume mixture test seeded in 1949 at Matanuska revealed that smooth bromegrass gave the highest yields in 1952 with a bromegrass-timothy mixture ranking next. Timothy alone yielded very poorly. This indicates that a bromegrass-timothy-legume mixture would be expected to be the best combination if stands are to remain for several years. The timothy and legume would yield well in the first and second years and give way to bromegrass in later years. A new trial comparing all combinations of 4 grasses and 5 legumes was seeded at Matanuska in 1952. Good stands of legumes and fair stands of grasses were obtained.

From the grass-legume mixture experiment seeded at Fairbanks in 1951 it appears that a bromegrass-Alaskland red clover mixture was the most satisfactory combination tested. First cutting yields of green matter were greater for the Kentucky bluegrass-Alaskland red clover mixture apparently because of a lack of competition for the red clover. However, second cutting yields were consider ably lower for the latter combination. The performance of timothy was similar to that of bromegrass and it is probable that a mixture of Alaskland red clover, timothy, and bromegrass would be the highest yielding combination for which seed is available.

Rate of seeding and date of harvesting oat-pea mixtures: Of several oat-pea mixtures tested in 1951 the one containing 67 pounds of peas and 33 pounds of oats per acre produced the greatest yields. Yields of dry matter were as great

where the crop was harvested when the lower pea pods were well filled and the oats in the milk stage as at later dates. Protein content of the herbage decreased with maturity and increased with the proportion of peas in the mixture. Highest yields of protein per acre occur from mixtures with a high proportion of peas and harvested at the stage of growth mentioned above. Mixtures in 1952 responded similarly but dry matter yields continued to increase until the last date of harvest. Protein data for the 1952 trials are not yet available. Protein content of the herbage, pounds of protein per acre, and yield of dry matter per acre all are important and the most favorable combination of these appears to result from mixtures containing 60-80 pounds of peas cut at relatively early stages of maturity.

Seed Production: Methods of seeding, date of last fall cutting, and various levels of nitrogen failed to produce differences in seed yields of Canadian Commercial smooth bromegrass. Very few seed stalks were produced on any treatment combination possibly as a result of unadaptability of the variety to the prevailing photoperiod. The fall cutting made after September 1 resulted in approximately 75 percent winterkilling of the bromegrass and indicates that late cutting or pasturing is likely to reduce yields in subsequent years.

A study was conducted to determine the germinability of seed of various forage species harvested at various dates following pollination and subjected to freezing (26° F. for 2 hours), artificial drying (110° F. for 24 hours), and air drying. For most forage species adapted to Alaska the freezing treatment did not reduce germination providing 30-35 days had elapsed between pollination and date of freezing. For several species, notably red, white and alsike clover, frost did not reduce germination when only 20-25 days elapsed between pollination and freezing. However, early frosts probably would cause a high proportion of shrunken seeds. Artificial drying at 110° F. was more injurious than freezing to partially developed seeds. In general, the rate of development of the seed was more rapid at Fairbanks than at Matanuska.

Role of Phosphorous and Potash in Bromegrass Nutrition: An experiment begun in 1951 compared 3 application levels of nitrogen (60 spring - 60 spring plus 60 summer - 120 spring), phosphate (0-40-80), and potash (0-40-80). All phosphate and potash applications were made in the spring. Each increment of nitrogen and phosphate increased yields of dry matter and protein per acre, and increased the percentage of crude protein in the herbage. Because both nutrients are necessary for good response, neither should be applied alone to bromegrass. Potash at 40 pounds per acre increased yields of dry matter per acre but not percentage crude protein of the herbage. A similar test was begun in 1952 at 2 locations. Yield data from 1 location was not reliable because of damage from cattle. Crude protein percentages were increased by the heavier nitrogen rates but phosphate and potash had no effect on this factor. Both nitrogen and phosphat increased dry matter yields at the second location but only nitrogen caused any noticeable increase in protein content. Potash had no effect on either yield of dry matter or protein content.

Response of Bromegrass to High Nitrogen Levels: Because of the linear response of bromegrass to nitrogen obtained in previous studies, 9 treatments replicated 4 times were laid out to explore the influence of heavy nitrogen applications. Nitrogen was varied from 40 to 320 pounds per acre with a fertilizer ratio of 4-2-1 remaining constant except for 2 of the heaviest rates where the ratio of 8-2-1 was used. Data on this test are not yet completely analyzed but trends are toward increased yields of both dry matter and crude protein and higher protein content with each nitrogen increment.

Comparison of Nitrogen Carriers: Data analysis on this experiment are not yet complete but dry matter yields and protein content appear to be about equal for ammonium nitrate, ammonium sulfate, and calcium nitrate. Response to urea was somewhat poorer and calcium cyanamide gave very poor results. In determining which of the 3 best carriers to use for fertilizing bromegrass, cost per pound of nitrogen is a deciding factor.

Fertilizing Native "Hayflats": An experiment was begun in 1951 to test response of native "hayflat" vegetation (chiefly Carex sp.) to 3 levels each of nitrogen, phosphate, and potash. Nitrogen applications increased yields of dry matter and crude protein per acre as well as crude protein content of the herbage. Phosphate and potash gave no response in this test.

A similar test was conducted in 1952 at 2 locations, one of which had a considerable portion of grass in the sward. Responses were the same as in 1951. Where grasses are present in considerable quantity 2 cuttings may be obtained.

PUBLICATIONS: Paper, Influence of Fertilizers on the Crude Protein Yields of Bromegrass Pasture in the Matanuska Valley and, in part, paper, Seed Production Possibilities on Grasses and Legumes in Alaska, presented at the American Society of Agronomy and Soil Science Society of America meetings at Cincinnati, Ohio, November 1952.

Unpublished Master's thesis, Evaluation for Seed Purposes in Alaska of Various Forage Species Harvested at Different Maturity Levels and Subjected to Diverse Treatments by John E. Osguthorpe, submitted to Graduate Faculty, Montana State College, Bozeman, Montana.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-7

DIVISION: Alaska Agricultural Experiment Station, Don L. Irwin, Director

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Entomological Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Richard H. Washburn

LOCATIONS: Palmer and Fairbanks, Alaska

COOPERATION: Soil Science Department (fertilizer); Agronomy Department (labor, land preparation, seed); Horticulture Department (plant materials and labor); Bureau of Entomology and Plant Quarantine (insect identification).

OBJECTIVE OF WORK: To develop insect control measures that will be effective in facilitating crop, livestock and poultry production under Alaskan conditions; work out the biology of Alaskan insect species, continue list of Alaskan insects; conduct investigations in insect pollination of crop plants and biological control measures of injurious insects.

PROGRESS DURING THE YEAR: Root Maggots (AL-1-7-1(A): studies on biology, control experiments, resistant variety studies in radishes, turnips, rutabagas, wild host plant studies and extent of maggot activity throughout the Territory. Cutworm Investigations (AL-1-7-2(F): studies and biology, control and parasite collection. Effect of Soil Treatments on Soil Biota and Future Plant Growth (AL-1-7-3(F): effect of insecticides on several crop plants grown in Alaska and effect on soil inhabiting insects and microorganisms. Wireworms (AL-1-7-5(F): studies on biology and control.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Control procedures have been worked out which make possible production of relatively maggot-free turnips and radishes and give excellent control in broccoli, cabbage and cauliflower. Several materials give excellent control of cutworms when applied in recommended manner. These make it possible to produce early vegetable in spite of cutworm attack and make it unnecessary to replant after every infestation. Control of wireworms in grain is possible by use of several insecticides at proper dosage.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Root maggot biology and control will be investigated further. Further testing of radishes, turnips and rutabagas will be carried on for maggot resistance, AL-1-7-1 (A). Cutworm biology and control will be investigated further, AL-1-7-2(F), Effect of soil treatments on plant growth and soil biota in the Matanuska Valley will be examined further, AL-1-7-3(F). Wireworm biology and control will be investigated further, AL-1-7-5(F).

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-7-1 (A)

PROJECT TITLE: Root Maggots

PERIOD COVERED BY REPORT: January 1 to December 31,, 1952

SUPERVISORY LEADER: Richard H. Washburn

LOCATIONS: Matanuska and Fairbanks Experiment Stations

COOPERATION: Soil Science Department (fertilizer); Agronomy Department (land preparation); Horticulture Department (plant material and labor); Bureau of Entomology and Plant Quarantine (insect identification).

OBJECTIVE OF WORK: To investigate the root maggot incidence, wild host plants, dissemination and crop damage under various environmental conditions in field and controlled conditions to determine an effective means of control for turnip, seed-corn and onion maggots.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Major emphasis during the coming year will be placed on continuing biological studies of root maggots, further development of control procedures, and further testing of resistant plant varieties.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Aldrin, dieldrin, chlordan, heptachlor and dilan have given maggot-free turnips in 4 applications at 10-day intervals of 1 pound active ingredient per application. This should greatly reduce production costs of cole crops since without treatment, 50-95 percent of turnips are culls. Commercial truck gardeners are using aldrin and chlordan, as recommended, with success in control of root maggots in cauliflower, broccoli, cabbage and turnips.

PROGRESS DURING THE YEAR: Treatments with chlordan, aldrin, heptachlor and dilan appear promising in root maggot control in cauliflower. In second season testing of maggot resistance in radish, rutabagas and turnips at the Matanuska and Fairbanks Stations, the flattened types of turnip such as Petrowski and Purple Top Strap Leaf are somewhat less infected than other types. No radish or rutabaga appears to be resistant. Onion maggots were found in onions from seed in several areas in the Matanuska Valley for the first time. In other areas of Alaska infestation appears to be confined to imported sets. The Haines area had infested wild mustards as did other areas. No area in Alaska that has been noted this year capable of growing crucifers has been found to be free of maggots.

Additional species of Hylemya which have been collected in Alaska and some of which may be of economic importance are as follows: H. varicolor Meig., H. fracta Mall, H. variata (Fall), H. betarum Lint., and H. uniseriata Stein.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-7-2(F)

PROJECT TITLE: Cutworm Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Richard H. Washburn

LOCATIONS: Matanuska and Tanana Valleys

COOPERATION: Horticulture Department (labor); Agronomy Department (labor); Bureau of Entomology and Plant Quarantine (insect identification).

OBJECTIVE OF WORK: To find an efficient means of control for the several species of cutworms important in the Matanuska Valley.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Collection and rearing of larvae, collection of parasites, comparison of insecticides applied by different methods.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Aldrin and heptachlor at 1 pound to the acre per application have been found to be very effective in control of cutworms. Chlordan at 2 pounds per acre also gives excellent control and has achieved wider acceptance by commercial growers.

PROGRESS DURING THE YEAR: Cutworm activity was more widespread in the Matanuska Valley and elsewhere in Alaska than in several years. Red-backed cutworm was the main species involved. Evidence of cutworm injury was found in the Tanana Valley, Kenai Peninsula and Haines area. Rearing attempts on field-collected specimens was moderately successful. The incidence of disease and parasitism was high. Isodrin and Endrin at the rate of 1 pound to the acre also were effective on cutworms in small plot tests. Band treatment of hay fields with chlordan from herbicide type sprayers was effective in halting cutworm spread. The majority of farmers are now convinced that cutworms can be controlled if treated in time.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-7-3 (F)

PROJECT TITLE: Effect of Soil Treatment on Soil Biota and Future Plant Growth

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Richard H. Washburn

LOCATION: Matanuska Experiment Station

COOPERATION: Soil Science Department (fertilizer); Horticulture Department (labor).

OBJECTIVE OF WORK: To determine long range effect of soil insecticides on plant growth and soil organisms under Alaskan conditions.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Major emphasis during the coming year will be placed on further testing of plant materials and continuing the soil examination for insects and microorganisms.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Soil treatments of aldrin, dieldrin, chlordan, DDT, lindane, methoxychlor and parathion at the rate of 25 pounds to the acre had no immediate effects on the growth of oats, bromegrass, radishes and turnips at the time of treatment and the secon year following. Growth of soil organisms on soil agar dilution plates apparently were unaffected with the exception of the plot treated with lindane.

PROGRESS DURING THE YEAR: No noticable effect in the growth of bromegrass turnips, lettuce, radishes or carrots was noted. There was a lighter maggot infestation in plots of parathion, aldrin and dieldrin than in DDT, methoxychlor, chlordan or check.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-7-5 (F)

PROJECT TITLE: Wireworm Investigations

PERIOD COVERED BY REPORT: January 1 to December 31, 1952

SUPERVISORY LEADER: Richard H. Washburn

LOCATIONS: Matanuska and Tanana Valleys

COOPERATION: Agronomy Department (land, plant material and labor); Bureau of Entomology and Plant Quarantine (insect identification).

OBJECTIVE OF WORK: To determine the species, life history and distribution in relation to soil type, and the control of Alaskan wireworms by cultural and chemical methods.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Emphasis in the coming year will be placed on further collections, biological and control studies.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: Several materials including aldrin, chlordan and lindane have been found to give excellent control of wireworms in grain and offer an easy method of control for grain crops.

PROGRESS DURING THE YEAR: Wireworm activity appeared to be lighter than in previous years. Infestation in replicated grain plots at Matanuska and in potato plots at Fairbanks Country Club area was so light as to give inconclusive results. Only infestation reported was in seed pieces of potatoes at the Fairbanks Station. Collections of adult stage were made but numbers were lighter than in previous years. The following wireworm adults have been collected: Ctenicera lobata Kby., Sericus incongruus LeC., Eanus decoratus Mann., Limonius pectoralis LeC., Ctenicera morulus (LeC.), Hypolithus bicolor Esch.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

WORK PROJECT NUMBER: AL-1-8

DIVISION: Alaska Agricultural Experiment Station

BUREAU OR AGENCY: Agricultural Research Administration

WORK PROJECT TITLE: Plant Pathology Investigations

PERIOD COVERED BY THE REPORT: January 1 to October 1, 1952

SUPERVISORY LEADER: Donald M. Coe

LOCATIONS: Palmer and Fairbanks, Alaska

COOPERATION: Agronomy, Horticulture and Entomology Departments; Division of Mycology and Plant Disease Survey, BPISAE

OBJECTIVE OF WORK: To investigate the more important diseases affecting the major economic crops grown in Alaska and their relationships to native plants and soil and climatic factors with the objective of developing methods for their control.

PROGRESS DURING THE YEAR: Field studies did not confirm the presence of virus - X in Alaska grown Kennebec potato seed stocks (AL-1-8-1). "Damping-off" of peas and tomatoes was controlled by use of newly-formulated fungicides. Winterkilling studies (AL-1-8-3) were interrupted by resignation of the project leader and will be held in abeyance until a new leader is employed.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: A more complete picture of the incidence and losses caused by ring rot of potatoes has been secured. A permanent herbarium of plant disease specimens has been established. Fungicidal materials have been gathered for systematic study of their use under Alaskan conditions.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: This work project is to be continued, contingent upon securing the services of a qualified pathologist. Studies of potato and forage diseases will be emphasized.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-8-1 (P)

PROJECT TITLE: Survey of Economic Crop Diseases

PERIOD COVERED BY REPORT: January 1 to October 1, 1952

SUPERVISORY LEADER: Donald M. Coe

LOCATION: Throughout agricultural sections of Alaska

COOPERATION: Horticulture and Agronomy Department; Division of Mycology and Plant Disease Survey, BPIS & AE, University of Alaska Extension Service and Territorial Department of Agriculture.

OBJECTIVE OF WORK: To investigate the identity, distribution and relative importance of diseases of the economic and related crop plants of Alaska

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Increased emphasis will be placed on diagnosis, by indexing methods, of the virus diseases affecting potatoes and the distribution of ring rot in Alaska potato stocks. Herbarium development will be pursued, emphasizing a more systematic method of collection.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: A survey of existing potato stocks shows none which can safely be presumed to be free from ring rot. On this basis, tuber units of desirable stocks have been selected and started through a program of developing disease-free potato seed stocks.

PROGRESS DURING THE YEAR: Two field tests compared the performance of Kennebec potatoes free of virus - X with Alaskan seed stocks of the same variety supposedly severely infected. Grown under customary management practices, no conclusive evidence was obtained to confirm the fact that Alaska seed stocks carry virus - X. Significant yield differences did not exist. Herbarium collections were continued.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-8-2 (P)

PROJECT TITLE: The Use of Fungicides for the Control of Plant Diseases

PERIOD COVERED BY REPORT: January 1 to October 1, 1952

SUPERVISORY LEADER: Donald M. Coe

LOCATION: Matanuska Experiment Station

COOPERATION: Entomology Department (duster and diluents), Horticulture Department (seed) and local farmers (lettuce field)

OBJECTIVE OF WORK; To test the efficiency of various fungicides and their methods of application in the control of plant diseases under Alaska conditions.

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Newly developed fungicides of a soil fumigating nature will be used in attempts to control potato scab. Damping-off will be studied in greenhouse trials with new fungicides at both Fairbanks and Matanuska. Trials of fungicidal dusts for the control of lettuce anthracnose will be carried on as seasonal development of the disease permits.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: The short time this project has been active has been insufficient for any conclusive results.

PROGRESS DURING THE YEAR: At both Fairbanks and Palmer surface algae in greenhouse beds and pots were controlled by fungicidal treatments including Ortho 406, Arosan or Dithane Z-78. Hyman P 162, a volatile material, did not give effective control. Greenhouse trials with the same materials controlled "damping-off" in peas and to a lessor extent, in tomatoes. Most consistent and effective control was obtained with Ortho 406, although severe terminal burning was noted in tomato seedlings. In field trials stand counts of field peas revealed 50 to 60 percent increases in emergence attributed to fungicide seed treatments with Spergon, Ortho 406, and Arason.

Field comparison of disease control materials customarily employed in cutting potato seed-pieces revealed no benefits; the entire matter of treating potato seed needs further study.

PUBLICATIONS: None.

ALASKA AGRICULTURAL EXPERIMENT STATION 1952
ANNUAL PROGRESS REPORT, FEDERAL AND FEDERAL-GRANT PROJECTS

PROJECT NUMBER AND FUND: AL-1-8-3 (P)

PROJECT TITLE: Pathology of Winterkilling of Forage Crops

PERIOD COVERED BY REPORT: January 1 to October 1, 1952

SUPERVISORY LEADER: Donald M. Coe

LOCATION: Matanuska and Fairbanks Experiment Station

COOPERATION: Agronomy Department

OBJECTIVE OF WORK: To determine the identity, distribution, parasitic relationship and ecological factors in the plant parasitic organisms operative in the winterkilling complex in forage crops

WORK TO RECEIVE SPECIAL ATTENTION DURING COMING YEAR: Major effort during the coming year will be on the ecological and cultural factors influencing incidence of winterkilling in forage crops.

IMPORTANT CONTRIBUTIONS WHICH JUSTIFY CONTINUED SUPPORT: This project has not been active long enough for any benefits to accrue.

PROGRESS DURING YEAR: Work on this project was held in abeyance during the reporting period.

PUBLICATIONS: None.

DIRECTOR'S COMMENTS

Major accomplishments in agricultural research at the Alaska Experiment Station during the year 1952 have been reported on the preceding pages. This report represents the wholehearted effort and cooperation of the entire staff. While 5 years have elapsed since the larger research program was begun, this is a comparatively short period in which to reap positive research results. Unlike conditions usual in older, well-established institutions, the work in Alaska was begun almost from scratch with 1 technician and but little scientific field equipment. No laboratories, no offices and but little housing were available. It has been necessary for each member of the staff to improvise many times and to work long hours. They have kept abreast of their research and administrative work and also have devoted considerable time to assisting the director in planning new research buildings and facilities, strengthening the accounting system and ordering suitable equipment and adequate supplies. Advice and assistance also were given by personnel of both the University and the U. S. Department of Agriculture. For all of this loyal effort and assistance the director here expresses grateful acknowledgment and appreciation.

Now that housekeeping has become more orderly, it is possible for the scientific staff to devote more time to intensive research activities and to strengthening techniques for accomplishing the work. Also, the administrative personnel have time for rehabilitation of the older physical plant of the Station and to integrating operational procedures under the Memorandum of Understanding between the University of Alaska and the U. S. Department of Agriculture.

PERSONNEL AND ORGANIZATION

Effective on July 1 of this year, a major organizational change was inaugurated. Personnel in the 8 subject matter departments of the Station previously have voluntarily acted as specialists to the University's Agricultural Extension Service and to the Veteran's on the Farm Training Classes, without transfer of funds. Occasionally, when agricultural classes were in session at the University, specialists of the Experiment Station delivered guest lectures. Teaching was not a part of their duties.

Academic, extension and research work have been integrated. Transfers of funds have been arranged so that some of the subject matter personnel of the Station will serve on the teaching staff of the Agricultural Department of the University and are legally authorized to act as specialists for the Extension Service. This arrangement will strengthen the entire agricultural program of the University and also of the U. S. Department of Agriculture in Alaska.

To carry out this integrated program, the Board of Regents of the University confirmed the appointment of Dr. Allan H. Mick, Head of the Soils Science Department of the Station, as Dean of the Department of Agriculture at the University. He was appointed Director of the Agricultural Extension Service and Associate Director of the Agricultural Experiment Station. Significant progress has been made in correlating and strengthening the work. Several years will be required to evidence the benefits accruing from this coordinated effort.

Appointments of technical personnel were made to fill positions previously left vacant by resignations. On June 20th, Arthur L. Brundage was appointed assistant in the Animal Husbandry Department. Richard A. Andrews was appointed on September 15 as assistant in the Department of Agricultural Economics. Harold L. Black took over the animal husbandry work at the Fairbanks Station on September 15. His work will be on a part-time research-academic-extension basis. Arthur S. Buswell, Head of the Department of Agriculture at the University will be assistant in horticultural crops at the Experiment Station during the summer months. Dr. William B. Wilder, in charge of agronomic work at the Fairbanks Station will assume responsibility for a part-time teaching assignment at the University.

Frederick L. Swingle in charge of dairy and poultry research at the Fairbanks Station resigned on March 31. Bobby L. Wilson, assistant in horticulture at the Fairbanks Station resigned on May 16. The resignation of Dr. Donald M. Coe, Head of the Department of Plant Pathology on October 15 leaves a vacancy in that department which has not yet been filled.

THE PHYSICAL PLANT

Many of the buildings and facilities of the Station were old when the enlarged research program was begun. Considerable expense has been entailed in rehabilitating these buildings and facilities to make them usable. Much of the following report deals with repair and renovation. In the presence of high costs and manpower shortage all construction, whether new or repair, has been costly. Substantial progress has been made although much still remains to be done.

Maintenance and Permanent Improvement

Matanuska Station. In April, 1952, the new two-story horticultural-agronomy building, constructed from a Federal Building Appropriation, was completed and is now in use. It is equipped with an oil-fired boiler of sufficient size for research work in grain and hay drying, and for horticultural work carried on during the winter months. Steam pipes have been extended to the milk room in the creamery building, both for heat and for live steam used in sterilizing dairy utensils. Steam lines were extended to the bull barn to prevent frozen water lines and for use in the artificial insemination project.

Paint was applied under bid contract in 1952 to the exterior of 4 residence buildings and the office building. Cedar shingle roofs of the buildings were treated with creosote-base paint. Cesspools at the Matanuska Station were clogged and no longer usable. Two new septic tanks were constructed and each is connected to large seepage pits. This construction meets all Territorial health and sanitary specifications and should last many years since sludge is largely digested by bacterial action before the effluent is dumped into the concrete block seepage pits.

Inadequate facilities for greasing trucks and tractors existed at the station. A grease pit of sufficient size and depth for working under equipment was completed this year. A steel prefabricated shed was constructed on concrete footings. The shed is 24' x 42' and replaced the old heifer shed which was converted to a bull barn 4 years ago. The new shed provides loafing space for dry cows and yearling heifers. Fire escape ladders were placed at windows of each second story apartment in the messhall building. New drying equipment for forage samples was constructed in the threshing shed of the horticultural-agronomy building. Construction of partitions and ventilator systems in the poultry house has been completed. The object of this work is to secure accurate information on the best method of ventilating poultry houses in Alaska.

Approximately 16 acres were cleared during June of 1952. It was immediately planted to oats and peas and a good yield was obtained. Four acres were cleared due east of the Station buildings, increasing the size of an old field to 8 acres. A road was constructed from the Station buildings to the fields in Section 14 so that it is now possible to gain access to them without going through an adjacent, privately-owned farm. This greatly facilitates the movement of cattle and equipment.

A 70-ton capacity pit silo was constructed near the heifer shed. Wood construction was used. Two additional stalls for bulls were built in the east end of the old hay barn and adjacent to the existing bull stalls. Horse stalls in the main barn have been converted into a calf barn with individual stalls. This facilitates individual feeding necessary in experimental work on calves. A grain elevator was installed in the main barn to permit the use of existing overhead bins for storage.

Fire from a defective chimney caused considerable damage to the dairyman's cottage. The chimney was rebuilt and the building repaired. Defective construction in the superintendent's cottage caused sagging of the second story. The defect has been remedied and the damage repaired.

Fairbanks Station. The garage-threshing shed begun in 1950 had not been fully insulated because sawdust was not available in sufficient quantity. That work now has been completed. New storage bins were constructed in the barn permitting mechanical elevation of the grain from the drier into the bins. This system is automatic and saves manpower. An extension to the agronomy laboratory was built to house seed cabinets and supplies. This permits adequate work space for technical equipment in the main laboratory room. By using material from old buildings, plus new aluminum roofing, a 6-car garage was constructed entirely by station personnel on their own time. This will provide shelter for personal cars and also will provide storage space for trunks and other personal belongings. No storage space is available in the small apartments.

Spruce piling supporting the superintendent's house and planks supporting the earth outside the basement walls were decayed. These were removed, concrete footings poured, and concrete block walls constructed. Only part of the basement floor had been concreted. The remaining portion of the floor was poured and new casings and doors added where necessary. Space formerly used for a

milk processing room was remodeled into 4 offices. Steam pipes previously installed in the building were extended to provide necessary heat for the offices. In May the old 3-phase electric power line connecting the Station with Fairbanks municipal power was removed. Power now is obtained under rate contract with the Golden Valley Electric Association.

Petersburg Station. A new concrete wellcurb 4' x 4' inside was constructed replacing the former pole crib. A sediment in the water used at the Station clogged the galvanized iron pipes supplying water to and in the superintendent's house. These were replaced by copper tubing which is standard installation in the Petersburg area. It also was necessary to replace the galvanized hot water tank in the house with a glass-lined tank. Fire excape ladders were installed to the living quarters on the second floor of this house. The building also was painted. A new footbridge was constructed from the main roadway extending across the creek to the assistant superintendent's living quarters.

Improvised pens used for experimental work with marten were beyond repair. Part of these pens have been rebuilt. Other pens will be replaced with new as rapidly as competent help can be obtained. It is also planned to construct a new 30' x 50' mink house. This will permit increase in basic research on the use of various antibiotics for the control of diseases of furbearing animals. Relocation of doors in the cold-storage room would add greatly to feed handling efficiency.

NEEDS OF THE STATION

Demands for research information continue to increase. It is necessary that all buildings, facilities and equipment be in good condition. To keep pace with this demand there is urgent need for experimental facilities for grain drying at the Matanuska Station. Tests under bin conditions, where the moisture content of grain was above 18 percent resulted in moldy grain and a consequent lowering of the germination. Research equipment for artificially drying grain is expensive, but the work must be done if an economical means of keeping threshed grains on the farm is to be found.

The dairy barns at both the Matanuska and Fairbanks Stations are badly in need of rehabilitation and insulation. Vapor-seals should be installed if the insulation is to be effective. Grounds at all stations require landscaping, lawns require seeding and access roads from the main highway around buildings and to the field require gravel surfacing.

A new 5-inch well at the Fairbanks Station provides adequate water for station use. Construction of a 25,000 gallon storage reservoir is planned for the coming summer. This should help provide a steady flow of water and also badly needed fire protection. The single well at the Matanuska Station is now taxed beyond capacity. A new well is needed to supplement the present one.

The 4-inch sewer main at the Fairbanks Station is inadequate and often is taxed beyond capacity. A larger line should be installed with manholes at appropriate distances and with some protective device at the outlet to avoid build-up of ice during winter months.

All possible funds available to the Station should be used for research. The physical needs of the Matanuska Station have been supervised by the animal husbandman and the agricultural engineer. While satisfactory in an operational respect, this work takes time from these 2 departments which could well be spent on research. The size of the physical plant of the various installations requires some source of adequate funds and personnel to keep buildings, grounds and facilities in good condition.

During the construction period insufficient funds were available for building a headhouse in connection with the greenhouse. Lack of this building hampers operations. There is no place where soil, flats, fertilizer, pots and other necessities may be stored or workspace where soil can be prepared for flats, pots and benches. The need is great and is part of the building program which was originally planned. This headhouse should be constructed at the earliest possible date.

Refrigerating equipment for the experimental vegetable-storage building is another item from the original construction plan which was deleted because of lack of funds. It will not be possible to carry on controlled research in this important phase of horticulture, agronomy, and nutrition until this equipment is provided.

In a new country, such as Alaska, research in nutrition should be given priority attention and adequate financial support. At present no technical organization in the Territory is conducting research on human or animal nutrition. Plans to initiate research in nutrition were made several years ago. This important work also has not been possible.

Every department of the Station is operating with a minimum of technical personnel. Progress on research is, therefore, very slow. The department heads and administrative and technical staff could supervise a much larger research program than is presently possible. A larger staff would permit the inclusion of much basic research which is now impossible.

PUBLICATIONS

A list of formal publications and other material prepared for dissemination of research information during 1952 follows:

Bulletins

Moore, C. A. Farming in the Matanuska and Tanana Valleys of Alaska Bulletin 14

Johnson, H. A. Family Farm Agreements in Alaska prepared for publication as Extension Service bulletin

-------Alaskan Agriculture - Present and Potential Bulletin 15 (in preparation)

Circulars

Mick, A. H., H. J. Hodgson, M. F. Babb General Recommendations - Fertilizers for Alaska, 1952 Circular 13 (Revised)

Dearborn, C. H. Chemical Weed Killers and Their Use Circular 18

Hodgson, H. J., R. L. Taylor, W. B. Wilder, J. E. Osguthorpe, J. C. Brinsmade Recommended Varieties of Field Crops for Alaska 1953-54 Circular 14 (Revised) (in preparation)

Journal Articles

Hodgson, H. J., D. M. Coe Bacterial Wilt of Alfalfa in Alaska PLANT DISEASE REPORTER 36:116

----------, A. H. Mick Farming in Alaska WHAT'S NEW IN CROPS & SOILS March 1952

----------, ----------, Alaska's Soils and Crops WHAT'S NEW IN CROPS & SOILS April-May 1952

Popular Articles

Johnson, H. A. Agricultural Research Activities in Alaska Lou Jacobin's Guide to Alaska, 1953 edition

----------Hard Cash from Cull Spuds The Alaska Farmer November-December 1952

Press Releases

Alaskan Grocery Costs Stay in Line - January

Shall Alaska's Growers Develop a Market for a No. 2 Commercial Grade Potato? March

Recommended Vegetable Varieties - prepared by Horticulture Department, released through Extension Service

Papers for Conferences or Meetings

Johnson, H. A. The Orientation of Agriculture to Resources Planning in Alaska All Alaska Resources Development meeting, McKinley Park, August 23, 1952

----------The Scientist's Role in Present Day Alaska Alaska Branch, AAAS, College, Alaska, November 18, 1952

Mick, A.H. The Future of Agricultural Education in Alaska (prepared by T. Moore and A. H. Mick) 3rd Alaska Science Conference, McKinley Park, September 1952

Coe, D. M. Observations on Alaska Plant Diseases for 1951 and 1952 3rd Alaska Science Conference, McKinley Park, September 1952

Hodgson, H. J. Seed Production Possibilities in Alaska American Society of Agronomy meeting, Cincinnati, Ohio, November 1952

Laughlin, W. M. Influence of Fertilizers on the Crude Protein Yields of Bromegrass Pasture in the Matanuska Valley American Society of Agronomy and the American Soil Science Society of America meetings, Cincinnati, Ohio, November 1952

Special Reports

Johnson, H. A., D. L. Irwin The Position of Agriculture in Alaska's Current Economy Special Report No. 1 (in press)

Sweetman, W. J. Alaska Artificial Insemination and Herd Improvement Program Report of Progress 1951-52 Special Report No. 2

Irwin, D. L., H. A. Johnson Research Activities of the Alaska Agricultural Experiment Station July 1952 (Special dittoed report for Gov. Gruening)

Michaelson, N. Exploratory Physical Studies of the Fairbanks and the Chatanika Soil Series, Tanana Valley, Alaska

Leekley, J. R. Utilization of Salmon Cannery Waste for Fur Animal (mink) Feed

Annual Reports

Administrative Report of Progress January 1 to December 31, 1951