ALASKA AGRICULTURAL EXPERIMENT STATION

THIRTEENTH PROGRESS REPORT
1948

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ALASKA AGRICULTURAL EXPERIMENT STATION
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December 31, 1948

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FOREWORD

Public Law 266 (80th Cong.), dated July 30, 1947, authorized the reorganization of the Alaska Agricultural Experiment Station, the expansion of its facilities, and the enlargement of its staff, and provided a special Federal appropriation to supplement Territorial resources for the purpose.

During the period of reorganization, from July 30, 1947, to June 30, 1949, the station was administered by the Agricultural Research Administration of the United States Department of Agriculture. Effective July 1, 1949, this arrangement was terminated, and a joint Federal-Territorial research program was inaugurated for which the United States Department of Agriculture and the University of Alaska carry concurrent responsibility.

P. V. Cardon,
Agricultural Research Administrator,
United States Department of Agriculture.
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Alaska Agricultural Experiment Station
Thirteenth Progress Report, 1948

Dr. P. V. Cardon,
Agricultural Research Administrator,
United States Department of Agriculture.

Dear Dr. Cardon: I present herewith a report of progress of the Alaska Agricultural Experiment Stations, at Palmer, Matanuska, College, and Petersburg. This report covers research for the crop season of 1948, together with financial summaries for fiscal years 1947–48 and 1948–49. It represents initial accomplishments after the reorganization of 1947.

Sincerely,

Don L. Irwin, Director.

INTRODUCTION

Reliable information on agricultural problems in Alaska has never been more urgently needed than at present. Research accomplishments over the last half century have laid a solid foundation of information invaluable to present-day investigators. Farming has been proved feasible. Agriculture is now a growing industry. Further guidance in technical improvements will place Alaskan agriculture on a firm basis.

A program of expanded research in agronomy, soil science, horticulture, and animal husbandry has been started. Studies in these fields will be expanded as qualified workers, equipment, and facilities are obtained. Now in progress are plans for establishing agricultural engineering, entomology, and pathology departments and obtaining experienced staff technicians and facilities for them.

Plans for a laboratory-office building, a greenhouse, and a vegetable storage building for experimental work are in preparation, all to be in Palmer. Also planned are several residences for technical employees. When this building program is completed, field facilities at the College (Fairbanks), Matanuska, and Petersburg stations will be coordinated with the Federal facilities at Palmer in an intensive attack on Alaska’s agricultural problems.

This report reviews progress made in the four existing departments of the reorganized Alaska Agricultural Experiment Station in the crop season of 1948. Not reflected here is the enormous task of organization and improvisation. Organization and administration are problems because of the difficulty of persuading competent personnel to live in Alaska, because of shortages of field and technical facilities, and because of an acute lack of field, office, and laboratory space.
AGRONY

Varietal studies of cereals and forage were expanded. Because of the importance of Alaska’s dairy industry, studies were also started on pasture and range improvement and on feed processing and preservation. All evidence indicates that the present necessity for importing large quantities of livestock feed can be eliminated by devising suitable management and preservation practices.

CEREAL CROP TESTING AND IMPROVEMENT

Several introduced varieties of oats, barley, and wheat were grown at the Matanuska and the Fairbanks stations. Varieties from the States, from Scandinavia, and from Siberia were planted and observed throughout the season, with particular attention to yield, maturity, and resistance to lodging and disease. Promising varieties of oats and barley are being increased, and it is hoped that at least one variety of each will be ready for release in 3 or 4 years.

OATS—Thirty-six varieties were grown in one experiment at the Matanuska station. Yields ranged from 48 bushels per acre for Vicland (an early variety) to 86 bushels per acre for Victory (a very late variety). A second experiment compared 20 newly introduced varieties. In this study yields ranged from 52 bushels per acre for Benton (an early variety) to 135 bushels per acre for Abegweit (a late variety). A higher fertility level in the second experiment is largely responsible for the very high yields. At the Fairbanks station 26 varieties were tested. Yields there ranged from 30 to 63 bushels per acre, both the lowest and highest yielding varieties being introductions from Siberia. Marked differences between varieties with respect to maturity and resistance to lodging were observed at all sites.

BARLEY.—Forty-three varieties were compared at Matanuska and 46 at Fairbanks. Yields ranged from 23 to 76 bushels per acre at Matanuska, compared with the general average of 35 bushels per acre for Matanuska Valley as a whole. Trapmar, which was developed in Alaska, yielded 50 bushels per acre but was the latest maturing variety and lodged badly. The 10 highest yielding varieties at Matanuska were introductions from Scandinavia. Especially promising among the Scandinavian varieties are Edda and Vega, both from Sweden. Siberian varieties were generally better at the Fairbanks station than at the Matanuska station. However, some of the Scandinavian varieties were fully as desirable at Fairbanks as the better ones from Siberia. Marked maturity differences between varieties were observed at all sites.

WHEAT.—Forty varieties were compared at Matanuska and 25 at Fairbanks. Of these, none excelled the popular Khogot wheat introduced from Siberia in 1913. At present, Khogot is the best variety available for Alaska in spite of its susceptibility to lodging and shattering. Khogot test plots yielded grain at the rate of 36 bushels per acre in 1948.
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FORAGE CROP TESTING AND IMPROVEMENT

About 125 species and strains of forage grasses and legumes were planted at the Matanuska station in 1948. Most forages made a vigorous growth before killing frosts came. Outstanding were smooth bromegrass, timothy, meadow fescue, red clover, and alsike clover. Winter survival, as yet undetermined, will be an important factor in selecting forages best suited to Alaska.

Yellow-flowered alfalfa appears to have exceptional winterhardiness, but its seeding characteristics must be improved before it can be used extensively by Alaskan farmers. Some preliminary evaluations of individual plants were made.

A small breeding nursery of smooth bromegrass was also established.

PASTURE AND RANGE IMPROVEMENT

Renovation, which includes thorough diskng, fertilizing, and reseeding with adapted legumes, affords a promising method of improving a large acreage of rather poor grass pasture in the Matanuska Valley. A representative 2-acre plot was managed in this manner in 1948. The legumes used were white and alsike clovers, fertilized with 200 pounds per acre of 7—21—15 complete fertilizer. A light seeding of oats served as a nurse crop, which was grazed off about July 1. By August 6, the clovers were 8 to 10 inches tall. They were then grazed back 4 to 6 inches. At the end of the season, they had regrown to a height of about 8 inches. Though grazed only twice, this renovated pasture yielded about 15 percent more forage than similar untreated pastures, as measured by animal weights and milk production. Two other pasture plots were fertilized in July with 100 and 150 pounds of ammonium nitrate per acre, respectively. These fertilized plots yielded 2 1/4 and 2 3/4 times as much as an unfertilized control plot.

ANIMAL HUSBANDRY

Major efforts were devoted to problems in dairy enterprises. In greatest need of attention are questions involved in raising herd replacements and in reducing the tremendous quantities of feed now imported to carry dairy herds through the long winters. A start was also made in determining the influence of artificial light during winter on milk production and breeding inception rates. This line of investigation holds great promise in that it may help equalize milk production throughout the year, thus making it possible to avoid peaks in an exaggerated seasonal cycle.

Poultry studies were focused primarily on feeding for egg production. In investigations of diets for fur-bearing animals, the use of local fisheries’ byproducts and wastes was emphasized.

RATIONS AND METHODS OF RAISING DAIRY CALVES

Because of the high price of whole milk and a general lack of knowledge on a suitable substitute calf feed, replacements for most Alaskan dairy herds have been imported rather than raised at home. In the last decade an effort has been made to devise inexpensive calf
rations in the hope that Alaska’s dairymen might be encouraged to raise their own herd replacements. These studies have involved starting calves on whole milk, then weaning them to a less expensive ration that serves as their chief diet until they are old enough to feed with the herd, usually at 5 to 6 months of age.

In these studies whole milk has proved the best although the most expensive feed. Calves raised on whole milk to the age of 5 months cost approximately $200 apiece. Calves fed fresh skim milk gain less weight but are only half as costly to raise. For this reason skim milk is considered more economical than whole milk.

Even cheaper substitutes for whole milk are reconstituted skim milk, dry skim milk, grain gruel, and various commercial feeds, such as Calf Manna and Milk-Flo. Gruel was fed at the rate of 8 pounds per calf per day. Reconstituted skim milk was fed at the rate of 6 to 8 pounds per day, the highest rate for the largest calves.

All of these rations must be supplemented by a grain mixture containing salt. For this purpose a satisfactory mixture is:

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<tr>
<td>Ground wheat</td>
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<tr>
<td>Fish meal</td>
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In addition, calves are encouraged to eat whole oats and good roughage, of which they are offered as much as they will take.

Calf Manna produced good cheap gains at a cost of about $65 per calf. Other combinations of commercial feeds, skim milk, and gruel produced satisfactory calves at costs ranging from $55 to $60 a head for the first 5 months. The results of these studies, with others to be described, are convincing Alaska’s dairymen that good husbandry management includes raising herd replacements at home and that these herd replacements can be economically produced. Calves are becoming a common sight in Matanuska Valley barnyards.

FEED PRODUCTION, PROCESSING, AND PRESERVATION

Because rainy weather frequently keeps hay from curing in the field in late summer, alternative methods of preserving forages must be developed. Two alternative methods in current use in Alaska and in the States are barn drying and ensiling. An experiment was begun to compare all three methods as to preservation of the nutritive value of forage and costs of preserving feed.

A uniform field of oats and peas was divided into three parts. Forage from one part was made into field-cured hay, that from the second part was barn dried, and that from the third part was made into silage. Field-cured hay was put on stakes and left in the field until dry. Barn-dried hay remained in the field 24 hours, at which time the threat of rain made it necessary to place it on the drier in the barn at a moisture content of 60 percent. Stacked 7 feet deep on the drier, it settled 2

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1 One pound of dry skim milk in 9 pints of water.
2 Fifteen pounds each of ground barley, oats, and wheat plus 25 pounds of dry whey, 20 pounds of linseed meal, 9 pounds of meat meal, and 1 pound of bone meal. One pound of this concentrate was mixed in 9 pounds of water to make the gruel.
feet during the drying period. Silage remained in the swath for 2 to 4 hours before ensiling. None of the forage was chopped. Comparative ton costs of harvesting and preserving this forage were: Field-cured hay, $15.45; barn-dried hay, $17.99; and silage, $4.53. The high cost of barn drying was partly due to the cost of operating an electric fan during the 15 days required to dry the hay from 60 to 18.5 percent moisture. Relative nutritive values will be determined by feeding the three roughages to milking cows.

**VALUE OF LIGHT IN WINTER MILK PRODUCTION**

This study has not progressed much beyond the planning phase. In preliminary work with the Fairbanks station herd, supplemental light did not increase milk production during the dark winter months.

**DAIRY CATTLE BREEDING INVESTIGATIONS**

Milk production in Alaska can be increased by introducing better germ plasm. An efficient method of doing this is an artificial insemination program that would use sires with proved records. In its early phases this problem involves research to adapt developed techniques and to provide experienced supervision.

During 8 months of 1948, 227 cows were bred to Holstein and Red Dane bulls. Records are being collected on all participating dams so that reliable production figures on the ancestors of both crossbred and purebred progeny will be available for later comparisons. Evaluation will be based on production values. The first crossbred calves are expected in February 1949. At the end of the first season, conception rates obtained from artificial insemination compared favorably with those in the United States.

**VITAMIN D IN DIETS OF LAYING HENS**

Previous feeding trials with laying Leghorns have indicated that their vitamin-D requirements in Alaska are considerably higher than in the northern United States. Laying hens on diets having high vitamin-D contents produced more eggs, eggs with heavier shells, more eggs per pound of feed consumed, and higher income over feed costs per hen than those on diets low in vitamin-D. Although these differences decreased during the second production year, hens fed on high-vitamin oil diets continued producing more eggs at a lower cost per dozen.

A continuation of this study during the season just ended confirmed conclusions drawn from prior trials. Hens fed 300 or 400 units of vitamin-D oil per 100 grams of total diet produced more and better eggs than hens receiving only 100 or 200 units. Eggs per hen during the test period varied from 172 on the lowest vitamin diet, to 216 for those on the 400-unit diet. Income over feed costs varied from $12.32 to $16.67 per hen; number of eggs produced per pound of feed consumed increased from 1.53 to 1.76; and eggshell weight (expressed as percent of total egg weight) increased from 8.7 to 9.2.\(^3\)

\(^3\)All these differences are statistically significant at the 5-percent level.
FEEDING FISH TO MINK

Cheap salmon has been a principal feed for fur animals in Alaska for more than two decades. In recent years small salmon runs, high prices, and strict enforcement of conservation regulations have prohibited feeding whole salmon to mink. Accordingly, an experiment was conducted this year to determine the nutritive value of frozen and cooked salmon waste. This waste included all portions of the fish except that normally canned for human consumption. Fed at a level of 80 percent of the entire ration during the breeding, gestation, and suckling periods, salmon waste produced satisfactory pelts. Breeding and procreation, however, were reduced to 50 to 75 percent of normal. Severe kit losses attributed to "yellow-fat" disease were associated with feeding salmon waste in any form during the weaning period. Red snapper or flounder fed during this period did not cause comparable losses.

FEEDING FISH WASTE TO BLUE FOXES

A search was continued for a cheap fish-waste ration for blue foxes that would be adequate for normal reproduction and good fur quality. A diet containing 40 percent frozen heads of either halibut or salmon produced good pelts. High mortality in 3- to 10-week-old pups was associated with both rations. Pup deaths associated with the halibut-head diet were twice as great as those associated with salmon-head diets. Rations containing 70 percent frozen salmon waste (entire offal, including intestines, eggs, etc., as well as heads) or 55 percent frozen red snapper supplemented by 10 percent seal meal proved satisfactory. Health and fur growth were normal. Fur experts judged skins produced on salmon waste superior in color and quality to those produced on red snapper supplemented with seal meal.

HORTICULTURE

Major horticultural projects under way or anticipated are: (1) Potato breeding, culture, storage, and processing; (2) vegetable culture, storage, and processing; (3) vegetable forcing; (4) variety testing and culture of ornamentals; (5) tree fruit variety testing and culture; (6) small fruit variety testing, breeding, and culture; (7) vegetable and flower production in greenhouses; and (8) vegetable variety testing and breeding.

Because horticultural projects were not initiated until April 23, it was impossible to ship in nursery stock from the States or even from Canada. Lack of facilities and personnel also made it impossible to undertake vegetable and flower production in greenhouses or winter forcing of vegetables in specially built structures. Thus most of the work during the past season has been limited to field vegetable crops and potatoes.

TREE FRUITS

Five trees each of 27 varieties of apples, 20 varieties of plums, and 14 varieties of cherries were ordered during the winter of 1948-49 for spring planting. These stocks include the more hardy of the older varieties of the fruits, with newer introductions from nurseries and experiment stations in the Northern States and Canada.
SMALL FRUITS

All stocks of strawberries, raspberries, currants, and gooseberries growing at the Matanuska station or available from local growers were transplanted into permanent experimental plots at the Matanuska station for testing. Orders have been placed with commercial nurseries for additional hardy stocks and some of the more hardy of the newer introductions to be added to the present collection during the 1949 growing season.

In a further effort to obtain hardy stocks, 56 small fruits—strawberries, raspberries, blueberries, elderberries, salmonberries, bearberries, white, black, and red currants, gooseberries, juneberries, wineberries, highbush cranberries, lowbush cranberries, and some native fruits of less importance—were gathered from wild and semwild conditions in the Matanuska Valley, at Willow Creek, and at Fairbanks. Whenever possible both seeds and plants were obtained. This material will also be set in permanent test plots during the 1949 growing season.

ORNAMENTALS

Work on ornamentals was limited to the propagation of some of the stocks already growing at the Matanuska station and to the collection of limited stocks of the more promising native trees and shrubs for testing under cultivation.

VEGETABLE VARIETY TESTS

A large, rather complete vegetable study was made to test the value of various varieties for culture in the Matanuska Valley. The planting consisted of 37 crops with a total of 289 varieties and strains. Tests such as this provide information leading to varietal selection and plant-breeding programs. They also disclose physiological abnormalities that may be corrected by fertilization or by cultural treatments. Thus, in the present test, the following observations are of interest, especially if confirmed by subsequent work:

Snap beans, though in general satisfactory, displayed great differences among varieties in quality, attractiveness, and number of pods produced. Some varieties showed an abnormality of growth, suggesting a soil manganese deficiency.

Peas were generally satisfactory. Some of the best from the standpoint of quality matured too late, thereby indicating the need for earlier maturing peas having the high quality of the late maturing varieties.

Turnips to a marked extent and rutabagas to a lesser degree showed varietal differences in susceptibility to root maggot injury.

Long-rooted varieties of carrots, as well as of parsnips, witloof, and salsify, formed numerous side roots that rendered many of them unsuitable for use.

Spinach, endive, mustard, and Chinese cabbage bolted to seed without forming an edible product. Some lettuce varieties also bolted.

Onions made poor growth. There were sufficient differences among varieties to indicate that better adapted ones may be found.

Summer squash grew poorly. Varieties are known, however, that have lower temperature optimums for growth, and there is a possibility that these will prove better adapted.
POTATO INVESTIGATIONS

A large collection of potato stocks, consisting of 37 named varieties, 25 first-year seedlings, and 125 selections, provided an excellent basis for an expanded breeding and improvement program. Sufficient seed of selections and breeding stocks permitted including 14 of the named varieties and 67 of the selections in a comparison test to determine their value and yielding ability.

Yields of U. S. No. 1 tubers varied from 501 bushels per acre (15 tons) for the variety Alaska to 228 bushels (7 tons) for an unnamed seedling. Two seedlings, 55.44–3–46 and 57.44–3–46, yielded as well as Alaska and appeared superior to it in several particulars.

Potato varieties especially adapted to Alaskan conditions are needed. Most commercial varieties tested were much rougher and more irregular in shape, had deeper eyes, and appeared generally inferior to the same varieties grown in the States. Several station selections were superior to commercial varieties in these characteristics.

Approximately 8,000 potato seedlings representing 49 crosses were grown under glass. About 7,300 of them produced tubers, which have been placed in storage. They will be field planted for increase and study next season.

TOBACCO

A tobacco study begun in 1946 was discontinued at the close of this season. Although tobacco grows fairly well in the Matanuska Valley, commercial production in Alaska is economically unfeasible at the present time. Even with maximum yields the return per acre cannot compete with that obtained from other crops.

SOIL SCIENCE

Soil investigations were started in early summer. The work was hampered by a serious shortage of laboratory facilities, housing, equipment, and transportation. Much effort was necessarily dissipated in observing, organizing, and improvising.

SOIL MAPPING

Work was begun on a soil inventory, a study universally fundamental to agricultural research. This basic soil survey is designed to meet all practical demands for extending agronomic results to farmers and farm advisors throughout the Territory. It will present basic soil facts for present and future interpretation. Progress in 1948 included a determination of the classifications into which the soils of the Matanuska Valley are to be placed when being mapped. These classifications are based on the early work of Bennett and Rice (1913–14) and later studies by the Soil Conservation Service in 1939 and 1940.

4 Collected by Zola M. Fineman in the course of his work at the Matanuska station.
5 A complete report of this cooperative project is contained in the 1948 annual report of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture, Washington, D. C.
Field mapping was started in early July, and during the next 3 months 39,920 acres were mapped in detail. The Kenai peninsula, Tanana Valley, and Spenard Lake areas were reconnoitered.

**FERTILIZERS FOR FORAGE CROPS**

An exploratory study showed that established grass stands on old fields are greatly stimulated by moderate applications of nitrogen. Applications of 40 pounds per acre (250 pounds of sodium nitrate) produced 2,020 pounds of dry timothy hay per acre compared to only 630 pounds where no fertilizer was applied. Eighty pounds of nitrogen produced 2,820 pounds of hay. Phosphate and potash did not increase timothy yields when applied alone. Nitrogen, phosphate, and potash, applied together at the rates of 80, 160, and 80 pounds per acre, respectively, increased the yield of dry hay to 5,400 pounds. This complete treatment consisted of 500 pounds per acre of sodium nitrate, 400 pounds of treblesuperphosphate (42 percent), and 130 pounds of muriate of potash (60 percent).

An old bromegrass sod was also stimulated by nitrogen top dressing. Unfertilized, this field produced only 664 pounds of hay per acre. An early spring application of 16 pounds of nitrogen per acre more than doubled its yield. Sixty-four pounds of nitrogen (400 pounds of 16-percent sodium nitrate) produced 2,837 pounds of dry hay per acre; in this treatment, half of the nitrogen was spread in early spring and the rest in midsummer after the first hay cutting had been harvested. A split application of 128 pounds of nitrogen per acre yielded no more than the 64-pound application.
### ALASKA AGRICULTURAL EXPERIMENT STATION

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#### FAIRBANKS STATION

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The following report shows the receipts and expenditures of the Alaska Agricultural Experiment Station under Federal and non-Federal appropriations for the fiscal years 1947-48 and 1948-49.

### RECEIPTS

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<th>Item</th>
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<td>Federal</td>
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<td>To balance from 1947</td>
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<td>To balance from Territorial building fund</td>
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### EXPENDITURES

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1 No break-down of expenses by object classification is available for this period.
2 Petty cash funds of superintendents were accounted for, and balance of $9.32 was returned to the University of Alaska.
3 Disbursement for lumber by University of Alaska.