JANUARY 1964

Alaska's

FARM & CONSUMER RESOURCES

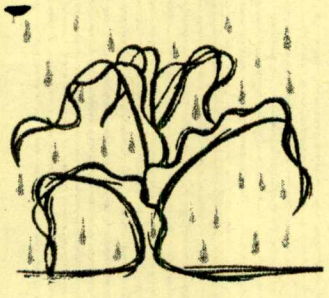
1963 RESEARCH PROGRESS

ALASKA AGRICULTURAL EXPERIMENT STATION — *University of Alaska*

COOPERATING WITH THE
UNITED STATES DEPARTMENT OF AGRICULTURE

OFFICE OF THE DIRECTOR
PALMER, ALASKA

Contents



IN 1964 ALASKA'S JOINT FARM AND CONSUMER research program enters its sixteenth year, having been established in the spring of 1948. Initial justification was based on a national effort to reduce the Territory's reliance on long vulnerable supply lines, responsibility at the national level being assumed by the Department of Defense. Congressional intent in setting up a joint program was to encourage greater self-sufficiency within Alaska, thus enhancing the nation's over-all defense posture. By 1950 an organization had evolved that has persisted throughout the past 15 years.

During the past decade some advance toward original objectives has been attained. The value of foodstuffs grown in Alaska went up from $1.7 million in 1949 to $5.8 million in 1962. Measured against population growth (from 134,000 to 260,000) these totals represent $25 worth of food per capita in 1962 as compared to $13 worth in 1949. Other changes that reflect applications of research findings are summarized in the table below.

Emphasis on improved farm organization and output, on better farm efficiency, and on improved competitive position are revealed in this summary. Although the number of farm enterprises declined, this trend (conforming to national shifts) permitted remaining units to enlarge and more than triple their output. Larger volumes in turn gave continuing enterprises a chance to raise their capital investments. This was done by up-grading physical facilities and buying new equipment. In 1962 Alaska's farmers were tilling more than twice as many acres and harvesting more than triple the amount of food as in 1949. Their average return per cropped acre went up as a result of adopting improved practices. Gains were made despite a diversion of considerable cleared land to growing feed grains, all of which had been imported in 1949. Alaska's agricultural industry and the state have thus attained a greater measure of self-sufficiency.

Gains were accomplished in the face of much stiffer competition offered by imported food. A revolution in freight handling, cheaper rate structures, greater marketing efficiency in the other states -- all these factors have greatly intensified competitive pressures generated in areas of cheaper production, especially in the northwestern states.

Changes in Alaska's agricultural industry during the 15-year period 1949 through 1962 and per cent gain (1949 equals 100)

Comparison	Unit	1949	1962	Gain
Commercial farms	number	527	403	- 24
Cropped acres	number	9,146	18,724	204
Cropped acres/farm	number	173	465	268
Value of production	$1,000	1,698	5,827	344
Return/farm	dollars	3,220	10,150	316
Return/cropped acre	dollars	186	218	117

Although Alaska's farmers must be granted full credit for gains made, Alaska's joint research effort has provided essential information for farm growth and improved efficiency. Among many indirect but highly significant contributions made by research is the fundamental proof that certain foodstuffs can be produced in considerable volume in sub-arctic regions with very economic utilization of soil nutrients and water. With this proof in hand the research program has played a major role in justifying additional farm services for the state. Among these is the emergence of the federal Agricultural Conservation and Stabilization Service as a state entity, strengthening of Alaska's Cooperative Extension Service (educational program), of the state's Division of Agriculture (financing and regulatory), of the Farmer's Home Administration (rural financing), of the Bureau of Indian Affairs reindeer program, establishing a Cooperative Crop and Livestock Reporting Service, the initiating of 5-day agricultural weather forecasts, and establishing plant and animal quarantine and inspection services at ports-of-entry.

More directly the Experiment Station has assisted farm growth by releasing some 13 new crop varieties and lines in the past 10 years. Among these are five special purpose potatoes (Knik, Alaska 114, Alaska Russet, Stately, Norland), four arising from breeding studies in Alaska. The other eight are animal feeds and forages (Edda barley, Golden Rain and Nip oats, Engmo timothy, annual ryegrass, Manchar brome, Alaskland red clover, Gasser wheat). It is estimated that 90 per cent of all plantings now made are of varieties recommended by the Experiment Station.

An improved Holstein dairy line was introduced to Alaska, together with a new breed -- the Red Dane -- early in the program. Some 73 per cent of Alaska's dairy cow population is served by Experiment Station sires. Milk production per cow in commercial dairy enterprises in the Matanuska Valley exceeded 9,500 pounds in 1962 (in contrast to only 4,900 pounds in 1949). Dairies in southeastern Alaska, which cannot be reached by this breeding work, produced only 6,900 pounds per cow per year.

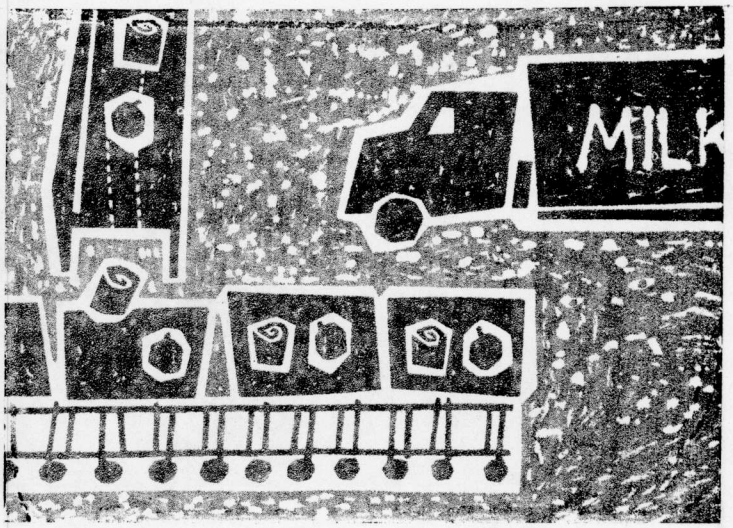
Other advances in fertilizer utilization and in chemical control of weeds and insects have helped improve farm efficiency. Fertilizer imports reflect close adherence to plant nutrition recommendations. Ring rot has been essentially eliminated as a threat to Alaska's potato industry.

Publications issued and distributed by the joint research program from 1949 through 1963, by 3-year intervals beginning in the year indicated.

Kind	49	52	55	58	61	Total
Printed reports . .	12	20	74	40	48	194
Processed reports .	5	24	64	74	57	224
Journal articles . .	2	21	26	20	26	95
Periodicals	-	-	1	2	3	6
Total	19	65	165	136	134	519

Research findings are communicated to Alaska's residents chiefly in the form of written reports and demonstrations. Since 1948 over 400 reports have been distributed by the Experiment Station (involving over a half million copies with a total of 4,900 printed pages).

This is an average of over three reports a year for each senior project leader. In addition the staff published 95 formal articles in professional journals (directed to peer groups) and prepared 139 committee reports (directed to co-workers in other stations in an attempt to coordinate approaches and avoid supplication of effort expended elsewhere)



Some 49 field days, 11 annual workshop sessions, and 113 field demonstrations were conducted during this period. Many of these were jointly sponsored by the Extension Service or by cooperating farm and consumer groups.

Many lines of endeavor have not proved fruitful. Among these the most significant are --

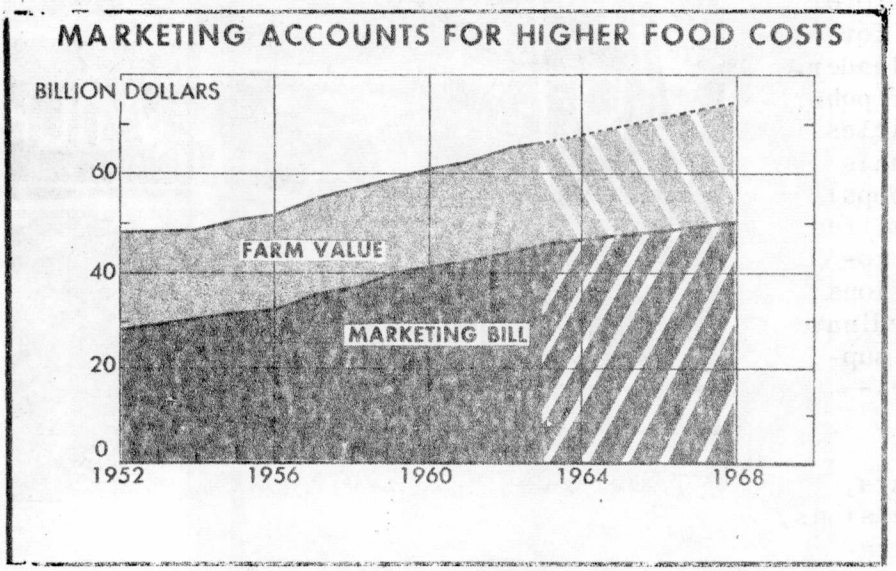
- o Failure to identify the joint research program with the interests of Alaska's urban and remote populations. Confounded by competive pressures for other tax supported activities within the state, agriculture does not have a strong position in seeking additional legislation to broaden its program scope, nor to maintain existing investigations and state facilities.

- o Increase in retail milk prices. Since consumer prices are controlled by urban retail outlets, no effective way of motivating price reduction has been found. It is unlikely that a research program can be effective in this area.

- o Regressive military procurement practices. Because this problem can be attacked only through USDA channels interacting with Defense at the cabinet level, little progress is expected. A fundamental difficulty is encountered in that the direct welfare of less than 400 Alaskan rural families is involved although all consumers are involved as is seen in the rise in civilian milk prices. This rise was initiated in an attempt to offset poor returns from military sales.

- o Static farm development. Since 1957 little advance has been noted in Alaska's farm development despite the availability of fairly good land and Alaska's continued deficit food production status. This condition reflects poor profit motivation for farmers.

How much further efficiency of current crop production can be improved by additional applied research -- within the framework of present



market development and organization and in view of ever greater competitive pressures from areas of more economic production -- is a question that only time can answer. More effort certainly should be devoted to marketing Alaska's farm produce in the face of diminishing military demands and the encroachment of well-managed chain store operations pushing their own brands grown in other states. Ample justification therefore seems to exist for continuing the current scope of the state-financed applied effort of the joint program with some shifts towards greater emphasis on marketing and on production management.

OUTLOOK

In addition, more attention should be directed to farm possibilities that might exploit national demands in areas where less competition exists than in fresh milk, potatoes, eggs, and meat production. Several of these possibilities are briefly mentioned to illustrate promising potentials.

For example, a program started five years ago with the help of the Rockefeller Foundation has led to the development of fairly comprehensive nurseries of native grasses. Benefits will shortly accrue in the form of an improved forage grass -- a synthetic brome line from a complicated cross between commercial and native bromes. Extremely hardy, this new line possesses several advantages that might be useful in other states. A possible export grass seed potential is offered here. Of even greater promise for diversifying local crop opportunities is the possibility of producing turf grass seed. Some of Alaska's native bluegrasses and fescues appear far superior to any commercial strains. Millions of acres of lawns, golf courses and other intensively managed landscape and recreational areas in North America offer large markets.

Disease-free plant material offers another possibility for diversifying Alaska farm production. Now in its third year is a study focused on producing virus-x free potato tubers to be marketed as foundation seed in other states. Isolation between fields in Alaska and a favorable environment promises commercial scale production with no more than the usual sanitary precautions. These are advantages not

found elsewhere. Alaska also has an undefined but alluring potential for producing virus-free nursery stocks, especially of strawberries and fruit trees.

Freedom from transmitting insect vectors and isolation are significant advantages of this subarctic region. Organization, management and marketing practices remain to be perfected.

Other new crop possibilities are seen in oil seed. For example, cooperative studies with the Plant Introduction Station at Ames, Iowa, have revealed that a species of Limnanthes containing an entirely different oil from that of flax and soybeans grows better in Alaska than elsewhere. Useful in industrial processes, a great deal of cultural, processing and marketing research is needed before this promise becomes a reality.

Besides working with farmers problems and searching for new, useful crops, many long range probabilities require basic research. Among the most important of these are studies of the peculiar light, temperature and moisture conditions in Alaska and their effects on plant growth and development. Alaska's welfare -- as well as man's survival -- depends on how we utilize irreplaceable and replaceable energy. Since renewable energy comes to us only through plants capturing a small fraction of the sun's output, more must be discovered about this process. Because of the low level of solar energy and a relatively short period of plant activity in subarctic regions, knowledge of plant processes and environmental interactions is more imperative here than elsewhere. Survival and population dynamics in plant and animal pests and diseases pose some equally interesting and important questions.

Agricultural research proceded much of Alaska's modern settlement. Initiated to demonstrate nationally that the Territory might develop some degree of self-sufficiency in growing food, this advance into new lands was unique, totally unlike the early history of other states. The national motive was expansion into the Pacific following the Spanish-American conflict. Alaska's coal resources were then considered a national asset as fuel for the U.S. Pacific fleet.

The Territory's first experiment station was established by the United States Department of Agriculture at Sitka in 1898. Copper Center is clustered around the buildings of an old experiment station closed in 1908. An experiment station site at Kodiak is pointed out to tourists, while the Kenai farm is now a suburb of a fast growing community. Fields of the Rampart station, unused since 1921, still persist on the banks of the Yukon. Service roads and lanes of these USDA demonstration farms marked the start of local road nets.

The Fairbanks Experiment Station was founded in 1908, based on equipment, staff, and machines moved north from Copper Center. Professional workers residing at this station conceived the idea of an agricultural land-grant college for the Territory. They helped justify additional land grants that -- together with the adjoining farm reservation -- now comprise the University of Alaska campus. The Matanuska Experiment Station was established in

HISTORY

1917, some buildings being moved there from Kodiak after Katmai's eruption in 1912 covered the island with volcanic ash. This farm was a nucleus around which the Matanuska Valley was later developed. Out of studies at this site came evidence justifying decisions to colonize the valley in 1935.

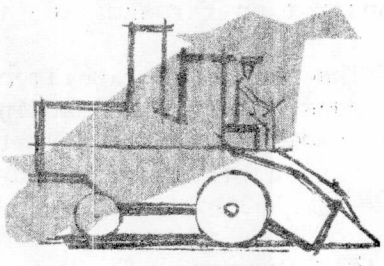
By the early 1930's, a small food production potential had been demonstrated. Oil had displaced coal as a marine fuel. The Matanuska and Fairbanks stations were then transferred to the Alaska Agricultural College and School of Mines. Territorial legislation accepted participation in the national land-grant acts. In 1937 the Petersburg Fur Farm was established by the University to delve into free fox farming disease problems then threatening a prosperous fur industry.

Agricultural research in Alaska is now jointly financed by the University of Alaska and the United States Department of Agriculture. Responding to Public Law 266 (1947) the federal government again assumed major responsibility and leadership in this field after a lapse of some 18 years. Since then the Department has contributed directly to its financial support and technical direction, over and above traditional Hatch Act grants common to all land-grant institutions.

Reawakened federal concern in the food production potential of subarctic regions is rooted in both the world-wide population explosion and in national security considerations. The present joint farm and consumer research program reflects this national interest. It was stimulated by world tensions stressing the strategic importance of Alaska. During times of world stress, Alaska's position is weak so long as its population depends on long overseas supply lines. Living costs in Alaska will remain high so long as a major portion of food and building supplies must be imported.

Mostly developmental in nature, food production and marketing research is administered from the Experiment Station headquarters at Palmer -- an installation maintained by the Agricultural Research Service -- rather than from the College campus. The Palmer headquarters is located on a 23-acre tract within the city limits. This site is devoted chiefly to small plot investigations dealing with plant breeding, plant pathology, response of plants to nutrition and supplemental water, insect pests and controls, and measurement of environmental parameters (including photo-period and net radiation, soil and air temperature, moisture and temperature gradients), and moisture relationships. The headquarters building provides about 8000 square feet of offices, laboratories, and workrooms. This installation includes greenhouses and cold storage facilities. All equipment is relatively modern, having been acquired since 1950.

FACILITIES



Parental stocks of especially adapted lines of plants and animals are collected and maintained at three experiment station farms - one

adjoining the University campus at College, one in the Matanuska Valley, and the third near Petersburg in southeastern Alaska. The first two farms are devoted to developing an economic animal feed base, and to devising improved husbandry and management practices with special emphasis on dairy production. Much effort is focused on developing possibilities for diversifying Alaska's agriculture thus reducing reliance on milk and potatoes as primary sources of farm income. Supplemental studies are focused on root and vegetable crops consumed by man. Of a total of nearly 1,700 acres, about 500 is under cultivation. Nearly a hundred acres are in small plot comparisons and nurseries perpetuating plant lines, and evaluating responses and variability. The Petersburg farm is devoted exclusively to fur production investigations, including the evaluation of fish waste, bottom fish and sea lion meat as fur animal feeds.

Somewhat over a third of all farm research is accomplished in cooperation with farmers, with retail outlets, and in evaluating market potentials. All studies are administered and reported as line projects, coordinated nationally by the Cooperative State Research Service of the U.S. Department of Agriculture. Liaison is maintained with similar research undertaken in Canada and in the Scandinavian countries. Alaska is affiliated with the North Central States in regional research, receiving through this channel some additional financial support.

ORGANIZATION

Within the experiment station the professional staff is organized into research teams generally following traditional agricultural subject matter patterns. Specific organization is documented in terms of research projects which normally run for two or more years but are usually revised after four or five years if objectives have not been attained in that time. Professional staff members serve as project leaders. They define problem areas, devise projects within these areas, supervise research activities, interpret and report results. All are actively engaged in the conduct of research work.

Since 1950 the scope of the overall program has covered nine subject matter areas -- soil science, agronomy, horticulture, animal husbandry, agricultural engineering, entomology, plant pathology, agricultural economics (management, statistics, marketing), and fur production. All of these are interdisciplinary, requiring both specialization and a broad knowledge of working tools and techniques.

As specified in the 1949 Memorandum of Understanding project leaders are with three exceptions, joint employees holding appointments with both the University and the Department of Agriculture. The exceptions are University employees, not holding USDA appointments.

In late 1961, following emergence of the old State Experiment Station Division as a full fledged service, the Territorial Experiment Station Division of ARS was abolished. The station director now reports, with respect to the direct federal portion of the joint research program, to the Crops Research Division, Agriculturla Research Service, through their Tropical and Subarctic Program. With respect to the state financed portion of the joint program, the director reports to the president of the University, through the vice-president

for Research and Advanced Studies. The director works closely with the new Cooperative State Research Service, charged with the responsibility for administering the national Hatch Act agricultural program through the various land-grant colleges and universities.

During 1962, the Alaska Agricultural Experiment Station conducted 59 project studies, 55 still active at the close of the calendar year, while five new projects were under preparation or consideration.

Considerable basic research has been undertaken in an effort to develop new knowledge on which further applied and developmental gains might be made. Estimated at some 18 per cent of the total program, this effort has intensified in recent years. Of special interest is the response of both plants and animals to photoperiod, light quality and low temperatures. Subarctic plant populations reflect a high degree of variability and remarkable proclivity toward hybridizing, the reasons for which are not yet clear. In these fields, and in winter hardiness and cold adaptation responses, subarctic environments offer unique opportunities for pioneer basic studies to expand general knowledge.

A wide variety of interdisciplinary techniques are employed, ranging from biometrics, genetics and meterology to colorimetric and chromotographic chemistry. Comparisons, differences and trends are developed by applying standard statistical procedures including population sampling, probabilities, analysis of variance and correlation, and by utilizing a wide variety of calculating tools. Data processing systems are available in Anchorage, at the University campus, and at Beltsville, Maryland.

In common with most experiment stations, continuing difficulty is encountered in justifying adequate professional salaries and program growth. In some degree, this paradox stems from a job too well done. One farmer in the United States now grows enough food to supply his own family needs and for 29 other people, three of whom live in other countries. This tremendous productivity means that less than 8 per cent of our nation's population is engaged in growing food and fiber. Farmers are now a minority group struggling to satisfy urban populations no longer intimately acquainted with farm problems. In this sense, being sheltered and even alienated from traditional ties with the land, the urban majority enjoys an assumed security. This situation engenders barriers to understanding, and

Source of funds supporting Alaska's joint research program for the 15-year period 1950 to 1964, and percent gain (1950 equals 100)

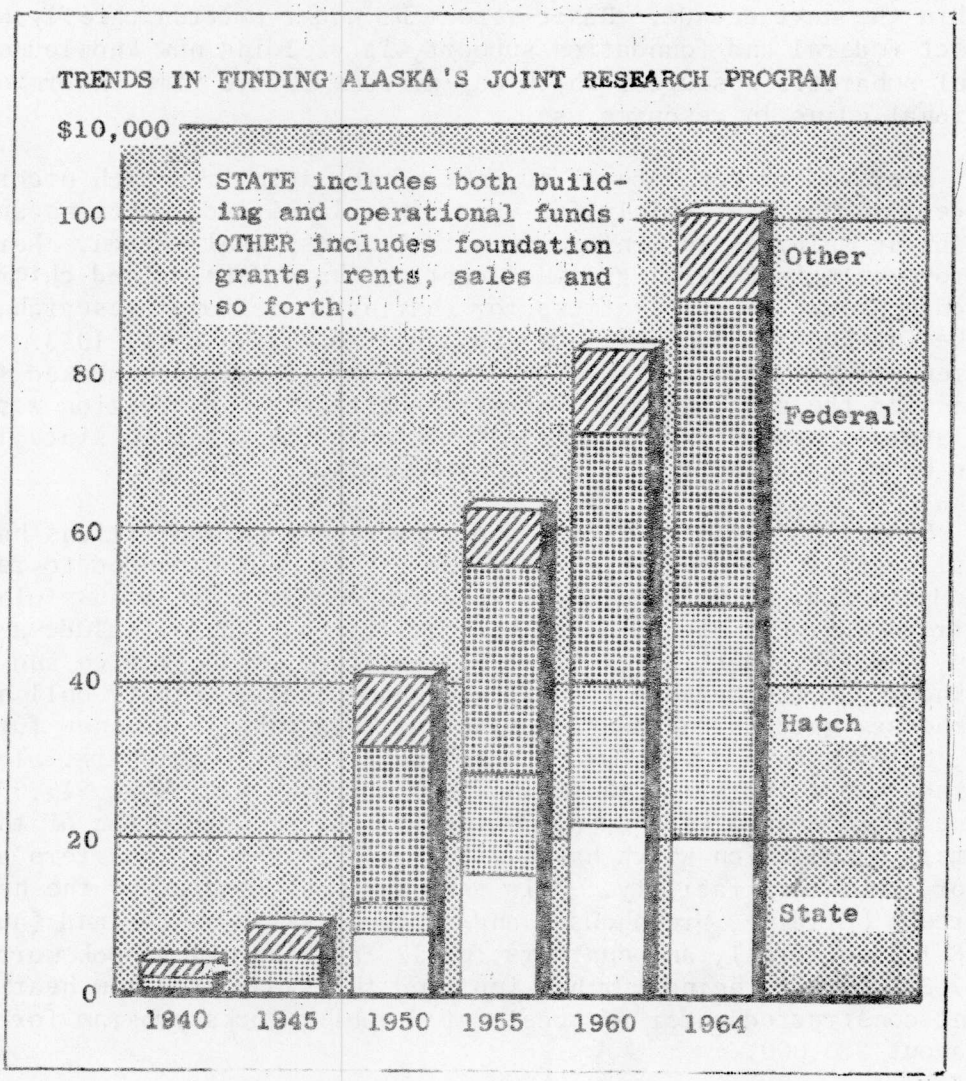
Source	1950	1956	1963	1964	Gain
	1,000 dollars				
Direct federal	260	283	364	381	147
Hatch grant	65	178	251	278	426
State funds*	125	168	225	200	160
	per cent				
Drrect federal	57	45	43	44	
Hatch grant	15	29	30	33	
State funds	28	26	27	23	

*Includes appropriation for improvements and operations

fosters group conflict in recognizing national and local goals. An extreme example is the common identification by other than farmers food "surpluses" as an expensive "scandal" when in fact food reserves are one of our strongest defense assets.

Agricultural land use was not a major motivation for Alaska's recent settlement. Many factors, including the tremendous productivity achieved on acres cleared in lower latitudes since the Civil War, conspire against Alaska's farmers and modern homesteaders. Except in certain restricted fields of application, research dollars will not correct or adjust many of these negative factors. Instead, imaginative legislation focused on restoring a profit motive to food production on a parity to that found in processing and marketing enterprises -- which claim an ever greater share of the consumer's food dollar -- is a more direct approach.

FINANCING



Agricultural land use has not been a major motivation for Alaska's recent settlement. Many factors, including the tremendous productivity achieved on acres cleared in lower latitudes since the Civil War, conspire against Alaska's homesteaders. Except in certain restricted applications research dollars will not favorably adjust many of these negative factors. Instead, imaginative legislation focused on insuring a profit motive for farmers equal to that now existing in food processing and marketing -- which claim an ever greater share of the consumer's dollar -- is perhaps a more direct and effective approach.

Current consumer attitudes will likely continue until a failure in production management ability demand adjustments, or until an awakened awareness of family farms as a needed social force is more generally recognized. Misunderstandings arising from erroneous and out-dated concepts are widespread among Alaska's consumer population. This is plainly seen in the theory of borough financing, seemingly based on land taxation for rural areas.

Agricultural research in Alaska is thus comprised of three kinds of effort. Applied research has contributed significantly to the state's self-sufficiency during the past 15 years. Developmental research shows promise of substantially diversifying farm production within the next decade. Basic research, under-written chiefly with direct federal and foundation support, is yielding new knowledge about subarctic resources which may at some future time underpin additional gains in resource use.

Improved direct federal support of the joint research program since 1956 has been solely for upgrading classified positions and improving salaries in conformity with Congressional action. Larger improvements in federal grant allocations have been gained chiefly through special justifications for sharing in regional research and marketing funds which were not available to Alaska until 1953. Two increments of Hatch increases have been specifically earmarked for improving the salaries of University positions. In addition most of the state's operational increases granted to the station since 1954 have been justified for salary improvements.

Since 1953 state building and improvement appropriations have totalled $328,724. Of this sum about a third was expended to return the Matanuska and College farms to a reasonable state of usefulness. The remainder was expended for new facilities. These include a new shop, heating plant, horticultural laboratory, silo, office and milkhouse at the College Farm; a new shop, heating plant, bull barn, milkhouse, garages and heating plant at Matanuska; and a new furring pen, breeding house and cold storage addition at Petersburg. The average expenditure for these 15 new structures was about $15,000 each. These improvements were supplemented in 1950 by completion of the Palmer installation which has since served as the headquarters and major laboratory facility. This establishment, including the headquarters building, greenhouses and storage, 15 acres of land (augmented by 8 leased acres), and quarters for 12 families has a book worth of $637,372. It is being further improved this year by a new heating plant constructed under an accelerated public works program for a cost of about $80,000.

Report of Progress

FERTILIZERS

Crops on soils being homesteaded west of Wasilla, and along the new highway from Willow to Talkeetna respond to nitrogen, potassium, phosphorus and lime. Barley growth without liming is unsatisfactory. Oats respond to high fertilization in the absence of lime, but they also respond to lime. Marl from near Lake Wasilla -- the only present cheap source of liming material -- was applied to a field north of Pittman with marked visible response of both barley and oats. While some are claiming this marl contains other valuable needed fertilizer elements, greenhouse trials have not confirmed other than liming responses.

Diammonium phosphate (DAP) is becoming cheaper. Since it has a high analysis it is being used more and more in mixed fertilizers. On some Alaska soils DAP is relatively ineffective without lime being added too. Large applications sometimes appear toxic.

Urea is now cheaper per nitrogen unit than any other source. Urea alone has never been as effective as ammonium nitrate as a grass topdressing. Mixtures of ammonium nitrate and urea applied as top dressing to brome or timothy can possibly supply both early and later needs. "Aqua humus" is made from lignite fortified with fertilizer nutrients. The additional organic matter (humates) is reported to increase crop growth and soil physical conditions. Greenhouse experiments thus far have demonstrated response only from the added fertilizer.

Timothy has not yielded well on the Kenai Peninsula and has shown great susceptability to a leaf spot. Fall or spring potassium applications have almost eliminated this leaf spot and markedly increased yields and decreased entrance of other less desirable grass species.

Potatoes are being fertilized at high rates to insure greater yields. Potassium fertilization is very important at these higher fertility levels. The low Ca to Mg ratio in foliage and tubers may result from high Mg in the soil suppressing K utilization. The yield decrease with increasing amounts of epsom salt in the absence of potassium substantiates this assumption. High KCl application decreases tuber quality by lowering dry matter content. High K_2SO_4 and KNO_3 have supplied the extra K without this lessening of quality.

CLIMATE

Thirty years (1931-1960) of weather records for 12 Alaskan sites have been assembled on computer cards. Covered are Matanuska, College, Anchorage, Big Delta, Fort Yukon, Holy Cross, Homer, Illiamna, Kasilof, Kodiak, McGrath and Talkeetna. Variables include daily maximum and minimum temperatures, precipitation and snow depth. An 8-year record for 175 other sites in Alaska has been made available by the Weather Bureau. This card library is physically located at the University of Alaska campus where it is available to all public agencies.

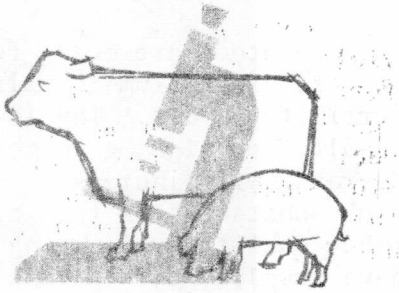
Environmental parameters now being defined by standard techniques are wet and dry bulb air temperatures, precipitation, total short-wave and net radiation, soil temperatures (from 1 inch to 10-foot depths), wind direction and velocity, evaporation losses, cloud cover, snow depth and density. Data are being transferred to cards so that inter-relationships and other analyses can be electronically computed. As an opportunity arises plant response is related to these environmental factors. During the past season, for example, development of potato vines and tubers was significantly linked to minimum temperatures through a time lag of 1 to 2 days. Daily water consumption of brome-grass gives records that will be correlated with evaporation indices. Winter environmental conditions are to be related to heat inputs required on maintaining livable temperatures in a series of test structures.

Measured energy inputs needed to maintain 70°F in nine experimental structures for the period July 1960 to February 1963 have been assembled on cards in preparation for data processing. Two separate cards have been prepared for each day -- one contains maximum and minimum temperatures for each synoptic period and average wind velocity, another contains daily meter readings for the various cabins and net radiation for the day. This preliminary collation is aimed at determining inter-relationship between energy input, environment, and structural features.

A National Institutes of Health grant has been received to aid in constructing three light quality measuring instruments by the Geophysics Institute, College, Alaska. The instruments will measure light automatically and in sequence throughout the natural spectrum, filtered into six non-uniform wave bands. They will also measure indirect light alternately with direct radiation and in sequence from one end of the spectrum to the other. The grant also provides for support of personnel attending the instruments at Columbia, Missouri, and a station between 0 and 10°N latitude (possibly at Turrialba, Costa Rica). These stations together with the instrument at Matanuska will provide a nearly simultaneous comparison of light quality at three widely separated latitudes.

LIGHT

Animal Industry



Systematic crossbreeding is efficient in improving the production capability of a given herd to the 14,000 pound level (500 fat). Thereafter a crossing system based on good sires is as effective as other methods in maintaining herd production.

Ten Dane-Holstein crosses with 19 records have given an average of 14,928 pounds of milk a year (551 f) compared to 30 Holstein dam records of 13,263 (494 f). The ten best records of this group averaged 15,841 (586 f) against 14,330 (536 f) for their dams. In a 9-year period 10 crosses (19 records) averaged 15,196 compared to 25 herd mates (43 records) calving within 40 days with an average of 14,040. In another comparison, 8 Dane-Holstein crosses (15 records) averaged 14,648 while their purebred sisters (18 records) averaged 14,834; their dams (27 records) averaged 13,385. All values are for mature equivalent, 305-day lactation, twice-a-day milking.

Production of a high-test herd was rapidly improved by crossing with high-milking bloodlines, although progress accomplished under this investigation can be measured only in terms of trends over several years. The following response comparison over three generations shows how a Guernsey (G) herd was up-graded by Holstein (H) and Red Dane (D) sires. Breeding back the second generation to a high-testing sire reduces production volume relatively more than fat. (All values are pounds per year, mature equivalents) --

Foundation Guernsey	7,073 milk, 362 fat
1st generation, D-G & H-G	10,581 milk, 456 fat
2d generation, H-DG & D-HG	12,667 milk, 520 fat
3d generation, H-HDG, D-HDG & H-DGH	12,395 milk, 464 fat
3d generation, G-HDG	9,999 milk, 456 fat

Production gains in the Matanuska herd are reflected by the time series at the right	1948	10 cows	6,180 milk, 298 fat
	1954	27 cows	9,204 milk, 361 fat
	1960	31 cows	12,313 milk, 502 fat
	1962	32 cows	12,609 milk, 503 fat

Two groups of dairy calves have been fed to six months of age on either plant protein or meat-and-bonemeal fortified rations. Calves were at first reluctant to eat a ration containing meat-and-bonemeal. Although they did consume this ration more readily with time, they never ate as rapidly as their mates on a plant protein fortified ration. Animals on animal protein showed rougher hair coats and poorer general appearance than the others.

Dairy heifers raised in an open shed (minimum shelter) again consumed more feed (16 per cent) than those in warmer quarters. Initial weight gains of those in minimum shelter are less, although this is offset by more rapid summer gains so that at two years of age little difference exists (977 vs 998 at two years, 1167 vs 1158 at three years for minimum shelter vs warm group, respectively). Heifers raised outside calve later than others in warm shelter, probably because they exhibit less symptoms of standing heat so that conception is delayed.

Milk Production Up

In 1956 Alaska produced an estimated 14 million pounds of milk that returned about $1.5 million to some 74 dairy farms. In 1962 milk production exceeded 22 million pounds, returning $2.3 million to 55 enterprises.

Minimum shelter induces udder problems which may lead to animal losses. Once in production, the heifer's early history is not reflected. For example, 16 heifers raised in an open shed calved at an average age of 2-8-7, producing an average of 12,231 pounds of milk (443 fat) during their first lactation; 17 heifers raised in a warm shelter calved at an average age of 2-5-5 and produced an average of 12,131 pounds of milk (438 fat) in this first lactation. Mature equivalents were 15,130 pounds of milk (544 fat) and 15,168 (548 fat), respectively.

A carry-over response to loose housing management was exhibited by three cows exposed to the 1961-62 winter. During their next lactation, they failed to attain their former production records by nearly 50 per cent; the remaining three also dropped in production although not as drastically. No such reduction was noted in those cows housed in warmer quarters.

In 1963 another 12 cows were assigned to this study, half being housed in a warm barn, half being managed in loose quarters where air temperatures (November through April) averaged 5.3°F (Minimum recorded was -44°). Although the loose-sheltered animals again maintained good health and produced above expectations they consumed 16 per cent more feed than the group in warm quarters. Milk yields of those cows in warm quarters was 18 per cent greater.

While silage is fed to both groups in this study, there is little chance that a dairy farmer can feed silage under comparable conditions. Cost of heating silage so that it remains unfrozen in severe weather is excessive. It is tentatively concluded that difficulties in producing dry hay prohibit utilizing loose dairy housing in the Tanana Valley.

Ryegrass and orchardgrass-alfalfa were seeded in quarter acre plots in randomized blocks with two replications. A 2 x 2 x 3 x 4 factorial design with progressive confounding of main effects to facilitate management compared plant species, mid-season harvest method (grazing vs direct harvest), mid-season harvest dates (July 24,31, and August 7), time for recovery prior to second harvest (16, 23, 30, and 37 days), and related interactions. Yields were superior from ryegrass.

GRAZING

Grazing behavior revealed an early marked preference for ryegrass (July 18-19), equal preference for the two swards (July 24-25), and later marked preference for orchardgrass-alfalfa (July 31-August 1). Orchardgrass-alfalfa is much more easily managed for pasture than ryegrass, retaining palatability over extended periods of time. This is associated with the fact that orchardgrass remains vegetative throughout the summer in south-central Alaska. Mid-summer grazing enhanced second growth yields of orchardgrass-alfalfa and reduced those of ryegrass in comparison with direct harvest.

Six acres were seeded to one-half acre plots of Manchar bromegrass and Engmo timothy during the summer to provide grazing for continued studies next year.

Low temperature moisture equilibrium studies of Alaskan barley in controlled atmosphere chanbers are now in progress. Magnesium chloride

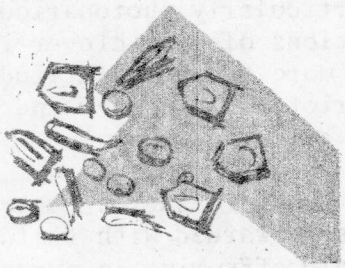
has been substituted for calcium chloride. Establishment of a system equilibrium is expedited by forced recirculation of the atmosphere, part of which is pumped through the vapor pressure control solution and a humidity sensing device. Barley combining at 40 per cent moisture and stored in a laminated waterproof paper bin is currently providing good feed thus confirming earlier findings. Rolled high moisture barley was fed to milking cows on a reversal trial at 0, 4, and 8 pounds in addition to the regular ration. Farmers are interested in this method of storing grain to save drying costs that may run as high as 75¢ per hundred pounds of grain fed.

GRAIN STORAGE

Sampling from the Matanuska Valley's central grain storage is continuing to provide additional information on moisture and protein content, weed dockage, and test weight of locally produced feed grains.

Comparison of conception rates of fresh and frozen semen continued, the latter being stored at liquid nitrogen temperatures. A summary of three years experience indicates that frozen semen is superior to fresh semen used the third day after collecting. Fresh semen used before it has aged 48 hours is much more efficient in assuring conception. In the Anchorage milkshed time of freshening is economically significant since it determines in a large measure the blend price received by an individual producer. Under these circumstances, fresh semen continues more popular than frozen although the latter is often preferred as source of new bloodlines. A continuing point of confusion is the commercial breeding associations' method of computing non-returns on a 60-to 90-day basis; results so calculated imply a conception rate some 10 to 15 per cent greater than actual calvings obtained from frozen semen.

FROZEN SEMEN



Crops Research

Severe winterkill again plagued perennial grass in Alaska's Matansuka Valley where an economical roughage helps reduce milk production costs. Poor winter survival of commercial bromegrass strains in four of the past seven winters points up the urgency for new, improved lines. Promising some relief is a new synthetic strain, Alaska B-1, which emerged little damaged from 1963's winter hazards. Yields obtained during the subsequent growing season from field plots comparing B-1 with four improved commercial varieties were B-1 3.9, Carleton 3.7, Manchar 3.4, Saratoga 2.2 and Sac 0.6 tons of dry matter per acre. Some 53 pounds of foundation seed were harvested from B-1, sufficient to produce a 1964 yield for commercial distribution. Of the lines bulked to give this new strain, several recombinations to improve its fertility were attempted.

FORAGES

Experimental observations of Bromus inermis x B. pumpellianus plants growing in nurseries continued, with major attention to phenological behavior and correlative growth habit features. Pressed specimens were assembled for morphological studies. Studies of variation are intended to improve the conceptual basis of the present brome breeding program involving the exploitation of germplasm from native sources to upgrade smooth brome as a forage grass, and to contribute to a taxonomic understanding of the complex.

Improved timothy continues in demand. Eight synthetic lines assembled a year ago were established in the field. Another synthetic was bulked from all plants that had survived for five years in a space planted nursery.

The 1963 spring season provided dramatic evidence of how time of harvest influences winter survival. Brome grass plots seeded in early 1962 were harvested at approximately 10-day intervals beginning August 10. Winter survival was lowest and spring vigor poorest in plots harvested on September 10. Survival was increasingly better in proportion to the extent that the harvest date the previous year was earlier or later than September 10. Harvest dates also influenced forage quality the following year in that weed growth was greatest in plots that suffered most winter injury.

Forage quality of native bluejoint grass (Calamagrostis canadensis) was influenced markedly both by stage of maturity at harvest and by fertilizers applied. Quality was poorer and yield considerably higher from early August harvests (grass fully headed) as opposed to harvest in early July (grass in boot stage).

Evidence of unique adaptation to subarctic environmental conditions, particularly photoperiod, was revealed in naturalized roadside populations of sweetclover in comparison to introduced varieties adapted to more southern latitudes. Alaska's ecotypes surpassed introduced varieties in number and development of crown buds and development of cold resistance.

Hybridization between Elymus sibiricus and Agropyron sericeum was forwarded with field collections and the maintenance of amphiploid offspring in nurseries. New studies commenced on the Bromus ciliatus complex with cytological and morphological work initiated on a mass collection from a population containing diploids, tetraploids, and some triploids. The robust tetraploid may have possibilities as a forage grass.

Six pounds of the Fairbanks synthetic Medicago sativa seed has been produced at Logan, Utah, and at Palmer using honey bees and leaf cutter bees as pollinators. About a half of the hybrid M. falcata x M. sativa was produced this year. A complete cycle of mass selecting Trifolium pratense was completed, with severe reduction of the number of non-hardy plants.

In an effort to define more precisely the problems involved in low temperature ensilage oats and peas were harvested at two stages of maturity (early head and milk) and ensiled in two gas-tight experimental silos. All silage effluent was collected from drains in the

bottom of each silo and weighed. Thermocouples were placed in each silo to provide temperature measurements during fermentation and subsequent storage. This silage will be fed to lactating dairy animals in a reversal feeding trial in late winter and early spring of 1964.

IRRIGATION

As an initial step in expanding forage irrigation studies, stands of bromegrass and timothy were established at three Matanuska Valley sites, representing three different magnitudes of soil moisture retention. Water demands of bromegrass again confirmed an average annual estimate of 11 inches for the previous five seasons. Preliminary to machine correlation, environmental and forage response data have been assembled on cards.

Although precipitation was well distributed throughout the 1963 growing season, supplemental water again fostered more uniform germination and stands of vegetables. While carrots and lettuce exhibited no yield or time-of-harvest response to irrigation, celery yields were improved 10 per cent. An extremely cool season nulified earlier responses to supplemental water.

A specially designed plot irrigator improved water distribution efficiency and precision, permitting both a reduction in plot size and better randomization. A neutron moisture meter is now at hand which may facilitate definition of soil moisture status.

Improvements on the infiltrometer were made as recommended by the NC-40 regional committee. Replicated intake measurements of Bodenburg, Knik and Minto silt loams under bromegrass and fallow showed annual variation is influenced by soil moisture levels. Intake rates of Minto silt loam (Tanana Valley) at low moisture content were similar to those of Bodenburg and Knik under less moisture stress.

Soil horizons at each plot were sampled for laboratory analysis of physical properties related to water intake. Cores from sod plots yielding representative intake rates will be sent to a regional laboratory for measurements of capillary conductivity. Analysis of sediment loads from the previous season reveal heavy soil losses from a high rate of simulated rainfall. Laboratory analysis of the previous season's soil samples were completed and results reported to regional research committee.

TURF GRASSES

Seed was harvested from about 150 superior bluegrass lines for preliminary turf evaluation. Two selections of Poa eminens exhibited extreme vigor and indicated possible value for use in soil stabilization. Two of 72 indigenous lines of Kentucky bluegrass possessed turf quality equal or better than the best introduced bluegrass and much superior cold tolerance. Indigenous fescue nurseries exhibited wide variability in hardiness, vigor, color, leaf width and culm production. Many fescue plants in nurseries appeared much superior to best introduced lines. Variability in check variety (Olds) suggests improvement for hardiness by selection. Eight indigenous fescue lines were equal in turf quality to best introduced fescues and are much hardier under turf management conditions.

Neither low nitrogen level nor 1-inch clipping reduced storage reserves, winter survival, or spring vigor. Turf quality was poorer at 4 pounds of nitrogen per season than at eight. One-inch clipping reduced Helminthosporium incidence in bluegrass and improved appearance in fescues. Merion and Newport bluegrasses and Duraturf and Pennlawn fescues were best. All other bluegrasses were severely damaged by Helminthosporium.

First crop seed yields of almost 700 pounds clean seed per acre were obtained. N levels had only slight effects on seed yields but large effects were obtained. N levels had only slight effect on seed yields but large effects on vegetative growth. Removal of vegetative growth after September 1 in year of establishment reduced the following year's seed yields. High yields of high quality seed indicate the possibility of establishing turfgrass seed industry in the state.

During 1963 a hundred individual 4 x 4 foot plots of indigenous and introduced selections of Poa, Festuca, and Agrostis species were established at College. To protect turf against damage caused by snow mold (Scleratinia borealis) two fungicides (Exp. #155 and CALO-CLOR) were applied October 10, 1963. Half of the plots were sprayed with three concentrations (4, 8, and 12 ounces per 1,000 square feet). Of the 1960, 1961, and 1962 treatments three chemicals (Thiram, Thirmer, and Terrachlor) were evaluated. Terrachlor was most effective in controlling snow mold (S. borealis) during the 1962-63 dormant season. Thiram was more effective than Thirmer, but less effective than Terrachlor.

CEREALS

Two severe late summer windstorms provided an opportunity to evaluate all barley selections in the nursery for head shattering, a serious fault of Edda barley. Lack of variability in nursery material indicates that improvement in this character is apt to be rather slow although some promising plant material was screened from segregating populations. An experiment was conducted to evaluate the possible usefulness of a defoliant-desiccant on barley. Plots receiving this treatment appeared to ripen more uniformly, and the grain to be somewhat drier at harvest. Materials of this type may have value in Alaska, where drying temperatures and humidity are not ideal at plant maturity.

Empirical revisions in fertilizer applications and rotation practices on fields devoted to cereal research appear to have improved soil uniformity in the area, which will contribute to more precise evaluation of production factors in future work.

While not given as much emphasis as in past years, attempts to induce useful mutations in cereals continue. Genetically pure seed of Edda barley was subjected to soak treatments of one to seven hours in ethyleniminesolution and planted in the light room. These treatments delayed plant emergence from one to two days. Survival to seed maturity was 50% or less on any treatment of three hours or longer, with no survival after treatment for seven hours. Field evaluation of the following generation revealed considerable sterility in the population. One visible mutation, a highly sterile plant exhibiting

a waxy, shiny appearance, was noted. Representative portions of the population were harvested for evaluation of treatment effects on yield and agronomic characteristics.

Yield and agronomic performance trials of potentially useful cereals were limited to an evaluation of variety-location and variety-year interactions. It is hoped that two years data will provide sufficient information to permit termination of this phase of the program.

Three F_2 barley populations of between 1,000 and 2,000 spaced plants were evaluated for yield components and agronomic characteristics. Data is currently being tabulated and plans completed to utilize these populations in a comparative study of selection methods under Alaskan conditions. Smaller F_2 populations of 8 hybrids were also evaluated as spaced plants in the field. Additional crossing has combined the 16 lines involved into a single hybrid. F_2 populations of the 4-line hybrids, the 8-line hybrids, and the 16-line hybrids will be available for field study in 1964. Within variety selections for yield components were grown in spaced plant replicated tests.

A wheat crossing series was initiated, with a goal of producing earlier maturing types by rigorous selection between cycles of hybridization.

WEED CONTROL

A logarithmic sprayer was utilized to apply DNEP as a preemergence spray on two dates to study both weed control and differential tolerance of barley varieties. Varietal differences in leaf damage largely disappeared prior to heading. There appeared to be a delay in maturity resulting from increased concentration of DNEP but this may have been due to an unexpected fertility gradient over the text area. Yields and quality data remain to be tabulated.

4-(2,4-DB) applied at 1.8 and 3.7 pounds per acre (with and without a spreader-sticker) to a weedy stand of year-old alfalfa on June 4 produced no injury although temporary wilting was noted at the highest rate. Excellent control of lambsquarters and knotweed resulted but shepherdspurse and pineappleweed were not controlled.

A valuable means of cultural weed control is being adopted incidentally with farmer acceptance of early-cut oats-peas-ryegrass followed by utilizing ryegrass aftermath. Many troublesome annual weeds that are prolific seed producers in conventional later harvested oat-pea crops are prevented from maturing seed in early-cut oats-peas-ryegrass.

A taxonomic study of the continental weed Hordeum jubatum and its closely related associate H. brachyantherum together with an intermediate hybrid H. jubatum var. caespitosum was completed.

Twenty-one herbicides were evaluated for horticultural crops at Matanuska during the 1963 growing season. Most screening was accomplished with an exponential sprayer, using two replications of each treatment. Crops on which herbicides were tested are carrots, beets,

beans, peas, cabbage, lettuce, potatoes, calendulas, asters, marigolds and pansies. Advanced weed control trials involved cabbage (Dacthal), and lettuce (various rates of Rogue (3,4-dichloropropionanilide)). Dachthal has considerable merit when applied at the rate of 12 pounds per acre shortly after seeding. This chemical is being recommended to the farmers for trial for cabbage and strawberries since it now has official FDA clearance. Rogue on lettuce has merit and warrents further study.

Studies of weed control by soil sterilization with Vapam show that this chemical can be used successfully for home flower gardens and other transplanted crops. Fall treatment of weed infested areas with Vapam is now being investigated. In addition to the above, investigations are in progress on brush control to release grass in grazing areas. Chemicals are applied by airplane on a cooperating farmer's leasehold.

POTATOES

Comparing growth and development of tubers and vines with environmental parameters showed greatest correlation between weight of vine and minimum temperature of previous day, weight of tuber with two days before. Seed pieces cut from bud end of tuber produced less vines but more tubers than stolen-end piece, this phenomenon being accentuated by storing tuber with bud end down. A hormone-like regulator responsive to gravity within seed piece is postulated. Light inhibition of sprout growth was nullified by gibberellic acid, glutathione and centrifugation. A search for chemical agents involved in light response yielded a water soluble extract that completely inhibited lettuce seed germination.

Tuber initiation studies suggest the phytochrome system is operative in potato development. Strains within varieties vary in response to photoperiod.

In 1963 as in 1962 CIPC and Mena effectively controlled tuber sprouting, reduced weight loss and after-cooking darkening of tubers held in common storage for one year. Fusarex was ineffective in sprout control as applied in this study. A fall foliar application of 3 pounds per acre of MH-30 in 1962 significantly inhibited sprouting, reduced weight loss and after-cooking darkening in tubers of Kennebec and Alaska 114. In 1963 the scope of the evaluation was enlarged to include 3 concentrations (0, 3, and 6 pounds per acre) and 3 application times (August 6, 12, and 19) of MH-30. Analysis of data shows that concentrations and time of application had no significant influence on yields of either variety. Effectiveness of sprout inhibition and other physiological responses will be recorded as the storage phase of this study continues until August, 1964.

Frost resistant clones from 1961 potato crosses were evaluated by several cooperating farmers. Although resistance was obvious, yields were not strikingly different from non-resistant varieties because the first frost (August 27) was late enough so that all made a fair yield. Shatter cracking continues a major deterrent in progenies with high frost resistance; 15 per cent of F_1 seedlings with one frost resistant parent failed to tuberize.

Seedlings from potato x (tomato x potato) crosses failed to tuberize. Cuttings of the hybrid rooted freely but cuttings of the frost resistant parent did not root. Instead they developed aerial tubers. One haploid F_1 clone was found that did not exhibit tuber dormancy. The Russians also claim to have such a clone.

VEGETABLES

Public interest in local vegetable processing plants continues. Since most freezer plants are based on commercial green peas, feasibility studies of production also continued. Several varieties exhibited sufficient quality and productivity to be competitive with commercial peas grown in other states. Freezer 37 was the earliest freezer type adapted to Alaska. Although Thomas Laxton types, including Freezonian, were early and of excellent quality, they were strongly indeterminate in growth and flowering habit. This resulted in a wide range of maturity when yields were sufficient to warrant harvesting by machine.

At a shear press value of 104, Freezer 37 produced 5155 pounds per acre of ungraded shelled peas, in sieve size 14/32" or above. Small Sieve Freezer, maturing a week later, had 53 per cent of its ovules in the 11/32 and 12/32" separation. Hyalite, maturing 5 days later than Small Sieve Freezer, was intermediate in ovule size. Perfected Freezer, 3 days later, was the last to be harvested. Midfreezer was prime 4 days after Freezer 37 but was considered unsatisfactory for freezing because of its light colored cotyledons. Results indicate a need for information on harvest dates as affected by planting date. Early maturing varieties that will withstand drought conditions appear best. Cooperative work with four farmers was begun to determine commercial performance of five freezer and two canner type varieties. High yields were obtained.

Further evaluation of 18 cabbage lines from the College breeding program confirmed that several possess a superior green color throughout the head, and that many are capable of standing in the field for 6 to 8 weeks without splitting. Tomato, sweet corn and cucumber improvement programs continued, with the promise of an early release of a cold tolerant field tomato that has exhibited superior performance in Alaska and Canadian trials. Clear plastic mulch again proved superior to black in improving yields of selected vegetables.

Replicated comparisons of recently released commercial vegetable varieties with current standards for Alaska up-dated basis for recommentations to farmers and gardeners. Superior seed yields were obtained from Limnanthes douglassi, a potential new oil crop.

Although the Tanana Valley is considered to have a severe winter environment, crown and root temperatures of field planted strawberries are sufficiently modified by snow cover so that little winter kill is induced, especially in those lines having indigenous germplasm material in their parentage. Even some commercial lines possessing much lower levels of winter hardiness may persist for several years. During the 1962-63 winter 94 per cent (12,318) of all transplanted

seedlings survived what appeared to be extremely severe conditions. During the 1963-64 winter the effect of a 6-inch snow cover will be compared with total snowfall on strawberry root and crown temperatures, and on subsequent survival and growth. Temperatures will be monitored with thermocouples. Current hybridization programs will provide an increase of chiloensis and glauca lines for expanding studies of their cold tolerance. Dacthal economically controlled chickweed, lambsquarter and spurry in field plantings.

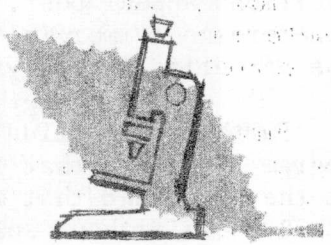
SMALL FRUITS

Survival of indigenous small fruits has been poor, with most success in establishing the material at Fairbanks. Rubus chamaemorus, Rubus idaenus, Fragaria chiloensis and Fragaria glauca species seem to be completely hardy. Several of the collections that earlier appeared to have survived the very severe winter of 1962-63 are now devoid of green foliage and will probably not survive the next winter.

Some of the chiloensis and glauca accessions have enough plants and characteristics are well enough known that these materials could be made available to interested small fruit breeders. These assessions are extremely hardy and are reported to be in the parentage of Sitka Hybrid, the hardiest known.

In addition to providing genetic material for sources of earliness and hardiness, further documentation of the presence of these useful species has been accomplished. It has been learned that the indigenous Vaccinium and Ribes species do not exhibit the type of hardiness that enables them to withstand winters common to cultivated areas in Alaska.

Plant Diseases



A relatively large field planting of virus x-free Kennebec potatoes again showed that this disease spreads very slowly under Alaska's environmental conditions. Interplanted with 100 infected Green Mountain tubers spaced every 20 hills only four of a possible 200 transmissions occurred (2 per cent). No symptoms could be detected in the foliage of adjacent plants; the presence of virus x appeared only in harvested tubers. Conventional seed cutting and preparation techniques failed to transmit the virus from one seed piece to another. There is some promise, therefore that virus-x free seed can be produced in Alaska with no more than conventional sanitary practices involved in growing table-stock. A special facility for winter production of Gomphrena was improved, enabling tuber indexing to proceed throughout the winter.

In arranging for winter test plantings in California -- a possible market for this material -- a great discrepancy was discovered between export and import shipping rates. Southbound freight charges may be so high that a favorable competitive position cannot be developed.

Total acreage plantings of certified seed were slightly less in 1963 than in 1962. Certified potato seed stocks for planting, however, are apt to be about the same because of favorable yields. Losses of grain due to high winds about harvest time severely reduced certified seed available for 1964 planting.

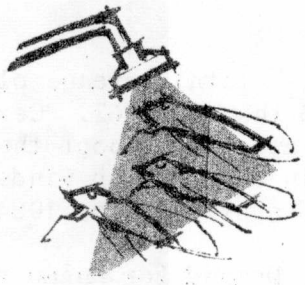
Demand for Engmo timothy continued strong. Seed requested by growers was sufficient to plant 400 acres. Because of contamination with Canada thistle, very little was released. Norway was contacted as a possible source of Engmo, but it was decided not to import from there because of the weed problems. There was little demand this year for Alaskland clover seed. Local seed sources are being sought as a possible means of satisfying demand.

Potato scab studies continued with efforts to mark at least one strain genetically so that it might be readily identified in mixed populations. Spores of S. scabies, the causal organism, germinate non-uniformly even under favorable conditions. While some germinate within 25 hours, others show no activity for a week or more. Stimulation by yeast extract fails to promote simultaneous germination. Delayed activity, while possibly significant in insuring survival may also offer opportunities for field control. S. scabies cultured in sterile extracts responded with stimulated growth to additions of both lime and sulfur, and by repressed growth to manure, potassium chloride, and ammonium sulfate. Sterile extracts of various soil materials differentially inhibited germination and growth of cultured S. scabies. Somewhat larger soil bacterial populations were found in newly cleared land compared with those of adjacent timbered sites. Cropping apparently maintains these population levels. Actinomycete populations expand when land is first cleared, then reduce as a field is cropped over a period of years. Fungal populations exhibited no increase with clearing, but decreased in older farm soils. Cropping newly cleared land to something other than potatoes avoids introducing scab during that period most favorable to its development.

Stemphyllium radicinum -- causal organism of carrot black-rot -- responds to light in pure cultures. An ether extractable thermostable inhibitory substance becomes effective when light is excluded. Inhibition of cultured colonies maintained for long periods at low temperatures in the dark continued after re-exposure to light. Stored at higher temperatures, colonies resume growth when re-exposed. No inhibition is noted in continuous light. Three phases of activity include seedling destruction caused by seed-borne inoculum, later crown infection by soil inoculum, and further root infection caused by secondary spread in storage. Over 15 tons of one lot of stored carrots (25 per cent of the harvested crop) was lost to S. radicium.

Home-owners in Fairbanks again lost much turf to snow-mold, Merion bluegrass appearing to be more susceptible than Newport, Common or Park. Other plant disease problems significant to growers were butt-rot of lettuce and pink rot of celery. Stemphyllium botryosum was observed on garden peas.

Insect Pests



BEES

High quality honey in good quantity can be produced in Alaska with proper management. The tree fruit and raspberry industry, limited as it is at present is dependent on insect pollination for fruit production. Legume seed production also depends on bees for pollination. A combination of native and introduced honey bees is needed as the native population is seldom large enough at the proper time. The use of leafcutters and honeybees can speed up production of adapted varieties as is now being done in the case of alfalfa.

Leafcutter bee, M. rotundata, was utilized in greenhouse alfalfa pollination in conjunction with honeybee hive. The M. rotundata activity was very heat responsive and appeared to be quite effective. They were more effective trippers than honeybees but required higher temperatures to be active. There appeared to be no antagonism between the two species. Frequent inspections of hives resulted in low swarming in spite of queens not being caged. Honey yields were better than in 1962. Edible fruited types of crab apples set no fruit without insect cross pollination.

PESTS

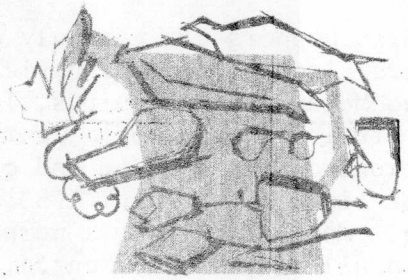
Root maggots are Alaska's most wide ranging and consistently serious insect problem. They are serious in all areas of Alaska in which members of the cabbage family can be grown. None of the crucifers can be profitably grown without insecticidal treatment. One treatment with approved insecticides will control maggots in short season crops such as radishes, but several treatments are required on other crops of longer growing season. At the present time no natural control agent such as parasites or predators are effective enough to keep the populations down as in the case of cutworms which are of only sporadic occurrence. Root maggot activity, emergence, and oviposition was late in starting but prolonged into the fall longer. Larvae were found feeding in October. In the untreated oviposition plot none of the brussel sprouts (Jade or Sutton Red) wilted from maggot feeding although part of all other crucifers wilted and died. In a control experiment in radishes, preplant treatment using General 4072, Telodrion, Diazinon and Trithion all gave good control. Application of asphalt emulsion to preplant treatments of diazinon and dieldrin gave no significant improvement over insecticide alone, although seed emergence was one or two days earlier in asphalt plots. None of the above listed materials gave season-long control on preplant treatment of turnips. Diazinon, Heptachlor, General 4072 and dieldrin gave over 50% maggot free turnip while chlordane, Trithion, Telodrin, and malathion gave low degree of control. In preliminary cooperative trial with Forest Service Research Lab, a neoplectanid nematode was found to attack root maggot larvae.

Grasshoppers are not only an occasionally serious local problem, they are also a source of basic biological information. This same species Melanoplus sanguipes, lesser migratory grasshopper, is also being studied in the North Central states under much different conditions of photoperiod and climate. Grasshopper numbers were largest since outbreak of 1953 and only a cool June prevented severe damage. More grasshoppers were found the first week's collection than in all of the 1962 season. Second instar nymphs were found May 27 to June 7; third from June 5-15; fourth-June 12 to July 1; fifth-June 20 to July 22 and first adults July 18 and last September 19. Mating occurred from July 19 to August 30th. Earliest collections of small nymphs were made in sage which they apparently use for shelter. Later stages in sage-grass mixtures. When young nymphs were caged in greenhouse with potted cabbage, broccoli, cauliflower, brome, timothy or bluegrass, they ignored it for about 24 hours before feeding but then fed and developed into apparently normal adults. Hordeum jubatum continued to be only oviposition site.

Cutworms were severe only in Hope area in vegetables and perennial ornamentals, some mature cabbage being injured. Springtails damaged seedling vegetables in Wasilla area, causing rejection of celery. Red turnip beetle continued serious in Kenney Lake in Copper River Valley. Onion maggot damaged set onions in truck garden near Seward. Slugs severely damaged potatoes near Seldovia, lettuce and cabbage in SE Alaska. Sitona scissifrons, a clover root weevil group, severely damaged alfalfa at College. Rhopalasiphum padi, the most effective barley yellow-dwarf vector, heavily infested birdcherries in Matanuska Valley, a likely source of local infection of this disease. Various insects were common on many nursery planted Oxytropus and Astragalus. Leaf miners (serpentine and blotch types) and petiole galls were common on willows and poplar in the Bettles area. Rose gall of willow was numerous in Valdez. Brown banded roach and German roach were common in Anchorage and Juneau areas. Book lice were numerous in households of Big Delta area. Some wood boring beetles emerged into homes from timbers, joists, and in one case, from a table leg imported from Japan. Stored products insects were found in package mixes throughout Alaska. During thaws blowflies emerged from hibernation, annoying households. Mosquitoes of several species were biting throughout the summer instead of ceasing in early July as usual. Greenhouse whitefly was found in many Palmer greenhouses as result of importation of one infected shipment by a commercial florist. Wooly aphids were especially numerous on alders and spruce in the Matanuska Valley. Sawflies defoliated alders in the Little Susitna Canyon area near Palmer.

An effective control of reindeer warbles is believed near. Control of reindeer warbles will not only increase value of hides but make reindeer easier to handle in summer months when egg laying by adult warbles agitate the deer. When deer are slaughtered in late winter or early spring there will also be less loss from trimming of meat due to presence of long larvae along the backs of the deer.

Marketing, Management, Economics



MILK

A consumer milk study was conducted at Fairbanks during May, 1963 to determine consumption patterns and attitudes. Four hundred households were included in the survey. Of 191 households who bought concentrate milk in preference to fresh local milk, 140 of the homemakers said the price of fresh milk was too high. Of households buying fresh milk, 126 said fresh milk was priced too high in relation to other foods. A fifth of the 1503 individuals included in the study drank no milk of any kind. Another 30 per cent were considered light milk drinkers (1 to 2 glasses per day). Only 49 per cent were classified as heavy milk drinkers (3 or more glasses per day). Only 29 of the 302 who drank no milk were under 20 years of age. Of the 302 who drank no nilk 211 were classified as heavy coffee drinkers (3 or more cups per day). Eighteen per cent of the 1503 people drank 6 or more cups of coffee daily. Income did not appear to affect purchases of butter as much as it did fresh milk. Forty per cent of the 226 families buying butter received less than $10,000 income. Of the 174 adult homemakers who drank no milk, 123 of them started drinking coffee when they were teenagers. The parents of 77 of these homemakers drank no milk when the respondents were children. This information will be useful in improving production, processing and marketing of milk products.

MEAT

A preliminary wholesaler and retailer study giving information on pricing practices, volume handled, and attitudes toward Alaska grown red meats has been completed in the Anchorage and Fairbanks trade areas. Preliminary results indicate that the per capita consumption of red meats in the railbelt is higher than the national 1962 per capita average. The estimated average railbelt per capita red meat consumption is 192 pounds compared to the national average in 1962 consumption of 164. Estimates of the total volume of the different classes of red meats were also obtained. They are lamb and mutton - 69,000 pounds, beef - 10,436,081 pounds, pork - 4,353,200 pounds, reindeer - 25,000 pounds, wild game - 7,400,000 pounds and other (including processed meats) 1,241,000 pounds. No significant amount of Alaska grown red meats are marketed at the present time. Most meat handlers indicated they would be willing to handle local meat products of acceptable quality standards.

Wholesaler and retailer studies will be useful to producers in planning marketing programs and expansion of the meat industry. Market structure information will be an aid in decision making concerning size, location, and cost of new facilities for processing meat animals.

Exploratory work to determine market potentials and alternative ways of developing and expanding the market for Alaska's agricultural

products was continued. A special study was conducted to up-date information continued in Marketing Research Report No. 385, "Marketing Milk in Alaska", 1957. The information obtained will be used to supply background data in support of efforts to establish a milk marketing order for Alaska.

Further work was done to investigate the economic feasibility of quick freezing vegetables produced in Alaska. Annual market potential is estimated at 250 to 500 tons. Research by horticulturists indicate Alaska can produce premium quality vegetables and small fruits. Development of a quick-freeze enterprise as an appendage to an already existing cold storage plant would appear most feasible. Small family size quick-freeze operations may be necessary in the initial stages.

MARKETS

A study to determine egg marketing procedures, consumer attitudes, egg consumption and egg quality was conpleted. Improved quality of imported eggs has reduced sales of local eggs. If Alaska producers are to maintain or take a greater share of the Alaska egg market they must improve egg quality and lower price. Per capita consumption of eggs was 406 eggs compared with a national average of 334 (1960).

Income and returns studies of 15 Matanuska Valley dairy farms, and selected dairies in the Tanana Valley and Kenai Peninsula continued. Factors reducing net income were marketing, surplus milk and competition from imported milk. Case studies of crop and livestock production costs, machinery utilization, labor requirements and management practices were started with individual farmers. Beef grading high good can be produced on native range and tame pastures without supplemental feed if proper grazing, slaughtering and handling practices are employed. A report on anticipated feed requirements and total costs of commercial beef production in the railbelt area is being prepared.

FARM OPERATION

The overall farm credit situation in Alaska has improved greatly in the last five years. More and longer term money is now available. Ample credit was available for established farmers but little money for new enterprises. A major problem facing lenders is to aid in the development of farming while observing the limitation imposed by market demands for local products. Lenders should place greater emphasis on improving production efficiency and reducing costs as means of increasing net income. There is a definite need for financial planning by farmers and lenders and reduction in piecemeal lending practices.

These studies have helped farmers find the strong and weak points of their business and make necessary management decisions and adjustments. Credit agencies have used information in developing better loaning practices.

A 1963 outlook report was published indicating trends and changes in costs, supply, and demand for each major product produced in Alaska. Costs continued to rise on most Alaska farms during 1963 with machinery, prepared feeds and concentrates, feed grains, labor and taxes leading the way. The continued shipping of fresh milk to Alaska from

the Pacific Northwest displaced local Class I Milk and reduced blend prices received by Alaska producers. Prices paid by local dairymen for milk cow replacements were higher than last year, averaging $415. Farm wage rates were higher (monthly wages paid with house furnished was $450 for a small number of workers). Those furnished room and board received around $365 per month, up $80 to $90 from a year ago. Hourly wages without room and board were $2.05. The historical series of prices maintained for commodities, i.e. farm supplies, foods, etc. was organized on a more systematic basis. Project leader cooperated with the state statistician in planning annual farm production surveys, seasonal reports and other statistical summaries. Information of this nature is used by agencies and individuals in appraising the agricultural situation and planning orderly marketing.

OUTLOOK

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FUR PRODUCTION

Over three million pounds of high protein meat products are wasted on the Pribilof Islands in the form of fur seal carcasses, a by-product of the U.S. Fish and Wildlife Service fur seal operation. A preliminary feeding trial was carried on with two groups of 50 young mink from September 26 to December 6 to determine any possible advantage in feeding this product to mink during the furring out season. A ration containing 25 per cent fur seal meat was compared to a similar diet in which 30 per cent chum salmon heads replaced the meat. Health was satisfactory in both groups, though three inferior cotton pelts developed on the all fish ration and one in the lot receiving the meat. Weight increases were very similar but the animals receiving the fish ration consumed slightly more feed. Fur quality was significantly better in the meat fed group. Female pelts from each lot sold for comparable prices but male pelts from animals receiving the meat brought nearly $2.00 more than those which had received the high fish diet.

MINK

Two new antioxidents (UOP88 and UOP288) were evaluated as a protective additive to mink rations, with resulting inferior production. A combination of BHT and vitamin E reduced steatitis incidence and improved mink fur quality.

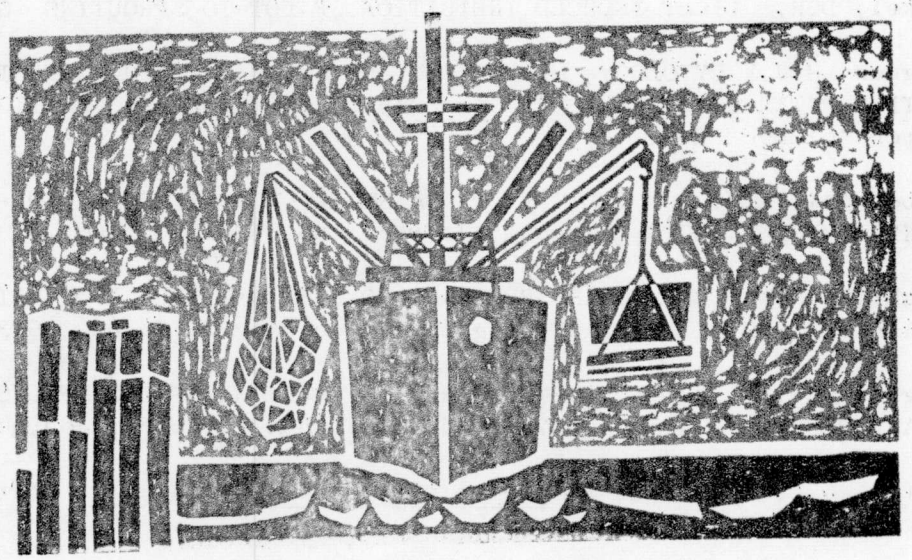
Reproduction of marten has been inconsistent and sporadic in attempts by public agencies or private industry to propagate these animals in captivity. Although the station herd is located in an area where wild marten are quite numerous, and diets have been perfected which insure good health, yet production has varied from none to one-half the mature female breeders. During the 1962 breeding season (which started July 3 and terminated September 12 only 9 matings were observed with 5 females though several pairs were left together unobserved for 24 hour periods. Next

MARTEN

April the actions of two bred females indicated the probability of their whelping, yet no young were born. This reduced breeding activity. Lack of any reproduction has only occurred once before at this station. In an attempt to instill more activity during the 1963 breeding season the amount of feed offered the marten during May and June was reduced by 35 per cent. Three wild-caught marten, one female and two males, were added to the station herd in January.

FOX

The addition of the antioxidant BHT (Butylated hydroxy tolune) to the diet of the station's small fox herd of 10 females during 1960 resulted in better production and furquality in 1961 with 8 out of 10 females producing a total of 33 pups whose pelts brought higher prices than the previous year. The same management and diet in 1962 resulted in 7 out of 10 females producing 49 pups, and pelts sold the following winter averaged nearly 25 per cent more in value than the 1961 pelts. No doubt, part of this increased value was due to greater interest in fox furs by the fur trade but it also indicated that the antioxidant was a beneficial addition to the diet. Eleven females were kept for breeding purposes in 1963. One did not come in estrus and another came in so late the males would not breed her. The remaining 9 bred a total of 18 times and 7 of them produced 36 pups. Inability to follow a planned herd improvement schedule because of the unwillingness of males to breed certain females has been a severe handicap in improving the fur quality of the station herd.



University of Alaska
ALASKA AGRICULTURAL EXPERIMENT STATION

March 2, 1964
Palmer, Alaska

New Publications

PRINTED REPORTS

Klebesadel, L.J. LAWN WEEDS IN ALASKA Bulletin 34, 32 pp, 3000 copies, illus.

Laughlin, W.M. et al FERTILIZER RECOMMENDATIONS FOR ALASKA Circular 13 revised 8 pp, 3000 copies

Reiger, Sam, et al SOIL SURVEY, FAIRBANKS AREA, ALASKA USDA Series 1959, Number 25, 1963 41 pages, maps, illus.

Saunders, A.D. FINANCING ALASKA'S FARMS Bulletin 35, 24 pp, 3000 copies

JOURNAL ARTICLES

Brundage, A.L. & W.J.Sweetman HAY VS SILAGE FOR TWO TO SIX MONTH OLD DAIRY CALVES WEANED AT 25 AND 60 DAYS Journal of Animal Science 22:429-431, 1963

Brundage, A.L. MEAT AND BONE MEAL AS A PROTEIN SUPPLEMENT FOR LACTATING DAIRY CATTLE Journal of Dairy Science 46:1081=1084, 1963

Brundage, A.L. et al GRASSES AND ALFALFA FOR ANNUAL FORAGE AND PASTURE IN SOUTH CENTRAL ALASKA Journal of Dairy Science 46:1260-1265, 1963

Dinkel, D.H. CHLOROGENIC ACID ASSOCIATED WITH PHYSIOLOGICAL NECROSIS OF POTATO TUBERS American Potato Journal 40:149-153, 1963

Dinkel, D.H. LIGHT INDUCED INHIBITION OF POTATO SPROUTING Science 141:1047 1963

Hodgson, H.J. CYTOLOGY, MORPHOLOGY AND AMINO ACID CHARACTERIZATION OF THE PUTATIVE INTER-GENERIC HYBRID, Agroelymus palmerensis, AND ITS PRESUMED PARENTS Crop Science , 1963

Klebesadel, L.J. and R.L.Taylor A SMALL, VERSATILE TRACTOR-MOUNTED DRILL FOR EXPERIMENTAL PLOTS Agronomy Journal 55:206-207, 1963

Laughlin, W.M. BROMEGRASS RESPONSE TO RATE AND SOURCE OF NITROGEN APPLIED IN FALL AND SPRING IN ALASKA Agronomy Journal 55:60-62, 1963

Laughlin, W.M. BROMEGRASS RESPONSE TO FALL AND SPRING APPLICATIONS OF THREE RATE OF PHOSPHORUS AND POTASSIUM IN ALASKA Agronomy Journal 1963

Wilton, A.C. VIVIPARY IN Bromus pumpellianus Canadian Journal of Botany 41:1645-1647, 1963

Washburn, R.H. A POTENTIAL HAZARD TO ALFALFA PRODUCTION IN ALASKA, Sitona scissifrona Say (Coleoptera, Circuleon idae) Journal of Economic Entomology 1963

PERIODICALS

Pownall, Paul ALASKA'S FARM PRODUCTION- 1963, 10pp, 4000 copies, annual

Marsh, C.F. QUARTERLY REPORT ON ALASKA'S FOOD PRICES, 2 pp, 7500 copies, quarterly

Sweetman, W.J. ALASKA'S DHIA NEWSLETTER, 2 pp, 450 copies, monthly

Logsdon, C.E. ALASKA'S CROP IMPROVEMENT NEWSLETTER, 2 pp, 200 copies, monthly

Marsh, C.F. ALASKA'S FARM OUTLOOK - 1964, 5 pp, 200 copies, annual

Mick, A.H. ALASKA FARM AND CONSUMER RESEARCH 1963, 50 pp, 400 copies, annual

Mick, A.H. RESEARCH PROGRESS REPORT, Crops Research Division, ARS-USDA, 12 pp

PROCESSED REPORTS

Dearborn, C.H. PRELIMINARY TESTING OF ADVANCED GENERATIONS (potatoes) 33rd Annual Report, The National Potato Breeders Program, 1962

Dinkel, D.H. POST-TRANSPLANT WEED CONTROL IN CELERY Research Report 19th Annual NCWCC, 1963

Klebesadel, L.J. et al A NEW LATE-SUMMER FORAGE SOURCE - COMMON RYEGRASS . . WITH . . OATS AND PEAS Forage Research Report 1, 7 pp, 1000 copies, 1963

Klebesadel, L.J. et al UTILIZATION OF NATIVE BLUEJOINT GRASS IN ALASKA Research Report 2, 4 pp, 500 copies, 1963

Klebesadel, L.J. MANAGEMENT OF NATIVE BLUEJOINT GRASS Forage Research Note 3A, 7 pp, 500 copies, 1963

Klebesadel, L.J. PLANTS OF ALASKA POISONOUS TO LIVESTOCK II. Water Hemlock miscellaneous report, 7 pp, 1000 copies, 1963

Schubin, James MARKETING EGGS IN ALASKA miscellaneous report, 27 pp, 500 copies

Washburn, R.H. ALASKA INSECT SITUATION, Cooperative Economic Insect Report, USDA

PROCEEDINGS

Allen, E.K. et al THE NODULATION SCOPE OF ARCTIC AND SUBARCTIC LEGUMINOUS SPECIES AAAS Science Conference, 1963

Branton, C.I. A PROPOSED TECHNIQUES FOR MEASURING RELATIVE HUMIDITY AT BELOW FREEZING TEMPERATURES International Symposium on Humidity and Moisture, Washington, D.C., 1963

Branton, C.I. ENGINEERING PRINCIPLES AND THEIR RELATION TO HOUSING MATERIALS IN SUBARCTIC ENVIRONMENTS American Society of Agricultural Engineers, Portland, Oregon, 1963

Hodgson, H.J. TURFGRASS RESEARCH IN ALASKA 14th AAAS Science Conference, 1963

Laughlin, W.M. EFFECT OF MANURE AND PHOSPHOBACTERIN ON GOLDEN RAIN OAT GROWTH AND YIELD 14th AAAS Science Conference, 1963

Logsdon, C.E. THE CHALLENGE OF CIRCUMPOLAR BIOLOGICAL RESEARCH 14th AAAS Science Conference, 1963

Mitchell, W.B. & H.J.Hodgson CAUSES AND EFFECTS OF HYBRIDIZATION IN ALASKAN GRAMINEAE 14th AAAS Science Conference, 1963

Washburn, R.H. DISTRIBUTION OF BUMBLEBEES AND THEIR SOCIAL PARASITES IN ALASKA 14th AAAS Science Conference, 1963

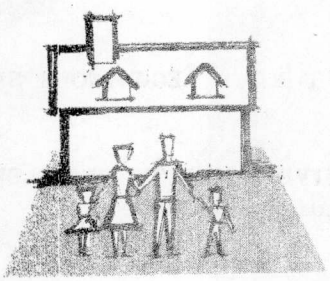
Wilton, A.C. TAXONOMY AND CYTOGENETICS OF A TETRAPLOID BROMEGRASS FOUND IN WEST-CENTRAL ALASKA, 14th AAAS Science Conference, 1963

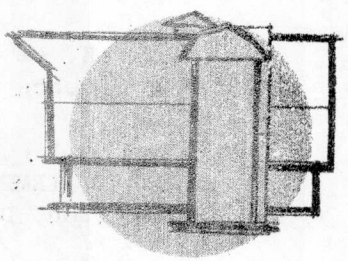
Wilton, A.C. BREEDING OF FORAGE GRASSES IN ALASKA 14th AAAS Science Conference, 1963

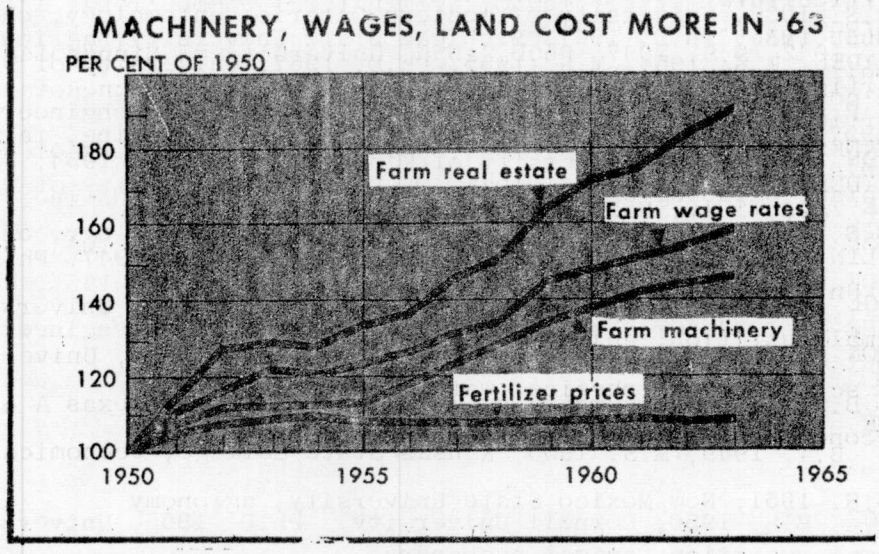
Aamodt, O.S. NORTHERN AGRICULTURAL RESEARCH 14th AAAS science Confenence 1963

Hodgson, H.J. EFFECT OF PHOTOPERIOD ON THE DEVELOPMENT OF COLD RESISTANCE IN ALFALFA 14th AAAS Science Conference, 1963

Klebesadel, L.J. ECOLOGIC AND GEOGRAPHIC RELATIONSHIPS IN THE DISTRIBUTION OF ALASKA'S INDIGENOUS LEGUMINOSAE, 14th AAAS Science Conference, 1963






MACHINERY, WAGES, LAND COST MORE IN '63
PER CENT OF 1950
180
160
140
120
100
1950
1955
1960
1965
Farm real estate
Farm wage rates
Farm machinery
Fertilizer prices

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WILLIAM P. SPENCER B.S. 1961, University of Delaware, M.S. 1963, University of Nevada, agricultural economics

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University of Alaska
ALASKA AGRICULTURAL EXPERIMENT STATION

March 4, 1964
Palmer, Alaska

Replaces list of
September 24, 1963

Experiment Station Projects

		Approximate termination date
20	Improvement of milk production through crossbreeding	Feb 66
34m	Markets for Alaska's agricultural products	Jun 65
41	Forage crop production	Jan 66
43	Mutagenic agents in forage crop improvement	May 65
50	A superior strain of blue fox	con
51	Marten mating systems (for) ... regularity and prolificacy	con
52	Diets for fox, mink, and marten	con
53	Influence of potassium fertilizers on Alaskan crops	Jun 64
62	Two management systems ... (for) heifers raised in Alaska	Feb 64
74r	Indigenous rubus, ribes, vaccinium and fragaria	Feb 64
75	Emergency insect control measures	con
81	Improving dairy production by crossbreeding	Feb 69
82m	Pathogenic decomposition of stored vegetables	Mar 64
83	Emergency disease problems	Jul 64
94	Improved pasture management	Jul 64
97	Cereal production in Alaska	Jul 64
101	Frozen semen for Alaska's dairy industry	May 65
103	Climate related to plant response in the Matanuska Valley	May 65
107r	Some factors influencing ... grasshoppers	Jun 65
109	Characteristics of subarctic solar energy	May 66
112r	Water infiltration rates	Mar 65
113	Costs and management of irrigation systems	Jan 64
114	New cereals for Alaska	Feb 66
115	New forages for Alaska	Feb 66
116	Alaska's potato virus dispersion rate	Mar 66
117	Response of potatoes to a subarctic environment	Mar 65
118	Herbicides for Alaska's horticultural crops	Mar 64
119	Life cycle of H. florialis ... and improved controls	Mar 64
120	Frost resistance foliage for Alaska's potatoes	Mar 66
121	Indigenous forage plants of Alaska (Rockefeller)	Mar 64
122r	Loose housing for Tanana Valley dairies	Jun 64
123	Response of vegetables to Alaska's subarctic environments	May 65
124	Progressive economic analysis of Alaska's farms	May 64
125	Heat loss through various walls	May 64
126	Maintaining and expanding markets for dairy products (ES 832,$5000)	Jun 65
127	Nature of winter survival in Alaska's fragaria	May 65
128	Systemic treatments to control reindeer warbles	May 65
129	Alaska's turf grasses, breeding physiology, seed production	May 67
130	Improving the efficiency of Alaska's insect pollinators	May 65
132	An improved dairy calf ration for Alaska	Oct 65

133r	Temperature studies of agricultural areas ... in Alaska . . .	Oct 67
134	The economics of marketing Alaska's red meats (ES 841, $5000)	May 66
135	A processing plant for Alaska's meats and vegetables	pend
136	Soil productivity and fertilizer practices	May 68
137m	Analysis and interpretation of ... statistics	May 66
138	Potato scab, its circumpolar distribution and variability . .	Jun 66
139	Value of Alaska's forages ensiled at various stages	Jul 68
140	Weed control in Alaska's cereals and forages	Jul 68
141m	Utilization and storage of Alaska's grains	Jul 67
143	Crop improvement in Alaska	con
144m	Prolonging the marketing period of stored Alaskan potatoes .	Sep 66
145	Date of harvest as a factor in marketing canning peas	Sep 66
146	Minimum tillage	Aug 67
147	Collection of indigenous grasses for use as forage or turf .	Aug 68
148	Recreation -- a market for Alaska's farm(ers)	pend
149	An economic analysis of Alaska's transportation services . . .	pend
150	Measurement of light quality of the natural spectrum (NIH) . .	Sep 66
151	Permafrost recession related to cropping practices in Alaska. .	pend
152	Utilization of wet barley in dairy rations	pend
153	Physiology of flowering grasses important to Alaska	pend