Alaskas Agricultural Production Potential: An Economic Analysis
by Wayne Eugene Burton

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY in Agricultural Economics
Montana State University

Abstract:
This thesis is concerned with the reasons why Alaska's agricultural industry has remained relatively undeveloped and with possible alternative directions that the industry might take in accelerating its rate of growth. The general hypothesis of the study is that some agricultural production is economically sound, and an economic opportunity for further growth exists.

Chapter 1 is a general description of the Alaska agricultural development problem situation in its general socio-economic setting. Chapter II is a review of agriculture development at the present times Chapter III explains the goals and objectives, as they have been interpreted, for development of the agricultural industry for both Federal and State levels of government. Specific emphasis is placed on Federal goals within the National interest and State goals within the State's interest.

Chapter IV treats Alaska agricultural development in terms of philosophical and theoretical aspects of an undeveloped agricultural region where many of the institutions and agency services of a highly developed society are directly or indirectly provided.

Chapter V provides a descriptive profile of partially developed segments of the production sector of the industry. Costs of production data are provided for a number of agricultural products.

Chapter VI discusses resources available, yield potentials by land capability class, projected demand for agricultural products that can be grown in Alaska, and potential production expansion for a limited number of products.

Chapter VII summarizes the salient points discussed in the study.

The conclusions of this study are that opportunities for agricultural expansion and growth do exist. Economic input-output relationships for farm production indicate the opportunity for moderate continuing growth. In order to achieve this growth, non-divergent objectives, policies and programs that are conducive to agricultural development and growth of an agriculture industry in a "modern frontier" situation must be pursued. Active public participation is necessary in development activities but as yet procedures and sequences of implementing all facets of new lands settlement and agricultural growth and development in such a situation do not appear to be well understood.

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130

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August, 1968

ACKNOWLEDGEMENT

The author wishes to express his appreciation to the Committee which provided guidance and encouragement in preparing the manuscript, Dr. Dana Myrick, Chairman, Dr. Charles H. Rust, Dr. Walter G. Heid, Dr. Clarence W. Jensen, and Dr. William Lassey. Particular thanks are extended to Mrs. Dorothy Thomas for her cheerful patience and persistence in typing and caring for the many details of final assembly of the thesis.

A special acknowledgement is extended to the Alaskan farmers who gave so generously of their time and information; Mr. Blaine Holliday, State Conservationist, S.C.S. who provided data and a continuing encouragement; the many Alaskan Agricultural Agency people who have vigorously pursued solutions to Alaska's agricultural development problems; and the Alaska Agricultural Experiment Station for providing the opportunity to study a number of facets of agricultural firm development. A special acknowledgement is also extended the University of Alaska for granting a nine-months leave-of-absence to the author to prepare the thesis.

A very special acknowledgement is extended to my wife, Vivian, for her patient and enduring confidence and encouragement, without which the task would have been infinitely more difficult.

Finally, I wish to express my thanks to Dr. Clarence W. Jensen for his friendship, and understanding patience that made the completion of the task possible.

Although much of this study is based on the contributions of many other people, any errors or deficiencies in thought or preparation are entirely the responsibility of the author.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

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CHAPTER I

INTRODUCTION

> "Agriculture is a relatively small part of the Alaskan economy ... and is an industry in crisis. The general condition of agriculture in Alaska can be expressed simply. The State today produces less of its food supply than any other state in the Union, even though it has only 250,000 people to feed and 586,400 square miles of land on which to grow its food supply ... At no time has it produced more than 8 per cent of the food products consumed by its people." 1/

The Problem Situation

Alaskans, and the nation, are now facing a critical question: "What is the future of agriculture in Alaska and what direction should it take if it is to develop?" The agricultural industry is small by any standard and has been described as an industry that is chronically depressed. Production has been dropping for several years. New entry into the production sector of the industry is at a virtual standstill. An intermediate marketing structure for most agricultural products is conspicuous by its absence. Present production is inadequate to support processing facilities for any product other than milk. Efforts must be made to salvage human and capital resources for more productive uses; however, if the industry is to survive and expand, careful consideration must be given

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1/ Douglas N. Jones, "Alaska's Economy - The State of the State." Alaska Review, Alaska Methodist University: Anchorage, Vol. II, Number 3, page 20, Fall and Winter, 1966-1967.

adjustments that will encourage and stimulate development in those areas where greatest opportunities lie.

Seven decades of experimentation have provided some of the production information needed for agricultural development. A lesser number of decades of effort and experience by various agricultural agencies has provided most of the services available to agricultural producers elsewhere in the continental United States. However, many development problems still exist that are both extensive and diverse in nature. The lack of formulation and expression of a comprehensive policy for agricultural development in Alaska has allowed continuing diffusion of research and agency efforts that, while adding to the "storehouse of knowledge", contributed little to the ongoing development of the agricultural industry. Agricultural research has been too fragmented in its relation to Alaska development problems. Agricultural extension has been without the research support needed for development programming and has exhibited little interest in developing programming that would elicit such research support. There has been no university curriculum that provided a disciplinary focus for inquiry into socio-economic problems of agricultural development within the state.

Federal homestead policy in Alaska has done little to bring about an orderly transfer of land from public domain to private agricultural use. Few agency programs have been oriented to the

"problems" of agricultural settlement and growth. An often repeated response to questions regarding agricultural development may be summarized: "Farm and agricultural marketing firms will spontaneously arise when and where the need exists." The complete burden of gathering the unlabeled threads of farm and market development has been left to the interested individual, who in most instances has attempted to weave all facets of production, processing and distribution into a single firm structure.

Territory to Statehood: Goals, Objectives, and Policies

Alaska was subject to a fairly typical colonial pattern of natural resource exploitation, military establishment, and emphasis on adequate population for service and supply of the federal establishment from purchase in 1867 until statehood in 1959. Goals, objectives, and policies throughout that period were typically described as "for the good of the Nation," and justified in terms of the colonial status of the territory. According to Cooley, the period was characterized by an appalling lack of essential information about the region's lands and resources and the absence of coordination among the numerous federal agencies with major responsibilities in Alaska. Numerous recommendations were made during territorial days regarding a long range integrated plan for development of the region.

These recommendations went unheeded and National policy toward Alaska continued to drift with the shifting winds of politics. 2/

When Alaska attained the status of a sovereign state, with the prerogatives and responsibilities of such a status, certain changes occurred with regard to goals, objectives, and policies. The sovereign state of Alaska was immediately faced with the need for developing or improving a full range of social, economic, and political institutions, programs, and services in response to the desires of the people within the state. Development of Alaska, as a sovereign state, had a far more critical time priority than development of the territory of Alaska. The criterion of evaluation changed to "for the good of the State and the Nation." Priority was assumed to be given the State in those areas where the State had prerogatives and responsibilities to its people. Federal programs and policies retained their position of dominance where National interests were presumed to be at stake. The transition from federal territorial status to that of a sovereign state was not without its problems. Proprietory interests of existing agencies were slowly and grudgingly relinquished in many instances, if at all. Agriculture has generally remained under the domination of a strong proprietory position of policy determination by the U. S. Department of Agriculture. The lack of agricultural development has continued from territorial days.

2/ Richard A. Cooley, Alaska, A Challenge in Conservation, The University of Wisconsin Press: Madison, Milwaukee and London, 1966, pp. 108-111.

There is a consensus that agricultural development has not responded adequately to the input of public resources over time. During the recent period while Federal and State agricultural agency appropriations have steadily increased, farming has steadily declined both in numbers of farmers and in total volume of agricultural products. The Federal Field Committee for Economic Development Planning for Alaska 3/ summarized the consensus in a Presidential Report:

> While it finds an acute awareness of the immediate problems of the farmer and the principal producing areas, it also finds an almost total lack of the type of economic analysis that would permit an accurate assessment of the long-range potential for food production in Alaska. Nor does it find any systematic search for new and novel methods of production in northern regions as distinguished from research into products which can grow and mature in such regions ... Farming in Alaska is still in a primitive state of development, faced with serious economic and climatic roadblocks ... Federal and State governments might then follow one of two courses in their future involvement. The first course would be a continuation of the present yearly investment of men and money by the Federal and State

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3/ The Federal Field Committee for Economic Development Planning in Alaska was established by Executive Order 11182 dated October 2, 1964. The Field Committee is responsible for developing coordinated plans for all federal programs that contribute to economic and resource development in Alaska. It was directed by the executive order to cooperate with the State of Alaska in surveys and studies. The Committee established task forces for each of the industries in question made up of representatives of all Federal, State and local agencies along with interested individuals. A more complete discussion of the Committee and its activities may be found in Cooley's, Alaska, A Challenge to Conservation, University of Wisconsin Press: Madison, Milwaukee and London, 1966, pp. 111-117.

governments, consisting of product research, experimentation, loans, statistical compilation, dissemination of new scientific information and other normal government assignments. These activities, diligently carried out by several Federal and State offices, have certainly aided the farmers and farming in general over the past few years; but as we previously noted, the competitive odds faced by these efforts have meant a slowly losing battle.

A second possible course of action might be gradual withdrawal of the Government's agricultural activities to a minimum degree of involvement. This position would recognize that further agricultural programs and efforts are expenditures whose success are so questionable that they should not be made.

The committee concluded that an analytical review of the current status and future potential for agricultural development should be carried out.

The Federal Field Committee's Agricultural Task Force carried on extended discussions and worked on preparation of a report on the agricultural situation in Alaska. A number of preliminary papers were prepared, but to date no final report has been compiled since the project was put in abeyance when a cooperative agreement was developed between the University of Alaska and the Economic Research Service, United States Department of Agriculture. One preliminary report was prepared by an E.R.S. consultant, a second report was prepared by the Institute of Social, Economic and Government Research, University of Alaska. The first report was primarily concerned with the opportunity for processing firms to develop in the current economic environment. The second placed primary emphasis on a preliminary review of the present situation within Alaska's agricultural industry.

The continuing study and development of Federal and State goals and objectives for general economic development has placed a strong emphasis on the need for critical study of each of the industries that go to make up the Alaskan economy. Since agriculture is currently a minor industry in the State, it is necessary to explore its future potential in overall economic development planning. Future Federal and State goals and objectives with respect to agriculture may necessarily be quite different if viewed in terms of overall economic development goals and objectives and the necessary plans and programs required to accomplish them, than in the past where apparently the only considerations were how agriculture could support military needs or what effect Alaska agriculture might have on other regional "surpluses". It is in light of this possible change in goal structure that a critical need exists for a comprehensive evaluation of the current status and future potential for agricultural development in Alaska.

Historical Perspective

> The pendulum of opinion about what Alaska is or can be has swung wildly back and forth from optimism to pessimism during the 100 years since its purchase; and today one still finds many contrasting views about this land and what the future may hold for it. The differences spring in part from the differing philosophies, desires and yearnings of the people who have come north to populate Alaska, but they also reflect its enormous size and the great diversity of its natural and physical features, which make generalizations about the future extraordinarily difficult. 4/

4/ Cooley, op. cit., p. 8.

There is little from previous frontier experience in agricultural settlement with which to compare Alaska. Alaska differs in many important respects. The people who first came to Alaska were not looking for permanent locations, they came to get rich quickly - if possible - and were looking back over their shoulders to "home". Alaska's location in the northern latitudes, with its severity of climate, locational isolation, and transient population is in dramatic contrast with the westward pioneer migration. Much of what had been learned from those early pioneer settlements had to be painfully unlearned in Alaska.

The State's great land area stimulates perennial dreams of agricultural development, and at the same time stirs virilent criticism of the rate and form of development. The clarion cry of "The Last Frontier!" along with the image of vast areas of unoccupied land has stimulated preconceptions of grandeur that continue to haunt the individual who wanders through the morass of problems resulting from the physical and economic conditions of Alaska in the Twentieth Century.

Dreams of agricultural development are not new in Alaska. Early reports relate accounts of cattle being brought to Unalaska and Kodiak Islands as early as 1795. One report indicates that a Russian trading company kept a herd of some 300 cattle on Kodiak Island from 1795 until 1868. Cattle production was in progress at each of the principal Russian settlements when the United States purchased the

territory from Russia. Only limited mention was made of vegetables and grain production in the Russian settlement records. 5/ With the United States' acquisition of the Alaska Territory, it truly became "Seward's Icebox" in terms of agricultural interest and development.

> On October 24, 1867, just six days after the Alaska acquisition was officially consummated, the Secretary of the Interior announced that any attempt to claim lands in the territory under the land laws of the United States would be considered illegal; intruders would be removed by military force if necessary. 6/

Some thirty years elapsed before public lands could be entered and patented for purposes other than mining. Not until 1897-1898 did official Washington begin to recognize food production possibilities in the territory of Alaska.

During the summer of 1897 a party headed by Walter H. Evans of the Office of Experiment Stations, Washington, D. C. made a preliminary survey of Alaska. Their report was sufficiently encouraging that a second survey was made in 1898. Cattle, sheep, vegetables and forage crops were found in the coastal areas and to a limited extent in the Yukon Valley. Vegetables were found growing as far up the Yukon Valley as Circle City. The beginning of "organized agriculture" was to come about with the establishment of experiment stations in the territory. Stations were located at Kodiak and Sitka in 1898, Kenai

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5/ H. H. Bancroft, History of Alaska 1730-1885 (New York: Antiquarian Press, reprint 1959).

6/ Cooley, op cit., pp. 18-22.

on the Kenai Peninsula in 1899, Rampart on the Yukon River in 1900, Copper Center in the Copper River Valley in 1903, Fairbanks in the Tanana Valley in 1906, and Matanuska in the Matanuska Valley in 1915. Work was immediately begun at each of the stations to investigate conditions peculiar to that area. Much of the work done at these early stations was of a pioneering nature, a mixture of manual labor interspersed with scientific work. Researchers, combating vagaries of weather in an unknown land, carried on continuous testing of plant materials. While some stations carried out extensive hybridization of plant materials, others concentrated on livestock in a continuing attempt to develop genetic stock suited to the Alaskan environment. 7/ Work initiated at the early stations has been continued with varying degrees of emphasis and intensity.

Disenchanted gold seekers and hungry miners found the opportunity to raise vegetables and horse feed during the gold-rush period. A limited number developed agricultural homesteads. Further homesteading was encouraged by the construction of the Alaska Railroad. World War I, however, provided the stimulus for an out-migration which severely decimated the ranks of Alaska's "farmers". The Alaska Railroad initiated an agricultural settlement program during the late 1920's with little success. The Matanuska Colony settlement of 1935 was the first concerted effort in agricultural settlement in Alaska.

7/ G. W. Gasser, A Brief History of Agriculture in Alaska, Unpublished Mimeograph.

World War II provided a stimulus for interest in food production, but it was not until the influx of veterans in the post-war period that interest was translated into efforts in agricultural development. Homesteading rose to a turmoil of activity, only to be confronted with the brutal economic facts of life. The romanticism of free land and a cottage in the wilderness soon took on the drudgery of a "boot-strapping" homestead with limited markets, even more limited credit and a very primitive agricultural environment. One circumstance that was generally overlooked was that of timing. Even though people were looking "to get away from it all," or wanting to "pioneer new lands," or following the allure of "free land" or perhaps just wanting "a piece of ground of their own", they were not conditioned as were their grandfathers to the hardships of pioneer homestead settlement. They were social creations of the abundant life of the mid-Twentieth Century. Good roads, schools and close neighbors, modern homes, nearness to trading centers and other manifestations of the good life were taken as a matter of course. The meager life of a pioneer homesteader and the social problems of isolation were beyond comprehension and generally resulted in disillusion and abandoning the homestead for a job "in town" or to go back "outside." The social and psychological stresses were more than many could bear.

Although infusions of institutional credit during the 1950's and early 1960's aroused new hope for agricultural development, an exodus

of "homestead farmers," that started during the 1950's, had also included many established farmers by the mid '60's. The 1964 Census of Agriculture preliminary reports show only 382 "farmers" in the State and, if a definition were used that better reflected the stages of farm development, one would find some one hundred farms producing agricultural products for commercial sale, the remainder being "agricultural homesteads" in varying stages of development.

The Research Problem

The research problem is concerned with the competitive posture of present agricultural producers in Alaska and the future potential for developing additional farm firms in various geographic areas. The problem has a number of distinct facets: (1) availability of productive resources, (2) physical production potential by geographic area, (3) competitive posture of present farm firms, (4) future production potential within the framework of Alaska's economic and physical environment, and (5) social, political, and economic institutions that structure development of farm firms.

The specific problem of the study is to appraise the future of the production sector of the agricultural industry in Alaska and then evaluate possible alternative directions that the industry might take in terms of alternate development goals and objectives. Specific objectives of the study were: (1) to review past agricultural development in terms of resources available, past settlement efforts

and resulting farm units, problems of and obstacles to farm development, and the scope of markets available to Alaska's producers; (2) to determine how Alaska's agricultural resources might be organized and combined to more successfully compete in potential in-state markets, under various development alternatives; and (3) to focus attention on problems and possible solutions for developing farm firms in Alaska's sub-arctic and modern "frontier" economic environment.

Hypothesis

Some agricultural production in Alaska is economically sound, and an opportunity for further economic growth in agriculture exists.

Assumptions

Three major assumptions were made at the beginning of the study. They were: (1) there is to be an agricultural industry in Alaska with some degree of diversification; (2) parameters of the study were to be production of agricultural crops sufficient to meet domestic food and indirect feed requirements; and (3) disregard the competitiveness of non-agricultural industries for investment capital.

Procedure

Data for the research effort were collected from a considerable number of primary and secondary sources. The first phase of the study involved two steps. The first step was the collection of published and unpublished data regarding many phases of agricultural development within the State. Available data were reviewed to develop an under-

standing of the historical background, the sequence of development efforts, and actual development results.

The second step was an attempt to develop an understanding of attitudes, ideas, and opinions of people within and outside the State regarding needs of and potentials for agricultural development in the future. 8/ The topic was discussed with farmers, agricultural agency representatives, non-agricultural oriented persons and other interested people. Active participation in the Federal Field Committee's Agricultural Task-Force and the University of Alaska - Economic Research Service, U.S.D.A. agricultural study group provided additional insight and understanding regarding the urgency of the problems, and an appreciation for the conflicting and divergent opinions that exist regarding philosophies, goals and objectives for the many people and agencies that are involved in the many phases of agricultural development within the State. It was through these initial efforts that a perspective of the problem was formed.

The second phase of the study is a systematic organization of available data regarding geographic distribution of available land resources, historical production records of crops and livestock, information regarding production potential for individual crops,

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8/ R. J. Hildreth and E. L. Castle, "Identification of Problems", in Methods of Land Economics Research, W. L. Gibson, Jr., et al., eds. (Lincoln: University of Nebraska Press, 1966), p. 23.

population records and population projections, as well as estimates of consumption of applicable agricultural crops both present and future. Farming areas were tentatively identified as crop reporting districts used by the Alaska Crop and Livestock Reporting Service and further refined by use of Soil Conservation Service soil survey maps. Statistical data regarding numbers of commercial and noncommercial farm units were drawn from the 1964 Census of Agriculture since the geographic areas were directly comparable to crop reporting districts. Investment, costs and income data from the Alaska Experiment Station were used to supplement other available data in reviewing the current status of the production sector of the agricultural industry.

Soil survey data were obtained from the Soil Conservation Service, corresponding to the delineated farming areas where available. Information regarding crop production potential by geographic area was obtained by a group interview with soil scientists, agronomists, horticulturists, agency representatives, and farmers. Investment, cost and income data as well as enterprise cost data were obtained by individual interviews in a number of farm surveys. Production statistics were obtained through cooperation of the Alaska Crop and Livestock Reporting Service and the State Division of Agriculture. Population projections were obtained from a number of sources. Statements of Federal and State goals and objectives regarding agricultural development were obtained through personal discussions and by extrapolation from published statements and articles.

The third phase of the study is a compilation and review of investment, cost and income studies for various types of crop and livestock production units. Wherever cost of production data were available, they were used to develop budgets in a common format. Where data were either not available or incomplete, budgets were developed through synthesis. As the various budgets were developed, statutory and policy limitations to firm development were studied to determine how serious the limitations had been and what expansions might be expected if limitations were relaxed. Due to geographic and climatic differences within Alaska, only those crop and livestock enterprises deamed appropriate for the particular geographic area were considered.

In the fourth phase of the study, emphasis is directed to potentials for future agricultural development. This phase is developed in four steps. The first step is the development of an inventory of the land resource availability and capability for agricultural production by geographic area. The second step is a projected demand for agricultural products that can be grown in Alaska. The third step is the development of estimates of expected farm firm investments, costs of production, and possible revenues under various firm development alternatives. Estimates are made for expanding existing farm units and developing new farm units on unused land in current farming areas, or developing new farm units on

uncleared raw lands. The fourth step is estimations of probable production expansion for various products under different development alternatives.

The fifth and final phase of the study was an appraisal of probable agricultural development within the framework of alternative goals and objectives for agricultural development, and to project conclusions of the author regarding possible changes in philosophies and policies, research and programs, regarding agricultural development that might facilitate agricultural settlement and development.

CHAPTER II

AGRICULTURAL DEVELOPMENT IN ALASKA

Alaska agricultural development 9/ has been slow and erratic. The percentage of successful farming attempts has been very low.

> During the past 65 years, 3,253 homesteads have been patented in Alaska, including 394,000 acres. Twelve percent of all homesteads patented are currently used for farming. Approximately one thousand are used only for residences, the remainder lay idle. 10/

Settlement attempts that didn't reach the stage of patent are not included; nor are those that have been multiple attempts on the same parcels of land.

Development has been sporadic with interest in farming developing in intermittent surges. The gold rushes and construction of the Alaska Railroad resulted in more than 100 farms in the Tanana Valley, having 1,764 acres of cultivated crops, (Figure 1). However, after the stimulus of mining and construction of the railroad

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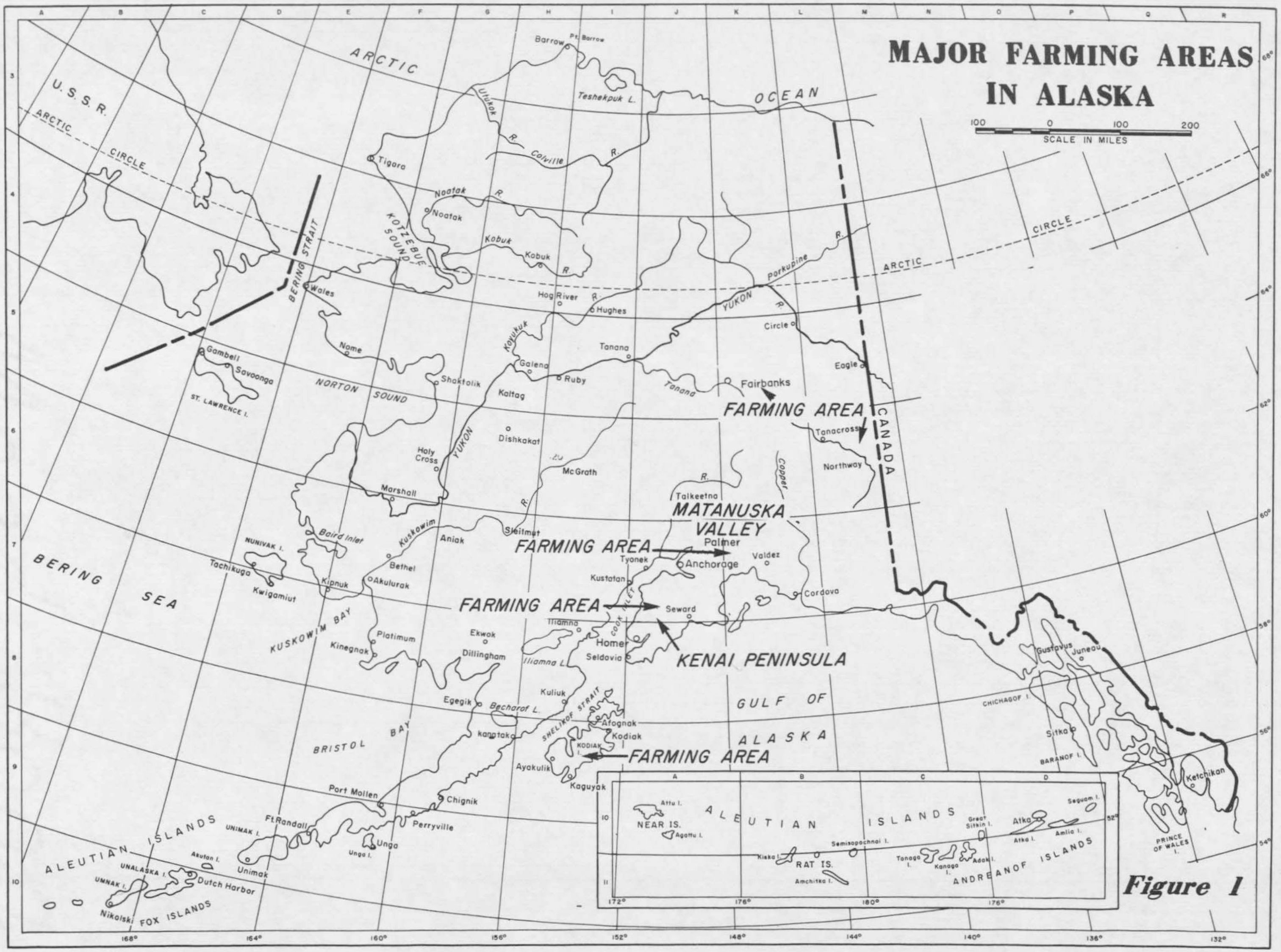
9/ Agricultural development in Alaska may be construed to include increased numbers of farms, increased production of agricultural products, additional processing and distribution firms and functions, and agricultural production increases in relation to overall population growth within the state as well as growth and development of related institutions.

10/ James W. Matthews, Alaska's Population - With Reference to the Relationship of Population to its Agricultural Economy, unpublished paper prepared for the Alaska Agricultural Task Force, July 1, 1966.


MAJOR FARMING AREAS
IN ALASKA
100 0 100 200
SCALE IN MILES
ARCTIC OCEAN
U.S.S.R.
ARCTIC CIRCLE
BERING STRAIT
KOTZEBUE SOUND
NORTON SOUND
BERING SEA
KUSKOKWIM BAY
BRISTOL BAY
GULF OF ALASKA
CANADA
FARMING AREA
Fairbanks
MATANUSKA VALLEY
FARMING AREA
Palmer
Anchorage
FARMING AREA
Seward
KENAI PENINSULA
Homer
Kodiak
FARMING AREA
Barrow
Nome
Tanana
Ruby
Galena
McGrath
Bethel
Valdez
Cordova
Juneau
Sitka
Ketchikan
Dutch Harbor
ALEUTIAN ISLANDS
Figure 1

had dissipated, agriculture languished until, by the 1930's, not more than five or six men were still farming. 11/ Interest was renewed after World War II until more than 100 families were attempting to farm in the early 1950's. By the early 1960's farming had started another sharp decline in the area.

Interest in the Matanuska Valley reached its initial peak during the 1915-1917 period with some 400 settlers in the valley. Nearly all land was homesteaded at that time. 12/ As in the Tanana Valley, agricultural interest dissipated after construction of the Alaska railroad until the Matanuska Colony settlement in 1935. The post-war period brought another sharp increase in interest which remained, with varying intensity, until the mid '60's, at which time the agricultural situation appeared to become static. Agency representatives reported no inquiries about farming opportunities or new agricultural loans.

The Kenai Peninsula received its strong impetus of interest in settlement after the completion of the Sterling Highway which provided a link with Anchorage. Settlement activity was strong during the late 1940's and 1950's but agricultural activity declined very rapidly during the 1960's until very few farms remained by late 1967.

11/ Hugh A. Johnson, Present and Potential Agricultural Areas in Alaska, A.A.E.S. Bul. 15, pp. 12-16.

12/ Hugh A. Johnson and Keith L. Stanton, Matanuska Memoir: The Story of How One Alaska Community Developed, A.A.E.S. Bul. 18, pp. 28-29.

Other areas have had similar spurts of interest which died out when market systems and facilities did not develop and speculative values of land did not materialize as expected.

Population growth has far exceeded agricultural development during the past decade.

> . . . when measured against the spectacular expansion of local Alaska markets for agricultural products as indicated by population growth, it is clear that this category of economic activity (commercial agriculture) has fallen far behind the general upward trend of the total economy and population of the State. 13/

Due to the apparent lack of viability of the agricultural industry, it appears that certain aspects of past settlement and growth of the agricultural industry are worthy of review in determining the potential for growth of agriculture production in the future.

Population Growth

Alaska's population has been relatively small and highly fluctuating until the last two decades. Population fluctuations during the period 1880-1940 were predominantly due to an ebb and flow of economic activities based on a fairly typical colonial pattern of natural resource exploitation and development. 14/

13/ G. W. Rogers and R. A. Cooley, Alaska's Population and Economy: Regional Growth, Development and Future Outlook, (Vol. 1, Analysis, Vol. II, Statistical Handbook), Univ. of Alaska Econ. Series, Inst. of Bus., Econ. and Govt. Research, 1963, p. 162.

14/ Ibid., p. 21.

Population growth since 1940 has been due to the rapid military build-up during World War II and the rapid growth of the civilian economy since the mid-1940's.

The official census in 1880 reported 33,426 Alaskans, of which all but 430 were native people. Population doubled during the gold-rush and then declined somewhat until the mid-thirty's, when recognition was given the need for more settlers for military security and commercial development. The Matanuska Colony project was initiated in 1935 and the military buildup of World War II began in 1940. There was a very rapid rise in population during the war, followed by a sharp decline. The post-war growth in population has been predominantly in the civilian sector.

TABLE I. ALASKA'S POPULATION GROWTH BY REGIONS, 1880-1967. */

Year	Total Alaska	South-east	South-central	South-west	Interior	North-west
1880	33,426	7,748	4,352	13,914	2,568	4,844
1890	32,052	8,038	6,112	12,071	2,333	3,498
1900	63,592	14,350	10,000	13,000	5,600	20,642
1910	64,256	15,216	12,900	12,049	13,064	11,127
1920	55,036	17,402	11,173	11,541	7,964	6,956
1930	59,278	19,304	11,880	12,118	8,246	7,730
1940	72,524	25,241	14,881	12,846	10,345	9,211
1950	128,643	28,203	50,093	17,715	23,008	9,624
1960	226,167	35,403	108,851	21,001	49,128	11,784
1967	278,900 a/					

*/ Source: Rogers and Cooley, p. 56.

a/ Estimates reported in the popular press during late 1967.

The growth of Alaska's population may be divided into four time periods. The first is the fur-trading period, from the initial Russian settlement until approximately 1900. The second, from 1900 until about 1940, is the gold-rush and mineral exploitation period. Growth during the third period, the 1940's and 1950's, was clearly related to fluctuations in size of military establishments. By the late 1950's, the fourth period of population growth had begun. This period has been characterized by a much greater element of population stability. By 1959-60 as much as 75 to 85 percent of population increase could be accounted for by natural increase. This period might be described as the era of emerging industry, and appears to coincide with the period of Alaska statehood.

Rogers and Cooley treat the period 1940-1960 as four separate time periods, Figure 2.

Population growth during the 1960's was stimulated by growth of the petroleum industry, forest products, fisheries, minerals, construction, service and supply industries and non-military government spending.

Past Production of Agricultural Crops, Livestock, and Livestock Products

Alaska's history of commercial agricultural production is relatively short, but the time period of regularly collected statistical data regarding production of agricultural products is even shorter. Annual collection of statistical data regarding crop

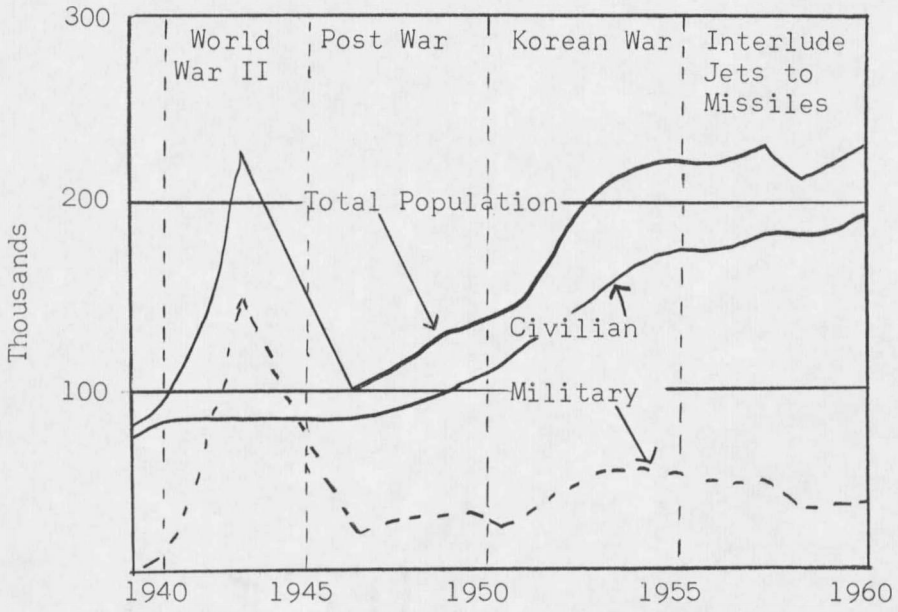


Figure 2. Estimated Average Population for Alaska, 1940-1960. (as of July 1)*/

*/ George W. Rogers and Richard A. Cooley, Alaska's Population and Economy: Regional Growth, Development and Future Outlook, Institute of Business and Government Research, University of Alaska, 1963, p. 23.

and livestock production and sales did not start until 1953. At that time the Alaska Agricultural Experiment Station, cooperating with the Territorial Department of Agriculture, initiated the regular collection of statistical data, and began publishing a Farm Production Report series. It was not until 1960 that the U. S. Department of Agriculture, Statistical Reporting Service extended its data collecting services to Alaska. The Alaska Cooperative Crop Reporting Service took over primary responsibility for agricultural data collection and publication in 1960.

A summary report on agricultural production and sales for the period 1953-1965 was prepared for the Federal Field Committee's Agricultural Task Force by a subcommittee headed by the Statician-in-charge, Statistical Reporting Service, U. S. Department of Agriculture, Palmer. The following summarization has been abstracted from that report:

> The number of farms in Alaska according to the U. S. Census increased from 12 farms in 1900 to a peak of 623 in 1939 and has declined since than to an estimated 350 farms for 1965. Virtual elimination of commercial fur farming in Alaska since 1939 accounts for much of the decrease in number of farms. . . . Rapid growth of commercial farming occurred right after the close of World War II. The 1950 Census of Agriculture shows value of sales of livestock and livestock and poultry products in Alaska had nearly trebled since the 1940 census, . . . However, dollar-wise, even a greater leap upwards occurred between 1950 and 1960 when sales of all crops, livestock, and livestock and poultry products rose to $3,214,000 from a total of $1,572,000 in 1950. . . . Most of this increase from 1940 through 1960 resulted from a rapid acceleration in the sales of milk from $307,000 in 1940 to . . . $1,643,000 in 1960, according to the U. S. Census of

> Agriculture for Alaska. . . . Accompanying the increase in value of milk production was the acceleration in production of hay and silage to feed the expanded milking herd. . . . Production of potatoes also showed a substantial increase in this period. Further expansion in value of agricultural production continued through 1964 which was followed by a sizable decrease in 1965.

Production data were selected from the Task Force report to show production trends (Table II), trends in value of production (Table III) and livestock inventories (Table IV) for the State. Data for 1965 and 1966 were added to the original statistical tables, from the Alaska Crop and Livestock Service Annual Reports.

TABLE II. TOTAL QUANTITY OF AGRICULTURAL COMMODITIES PRODUCED IN ALASKA - 1953-67 */

CROPS	Unit	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Oats for Grain	Cwt.	6,620	11,160	7,780	12,880	12,830	17,500	15,900	25,500	14,700	21,500	14,400	11,500	9,800	10,200	14,800
Barley for Grain	Cwt.	3,240	3,600	5,540	11,240	15,840	32,700	28,900	41,800	35,000	42,200	31,700	28,400	21,100	34,600	36,300
Grain Silage	Tons	8,200	8,300	11,300	16,000	18,400	17,300	20,200	18,000	19,000	22,300	28,800	28,500	18,700	16,000	17,100
Grass Silage	Tons	700	1,300	1,700	3,500	2,000	3,400	5,700	5,400	8,000	9,000	7,600	6,100	4,600	4,000	5,600
Grain Hay	Tons	2,400	2,400	2,400	2,700	2,900	1,600	2,300	1,400	1,600	1,300	800	1,500	1,000	2,400	2,000
Grass Hay	Tons	2,800	3,000	3,600	3,900	3,400	4,100	6,300	7,200	6,800	7,700	6,900	7,300	5,900	9,200	12,000
Potatoes a/	Cwt.	147,200	127,600	114,100	173,400	148,300	178,100	107,900	131,400	146,300	138,700	140,600	140,900	131,000	111,500	138,000
Cabbage a/	Cwt.	5,600	6,000	3,200	3,900	5,600	4,500	4,000	3,600	3,400	3,600	6,300	2,700	3,000	2,800	2,200
Carrots a/	Cwt.	5,800	4,700	5,400	3,900	5,100	6,200	4,700	7,600	5,200	5,400	5,800	4,000	2,400	3,900	5,200
Head Lettuce a/	Cwt.	4,500	4,600	5,300	5,800	6,800	4,900	5,300	6,200	6,800	8,000	8,100	7,200	6,500	6,300	7,500
Other Vegetables	Cwt.	---------- Not Available ----------							2,780	2,100	2,020	2,400	3,600	2,100	1,900	2,000
Livestock and Livestock Products																
Milk in Thousands	Lbs.	10,200	11,800	12,600	14,800	15,500	16,100	16,900	20,000	23,000	23,000	23,000	22,700	20,700	19,000	18,200
Eggs	Doz.	298,000	346,000	343,000	364,000	402,000	444,000	553,000	529,800	541,700	508,300	475,000	416,700	766,700	862,500	750,000
Poultry Meat	Lbs.	113,000	105,000	126,000	65,000	55,000	100,000	67,800	55,000	61,000	47,000	56,000	48,000	89,000	73,000	116,000
Beef & Veal	Lbs.	225,000	207,000	314,000	294,000	372,000	320,000	359,000	357,000	321,000	626,000	623,000	769,000	798,000	1,000,000	893,000
Pork	Lbs.	88,000	111,000	112,000	94,000	142,000	180,000	225,000	151,000	175,000	130,000	70,000	136,000	205,000	152,000	130,000
Mutton & Lamb	Lbs.	8,000	6,000	11,000	11,000	23,000	18,000	20,000	12,000	18,000	20,000	18,000	30,000	28,000	45,000	38,000
Wool	Lbs.	75,000	72,000	89,000	92,000	98,000	88,000	113,000	125,000	128,000	146,000	167,000	184,000	209,000	215,000	246,000

*/ Alaska Farm Production Reports, A. A. E. S. and State Dept. of Agriculture through 1959, S.R.S. 1960 through 1967.

a/ The data for 1953 through 1957 for Potatoes, Cabbage, Carrots, and Head Lettuce is only the quantity sold and does not include that used at home or culled out. This information is not available.

TABLE III. VALUE OF AGRICULTURAL COMMODITIES PRODUCED IN ALASKA--1953-1967 INCLUSIVE */

CROPS	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
	(Thousands of Dollars)														
Oats for Grain	39.8	62.0	43.3	58.7	65.3	79.1	67.8	118.9	71.0	97.0	65.0	50.0	41.0	42.0	62.0
Barley for Grain	16.5	18.2	27.6	56.3	75.4	148.9	125.8	190.0	172.0	185.0	135.0	115.0	86.0	140.0	144.0
Grain Silage	177.2	167.9	234.0	320.2	366.6	355.6	420.1	368.0	399.0	424.0	533.0	527.0	357.0	288.0	274.0
Grass Silage	13.3	26.0	33.7	69.4	39.2	67.2	113.0	108.0	168.0	171.0	140.0	113.0	86.0	72.0	89.0
Grain Hay	131.5	125.9	118.9	135.6	173.6	100.7	149.0	96.0	91.0	69.0	39.0	78.0	54.0	115.0	100.0
Grass Hay	144.0	170.0	214.5	197.2	203.9	249.0	376.0	536.0	463.0	498.0	408.0	432.0	360.0	558.0	670.0
Potatoes	835.8	635.1	520.4	957.8	841.7	694.6	589.0	723.0	783.0	666.0	612.0	1,043.0	799.0	619.0	607.0
Cabbage	44.5	41.0	22.6	33.5	44.4	34.9	46.1	31.0	29.0	33.0	50.0	25.0	37.0	31.0	21.0
Carrots	53.2	35.0	43.3	34.3	45.6	76.6	55.2	49.0	57.0	60.0	52.0	42.0	33.0	51.0	60.0
Head Lettuce	73.2	60.2	53.8	81.5	81.6	76.1	76.4	78.0	86.0	113.0	73.0	97.0	98.0	96.0	103.0
Other Vegetables	64.0	70.0	52.0	60.0	77.0	60.3	68.6	39.9	29.0	31.0	26.0	45.0	29.0	30.0	30.0
Value of All Crops	1,593.0	1,411.3	1,364.1	2,004.5	2,014.3	1,943.0	2,087.0	2,337.8	2,348.0	2,347.0	2,133.0	2,567.0	1,980.0	2,042.0	2,161.0
LIVESTOCK AND POULTRY PRODUCTS															
Milk	1,086.6	1,286.8	1,374.0	1,583.7	1,687.8	1,694.8	1,877.8	2,162.0	2,392.0	2,380.0	2,309.0	2,181.0	2,053.0	1,953.0	1,931.0
Eggs	300.8	336.3	322.9	347.3	366.0	395.5	469.2	464.0	422.0	412.0	383.0	335.0	590.0	667.0	592.0
Poultry Meat	72.8	66.0	66.8	32.6	23.5	52.4	33.0	26.0	29.0	22.0	21.0	16.0	22.0	18.0	28.0
Beef and Veal	92.8	84.9	127.2	110.7	131.4	126.4	145.0	144.0	148.0	293.0	265.0	302.0	294.0	417.0	373.0
Pork	36.6	37.1	41.8	39.1	60.2	71.4	92.9	62.0	71.0	55.0	26.0	54.0	94.0	81.0	68.0
Mutton and Lamb	4.9	3.2	5.4	5.2	6.2	9.1	10.0	6.2	10.0	14.0	10.0	15.0	12.0	19.0	16.0
Wool	38.5	30.4	43.8	45.9	58.6	48.4	62.1	50.0	51.0	72.0	97.0	112.0	111.0	123.0	98.0
Value of Livestock Products	1,633.0	1,844.7	1,981.9	2,164.5	2,333.7	2,398.0	2,690.0	2,914.2	3,123.0	3,248.0	3,111.0	3,015.0	3,176.0	3,278.0	3,363.0
Value of all Commodities Produced	3,226.0	3,256.0	3,346.0	4,169.0	4,348.0	4,341.0	4,777.0	5,252.0	5,471.0	5,595.0	5,244.0	5,582.0	5,156.0	5,320.0	5,524.0

*/ Alaska Farm Production Reports, A.A.E.S. and State Div. of Agriculture through 1959, S.R.S., 1960 through 1967.

TABLE IV. LIVESTOCK ON ALASKAN FARMS AND RANCHES ON JANUARY 1, 1954-1968 */

	1954a/	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Milk Cows 2 years old or over	1,400	1,600	1,800	2,100	2,100	2,100	2,200	2,800	3,200	2,900	2,800	2,600	2,400	2,100	2,000
Dairy Heifers 1-2 years old	500	500	600	600	600	700	600	600	600	600	600	700	500	400	400
Dairy Heifers under 1 year old	500	400	500	500	600	600	700	600	600	600	700	500	400	400	400
Beef Cows 2 years old or over	500	700	1,100	1,100	1,000	1,100	1,400	1,400	1,400	1,600	1,700	1,800	2,000	2,300	2,400
Beef Heifers 1-2 years old	200	200	500	500	300	300	400	400	500	400	600	500	600	600	700
Other Calves b/ under 1 year old	100	200	400	300	500	700	700	700	700	1,000	1,000	1,000	1,200	1,500	1,600
Steers 1 year old or over	100	300	300	400	300	300	400	600	700	700	700	700	900	700	700
Bulls 1 year old or over	100	100	100	100	100	100	200	200	200	200	200	200	200	300	300
All Cattle	3,400	4,000	5,300	5,600	5,500	5,900	6,600	7,300	7,900	8,000	8,300	8,000	8,200	8,300	8,500
All Hogs	600	1,100	800	1,000	800	900	1,300	1,000	1,000	1,000	900	1,400	1,400	1,200	1,200
All Sheep and Lambs	9,200	9,100	9,900	12,400	13,600	10,800	13,600	15,000	15,000	16,000	18,000	20,000	23,000	24,000	27,000
Hens and Pullets	31,000	40,000	33,000	29,000	32,000	34,000	47,000	41,000	34,000	36,000	33,000	38,000	46,000	50,000	36,000

*/ Alaska Farm Production Reports, A.A.E.S. and State Dept. of Agriculture through 1959, S.R.S., 1960 through 1967.

a/ Not complete for some species and classes.

b/ Includes dairy bull calves as well as all beef-type calves.

The Demand for Agricultural Products That Can Be Grown in Alaska

To establish the first parameter for evaluating Alaska's agricultural industry, demand estimates for agricultural products that can be grown in Alaska were calculated from per-capita consumption data, estimated by Alaska Agricultural Experiment Station and E.R.S., U.S.D.A. personnel, and population data for 1965. Crop production data from the Alaska Crop and Livestock Reporting Service were then compared with demand to estimate production deficits at the present time. Data on land availability, from the Alaska Soil Conservation Service, U.S.D.A., were used to estimate present potential for additional production. Comparisons were then made, using available data and estimates of demand, present production and potential production.

Per-capita consumption estimates of selected food products that could be produced in Alaska were made by the Alaska Experiment Station and Economic Research Service economists during the summer of 1967, using Alaska consumption studies, national per-capita average consumption data, estimates by commercial food distributors and the best judgments of other persons (Table V).

State consumption estimates for 1965 were calculated using per-capita consumption data and population estimates for Alaska for that year (Table VI). Total consumption estimates were converted to farm level equivalent quantities for comparisons with Alaska production data (Table VII).

TABLE V. ESTIMATED PER CAPITA CONSUMPTION OF SELECTED FOOD PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT, 1967 */

Item	Unit	Tanana Valley	Matanuska Valley	Kenai	Southeast	Southwest
Milk	lb.	260.0	300.0	275.0	300.0	100.0
Potatoes						
fresh	lb.	150.0	140.0	140.0	115.0	75.0
frozen	lb.	20.0	20.0	20.0	15.0	10.0
chips & shoestrings	lb.	12.0	12.0	12.0	12.0	10.0
Eggs	no.	400.0	400.0	400.0	400.0	200.0
Carrots a/	lb.	7.0(0.3)	7.0(0.3)	7.0(0.3)	7.0(0.3)	4.0(0.1)
Cabbage	lb.	8.0	8.0	7.0	7.0	4.0
Cauliflower a/	lb.	1.5(0.1)	1.5(0.1)	1.5(0.1)	1.0(0.1)	0.5
Lettuce	lb.	15.0	15.0	15.0	10.0	5.0
Brussel sprouts a/	lb.	0.2(0.1)	0.2(0.1)	0.2(0.1)	0.3(0.1)	0.1
Peas a/	lb.	0.3(1.5)	0.3(1.5)	0.3(1.5)	0.2(1.5)	0.1
Beets	lb.	0.6	0.6	0.6	0.6	0.3
Celery	lb.	3.0	3.0	3.0	4.0	2.0
Green Onions	lb.	1.0	1.0	1.0	1.0	1.0
Rhubarb a/	lb.	0.5(.03)	0.5(.03)	0.5(.03)	0.5(.03)	0.2
Broccoli a/	lb.	0.5(0.5)	0.5(0.5)	0.5(0.5)	0.5(0.5)	0.2
Cucumbers	lb.	1.0	1.0	1.0	1.0	0.5
Tomatoes	lb.	6.0	6.0	6.0	6.0	3.0
Zucchini	lb.	0.1	0.1	0.1	0.1	0.1
Rutabagas & turnips	lb.	0.2	0.2	0.2	0.2	0.1
Radishes & parsnips	lb.	0.2	0.2	0.2	0.2	0.1
Beef	lb.	85.0	85.0	85.0	90.0	50.0
Pork	lb.	35.0	35.0	35.0	45.0	25.0
Lamb & mutton	lb.	0.2	0.2	0.2	0.5	0.5
Reindeer	lb.	0.2	0.2	0.2	0.2	10.0
Other meats	lb.	5.0	5.0	5.0	5.0	25.0
Wild game	lb.	40.0	35.0	35.0	20.0	35.0

*/ Source: Alaska Agricultural Experiment Station, Unpublished report.

a/ Figures in parenthesis are frozen consumption.

TABLE VI. ESTIMATED CONSUMPTION OF SELECTED PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT, 1965

Item	Unit	Tanana Valley Dist. No. 1	Matanuska Valley Dist. No. 2	Kenai Peninsula Dist. No. 3	Southeast Alaska Dist. No. 4	Southwest Alaska Dist. No. 5	Total of all Regions
Milk	mil.lbs.	13.94	33.45	3.05	12.63	4.49	67.56
Potatoes							
Fresh	tons	4,020.0	7,805.0	777.0	2,420.8	1,683.8	16,706.6
Frozen	tons	536.0	1,115.0	111.0	315.8	224.5	2,302.2
Chips & Shoestrings	tons	321.6	669.0	66.6	252.6	224.5	1,534.3
Eggs	mil.doz.	21.44	44.60	4.44	16.84	8.98	96.30
Carrots a/	tons	187.6(8.0)	390.3(16.7)	38.9(1.7)	147.4(6.3)	89.8(2.2)	854.0(34.9)
Cabbage	tons	214.4	446.0	38.9	147.4	89.8	936.5
Cauliflower a/	tons	40.2(2.7)	83.6(5.6)	8.3(0.6)	21.0(2.1)	11.2	164.3(11.0)
Lettuce	tons	402.0	836.3	83.2	210.5	112.3	1,644.3
Brussel sprouts a/	tons	5.4(2.7)	11.2(5.6)	1.1(0.6)	6.3(2.1)	2.2	26.2(11.0)
Peas a/	tons	8.0(40.2)	16.7(83.6)	1.7(8.3)	4.2(31.6)	2.2	32.8(163.7)
Beets	tons	16.1	33.5	3.3	12.6	6.7	72.2
Celery	tons	80.4	167.3	16.7	84.2	44.9	393.5
Green Onions	tons	26.8	55.8	5.6	21.1	22.5	131.8
Rhubarb a/	tons	13.4(0.8)	27.9(1.7)	2.8(0.2)	10.5(0.6)	4.5	59.1(3.3)
Broccoli a/	tons	13.4(13.4)	27.9(27.9)	2.8(2.8)	10.5(10.5)	4.5	59.1(54.6)
Cucumbers	tons	26.8	55.8	5.6	21.1	11.2	120.5
Tomatoes	tons	160.8	334.5	33.3	12.6	67.4	608.6
Zucchini	tons	2.7	5.6	0.6	2.1	2.3	13.3
Rutabagas & Turnips	tons	5.4	11.2	1.1	4.2	2.3	24.2
Beef	mil.lbs.	4.56	9.48	0.94	3.79	2.25	21.02
Pork	mil.lbs.	1.88	3.90	0.39	1.89	1.12	9.18
Lamb & Mutton	mil.lbs.	0.01	0.02	0.002	0.02	0.02	0.072
Other Meat	mil.lbs.	0.27	0.56	0.06	0.21	1.12	2.220
Reindeer	mil.lbs.	0.01	0.02	0.002	0.008	0.45	0.490

a/ Figures in parentheses are frozen consumption.

TABLE VII. DEFICIT OF ALASKA CROP PRODUCTION TO SUPPLY INTRASTATE DEMAND, 1965.

Item	Unit	Demand a/	Alaska Production b/	Deficit
Milk	mil. lbs.	72.34c/	20.70	51.64
Potatoes:				
Fresh	tons	17,488.3c/	6,550.	10,938.3
Frozen	tons	5,640.4c/	None	5,640.4
Chips & Shoestrings	tons	3,759.0c/	None	3,759.0
Eggs	mil. doz.	99.19c/	0.767	98.423
Carrots	tons	879.6c/ (35.9)	120.	759.6 (35.9)
Cabbage	tons	1,011.4c/	150.	861.4
Cauliflower	tons	d/ 164.3 (11.0)		164.3 (11.0)
Lettuce	tons	3,191.3c/	325.	2,966.3
Brussel Sprouts	tons	d/ 26.2 (11.0)		26.2 (11.0)
Peas	tons	36.7 (183.3)c/	All	36.7 (183.3)
Beets	tons	d/ 72.2	vegetables	72.2
Celery	tons	425.0c/	crops not	425.0
Green Onions	tons	d/ 131.8	individually	131.8
Rhubarb	tons	d/ 59.1 (3.3)	reported are	59.1 (3.3)
Broccoli	tons	d/ 59.1 (54.6)	reported at	59.1 (54.6)
Cucumbers	tons	131.3	105 tons.	131.3
Tomatoes	tons	d/ 608.6		608.6
Zucchini	tons	14.5		14.5
Rutabagas & Turnips	tons	d/ 21.7		21.7
Radishes & Parsnips	tons	d/ 21.7		21.7
Beef	mil. lbs.	28.38e/	0.798	27.58
Pork	mil. lbs.	13.77e/	0.205	13.565
Lamb & Mutton	mil. lbs.	0.936e/	0.028	0.0656
Other Meat	mil. lbs.	d/ 2.22		
Reindeer	mil. lbs.	d/ 0.490	0.563	+0.173

a/ Demand estimates converted to farm level equivalents.

b/ Alaska Crop and Livestock Reporting Service, SRS, USDA, 1966.

c/ Conversion factor from Marketing and Transportation Situation, ERS, USDA MTS-164, Feb. 1967, (Table 16, p. 39).

d/ Not converted to farm equivalents.

e/ Dressed weight (Carcass).

Production deficits for those products that could be produced in Alaska were calculated using total consumption estimates and Alaska production data. No attempt was made to determine what portion of the production deficit Alaska producers should supply, but only to determine what additional acreages would be needed at 1965 yields if total deficits were produced in Alaska. Estimated acreage deficits for potatoes and vegetables were: approximately 2,200 acres potatoes, 113 acres carrots, 127 acres cabbage, 420 acres lettuce and 640 acres other vegetables. Feed acreage deficits for an additional 5,650 dairy cows were 6,400 acres barley, 3,000 acres of oats and some 11,000 acres of hay and silage. Deficits in hog production would add another 28,000 acres of barley production. Beef deficits would add another 16,000 acres of barley and some 17 to 18,000 acres or more of harvested forage for the beef finishing operations. Neither dairy nor beef estimates include needed feeds for breeding herds. Indicated total acres needed to offset 1965 deficits were some 3,500 acres for vegetables, more than 50,000 acres of barley, 3,000 acres of oats and more than 28,000 acres of harvested forage. Idle land available for immediate cultivation was only some 19,000 acres (Table VIII).

TABLE VIII. LAND AVAILABILITY AS REPORTED BY SOIL CONSERVATION SUBDISTRICT, 1967 (MAJOR FARMING AREAS)*/

Crop Reporting District	Cropland			Forest Land			Pasture and Range	Other	Inventory Total	Urban
	Tilled Acres	Idle Acres	Total Acres	Commercial Acres	Non-Comm. Acres	Total Acres				
District No. 1										
Fairbanks	5,523	2,877	8,400	162,692	76,560	239,252	250	6,669	254,571	965
Salcha-Big D	2,846	1,605	4,451	87,915	214,941	302,856	250	1,103	308,660	300
District No. 2										
Anchorage	100	-	100	19,960	7,164	27,124	-	8,776	36,000	15,100
Chugiak	200	-	200	11,536	8,103	19,639	-	4,561	24,400	4,000
Kenny Lake	300	200	500	14,585	33,679	48,264	-	4,973	53,737	50
Montana	572	3,071	3,643	172,805	8,976	181,781	-	58,816	244,240	100
Palmer	12,260	228	12,488	66,451	27,072	93,523	-	22,155	128,166	1,300
Wasilla	2,050	6,463	8,513	277,073	76,747	353,820	-	198,735	561,068	800
District No. 3										
Homer	1,615	292	1,907	52,767	22,295	75,062	65,037	39,374	181,380	360
Kenai-Kasilof	1,123	2,000	3,123	113,695	31,370	145,065	691	41,508	190,387	1,250
Ninilchick	277	2,000	2,277	73,963	21,833	95,796	1,852	36,566	136,491	40
District No. 4 (No Subdist. Reported)										
District No. 5										
Kodiak	100	-	100	25,299	-	25,299	141,398	139,850	306,647	560
Total	26,966	18,736	45,702	1,078,741	528,740	1,607,481	209,478	563,086	2,425,744	24,825

*/ Alaska Conservation Needs, Soil Conservation Subdistricts, SCS, USDA, Palmer, 1967.

Production Status of Present Farming Areas

The area commonly known as the Matanuska Valley, in Crop Reporting District No. 2, is currently the major farming area of the State (Figure 3). The area is characterized by a predominance of commercial farming operations. All but one of the commercial Grade A dairy farms in the state are located in the Valley. More than half of the commercial potato farms are located in this area. Both of the large commercial egg producers are located in the Valley also. During the 1966 cropping year 10,490 acres, or 66.2 percent of the total land cropped within the state, were used for crops in the Valley (Table IX). Historically, since the regular collection of statistical data, the Valley has, on the average, produced more than 70 percent of the State's value of agricultural production.

The Tanana Valley, in Crop Reporting District No. 1, is the second largest farming area in terms of farm products raised and sold. During 1966, 3,212 acres, or 20.2 percent of the total land cropped within the state, were cropped. The area is characterized by a mixture of commercial and part-time farmers. Dairy farming is rapidly declining, with one commercial Grade A dairy farm remaining in the area. Predominant farming is potatoes, vegetables, forage and grain crops. For the 14-year period under study, farm production from the Tanana Valley accounted for 13-17 percent of the State's agricultural output.

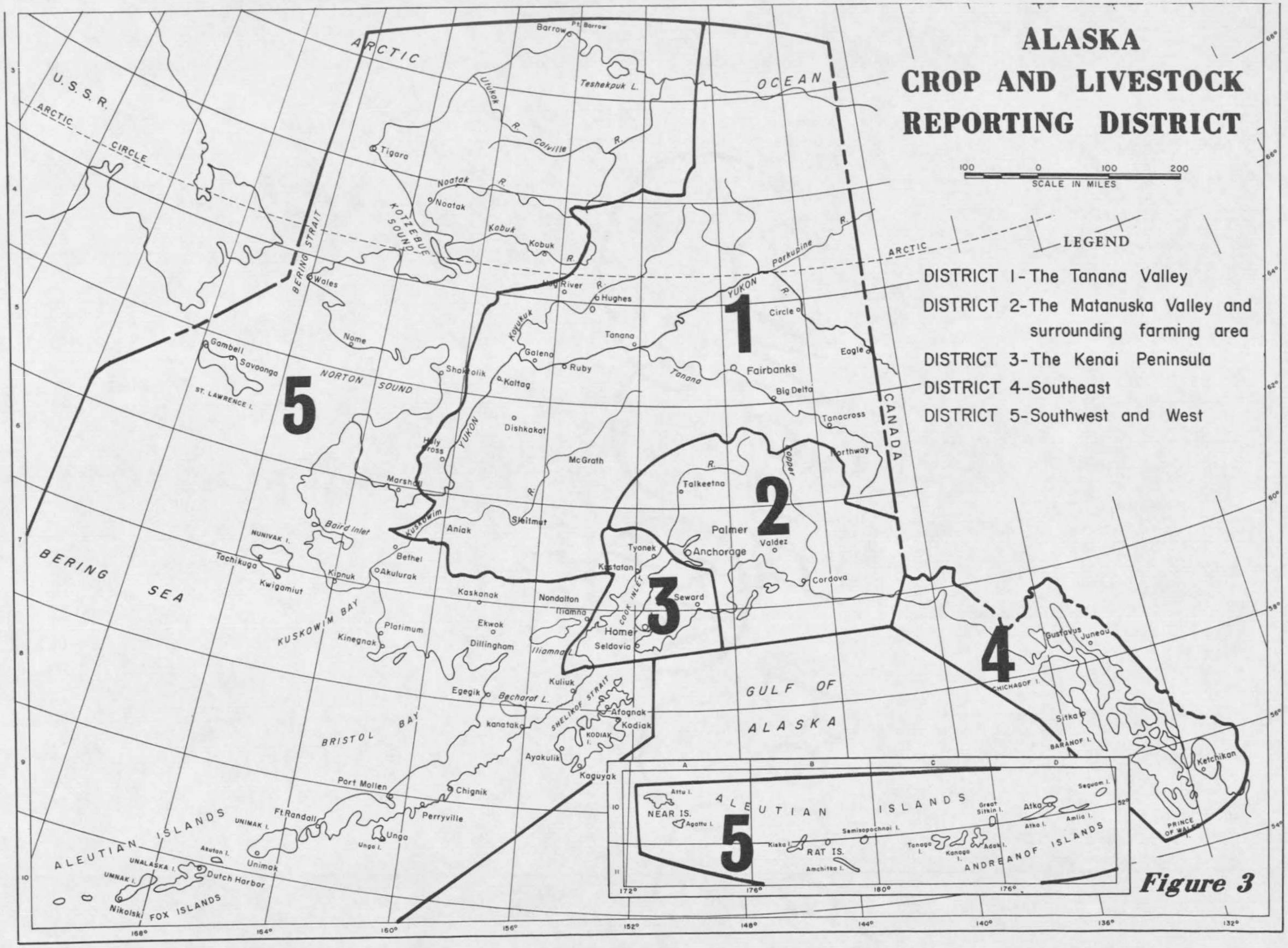

ALASKA
CROP AND LIVESTOCK
REPORTING DISTRICT
100 0 100 200
SCALE IN MILES
LEGEND
DISTRICT 1-The Tanana Valley
DISTRICT 2-The Matanuska Valley and surrounding farming area
DISTRICT 3-The Kenai Peninsula
DISTRICT 4-Southeast
DISTRICT 5-Southwest and West
1
2
3
4
5
5
ARCTIC OCEAN
U. S. S. R.
ARCTIC CIRCLE
CANADA
BERING SEA
BERING STRAIT
GULF OF ALASKA
BRISTOL BAY
NORTON SOUND
KOTZEBUE SOUND
KUSKOKWIM BAY
Barrow
Teshekpuk L.
Tigara
Noatak
Kobuk
Wales
Nome
Hughes
Tanana
Galena
Ruby
Kaltag
Fairbanks
Circle
Eagle
Big Delta
Tanacross
Northway
Dishkakat
Holy Cross
McGrath
Marshall
Talkeetna
Palmer
Anchorage
Valdez
Cordova
Tyonek
Kustatan
Seward
Homer
Seldovia
Aniak
Bethel
Akulurak
Kipnuk
Kaskanak
Nondalton
Iliamna
Ekwok
Dillingham
Platinum
Kinegnak
Egegik
Becharof L.
Kanatak
Kuliuk
Afognak
Kodiak
Ayakulik
Kaguyak
Port Moller
Chignik
Perryville
Unga
Ft Randall
Unimak
Dutch Harbor
Nikolski
FOX ISLANDS
ALEUTIAN ISLANDS
Gambell
Savoonga
ST. LAWRENCE I.
NUNIVAK I.
Juneau
Gustavus
Sitka
Ketchikan
CHICHAGOF I.
BARANOF I.
PRINCE OF WALES I.
NEAR IS.
RAT IS.
ANDREANOF ISLANDS
Attu I.
Agattu I.
Kiska I.
Amchitka I.
Semisopochnoi I.
Great Sitkin I.
Atka
Atka I.
Amlia I.
Seguam I.
Adak I.
Tanaga I.
Kanaga I.

Figure 3

TABLE IX. CROPLAND UTILIZATION BY AREAS--1966*/

Crops Planted	Tanana Valley	Matanuska Valley	Kenai Penin.	South-east	South-west	Alaska Total	% of 1965
	Acres	Acres	Acres	Acres	Acres	Acres	%
Commercial Vegetables							
Potatoes	285	410	28	2	5	730	91
Cabbage	13	20	1	a/	1	35	100
Carrots	9	24	1	1	a/	35	140
Lettuce	9	55	1	a/	a/	65	108
Other Vegetables b/	16	21	2	a/	1	40	100
Feed Crops							
All Oats	430	900	130	-	40	1,500	83
All Barley	500	1,130	70	-	-	1,700	81
Other Grains	20	30	-	-	-	50	50
Grain Mixtures	450	2,750	250	50	-	3,500	83
Total Acres Planted	1,732	5,340	483	53	47	7,655	84
Grassland Harvested							
Seeded Grass	1,270	5,000	700	90	40	7,100	125
Native Grass	210	150	580	90	70	1,100	92
Total Land in Crops	3,212	10,490	1,763	233	157	15,855	99
Percent of State Total	20.2	66.2	11.1	1.5	1.0	100.0	-

*/ Alaska Agricultural Statistics, 1966, Alaska Crop and Livestock Reporting Service, SRS, Palmer.

a/ Small amount, combined to avoid disclosure of individual operations.

b/ Includes radishes and celery.

On the Kenai Peninsula, in Crop Reporting District No. 3, most farms are small and in the beginning stages of development. Much of the food produced is locally consumed. There are dairy, beef, swime, and poultry as well as smaller crop farms. Most farms are part-time operations. There are no commercial dairy farms. Beef ranches have declined in number, but cattle numbers have remained about the same. One small egg flock remains in the area. A few part-time vegetable-potato farms continue in operation. Except for 1965, production from Kenai Peninsula constituted from 4 percent to 7 percent of the value of the total agricultural output of the State. For the 14-year period, 1953-1966, Kenai's share of the State's total output averaged 5.9 percent.

In Southeastern Alaska, Crop Reporting District No. 4, chief products are fish and timber. Agriculture has steadily declined in commercial importance, to only about 1.5 percent of 1966 cropped acres. Farming would generally be classed as part-time and subsistence agriculture. The greatest change in the State's agriculture in the 1953-66 period occurred in Southeastern Alaska, where it declined steadily from 10 percent of the State's farm output in 1953 to only 3 percent in 1963-1966. Disposition of nearly all of the commercial egg production in the area along with reduced milk production accounted for the substantial decline in the agricultural economy of Southeast Alaska. Disposition of all commercial milking herds during 1966 caused still further reduction in the

area's share of farm production. In spite of the sharp decline in Southeast's share of the value of State production, the average for the 14-year period was just below that for the Kenai Peninsula area farmers at 5.1 percent.

On Kodiak and the Aleutian Islands, Crop Reporting District No. 5, stock raising (sheep and cattle) is the leading agricultural enterprise. Natural vegetation and grasses provide seasonal and even year-long grazing, although supplemental feeding is recommended. Wool is shipped and sold in the lower 48 states. Some beef is shipped to Anchorage, in addition to the local consumption. Kodiak and other islands of southwest Alaska maintained the steadiest level in an area's share of Alaska's farm production of any location in the state. Southwest Alaska averaged producing 3.1 percent of the State's total farm production from 1953-1966.

General Problems Faced by Agricultural Producers

Alaska farmers and potential farmers are faced by a harsh climate that limits crops which can be grown. Little progress has been made to date in developing products and production methods particularly suited to the unusual Alaskan environment. Farms tend to be found in widely separated geographic locations which have differing production possibilities. Producers located near growing population centers find it difficult to exploit expanding markets due to small volumes of production and inadequate development of some elements of the inter-

mediate marketing structure in Alaska. Producers in more "remote" locations find their problems infinitely more complex. Absence of public facilities such as roads, schools, churches, and hospitals discourage settlement by able, experienced farmers in the more remote areas. Lack of access to remote areas provides both economic and psychological barriers. The 160-acre limitation of Federal land settlement laws, high costs of purchasing privately owned or State lands, high clearing and development costs, the long waiting period after clearing due to slow drying of the soil and slow bacterial action, and the short and cool growing season, all tend to discourage both current and prospective farmers in the more remote regions.

Scattered locations of many small production units and lack of appropriate marketing organizations result in many producers, generally untrained in marketing, having to sell their own produce, often-times in remote markets. Similarly, general absence of cooperatives forces producers to purchase agricultural supplies and equipment in small quantities without discounts which accompany large volume buying. The marketing problem is accentuated by extreme seasonality of production of many commodities and difficulty of breaking into established markets for only a short period each year.

Many of Alaska's operators are part-time farmers, dependent on off-farm incomes to permit continuance of their agricultural efforts. The absence of specialization in farm production, marketing and service

operations often results in placing undue managerial burdens on small farm operators. High development, production, processing, and marketing costs require large financial investments to develop economic-sized operations. Unavailability of such capital to most existing farmers and ranchers has resulted in a high proportion of small, uneconomic units. Agencies concerned with Alaska agriculture have been unable to furnish needed financial and technical assistance. The needed financial assistance has included both long-term investment capital and short-term operating capital.

Finally, transportation costs involved in delivery of Alaska products to "outside" markets, together with the generally high production costs, limit the products which can currently compete for outside markets. Also, transportation costs involved in delivery of Alaska products to the few major Alaska markets limit the opportunities to successfully compete in the in-state markets, and the shortage of processing facilities limits even more the markets for Alaska produce.

Source of Farmers and Entry into Farming

Problems of entry into farming are numerous and complex. The question often raised, "Where are your replacement farmers coming from?" is not unique to Alaska, but it does focus on two complex and interrelated problems. The first problem is the source of replacement farmers and the second is the difficulties of entry into the

farm production sector of the agricultural industry in Alaska. Surveys have shown practically no second-generation Alaskan farmers.

Experienced mature farmers with investment capital, who come from "outside", are not attracted to farming opportunities in Alaska due to the complex problems of production, undeveloped marketing structure, limited loan capital, limited sources of technical information, the limited service and supply industry and often remote locations of farming and ranching areas. Inexperienced potential farmers without investment capital find problems of entry insurmountable and are quickly discouraged. Financial agencies are reluctant to encourage the development of additional or new enterprises, Statutory limitations on agricultural loans limit opportunity to develop large commercial, or even economic-sized farm units in many instances.

It is extremely difficult for interested individuals to "find" farms for sale due to the lack of real estate institutions oriented to farm or farmland sales. This situation is further complicated by the historical pattern of small land holdings. Very limited information regarding possible farm availability, either through purchase or rental, may be found from agency or commercial sources.

Technical production and farm practices information, in suitable package form, is unavailable to prospective farmers, and the time and cost of researching such information by the individual is excessive. In addition, the very limited market organization and market information

places heavy burden on prospective farmers who are attempting to budget probable costs and returns on enterprises they are interested in.

The absence of processing facilities for most agricultural products, and the absence of an intermediate marketing structure necessitates an integrated firm structure that includes production, processing, and distribution. Such a firm structure is not compatible with the small family farm philosophy generally held by agricultural agencies in the state.

Credit and Loan Capital

The absence or limited availability of credit and investment capital is one of the more serious problems of existing farm operators, and one of the critical deterrents to new entry into farming. Due to this limited availability of agricultural credit, and statutory limitations on individual loans, farm operators are forced into complex credit arrangements with a number of credit sources. A unique problem, arising out of loan limitations, is the tacit approval of financing through "forgiven delinquencies" which evade the legal loan authorizations, but eventually labels the borrower as a questionable loan risk and often results in a negotiated foreclosure.

Unlike other areas of the U. S., private capital is available only in limited quantity and only for short-term use. Only one commercial bank makes agricultural loans with any degree of frequency. Agency credit is often loaned for shorter periods than in other states.

Federal Land Bank credit is available to Alaska borrowers on a 20-year basis, but on a 33-year basis in most other states. Overall agency appraisals, other than Federal Land Bank appraisals, have been exceedingly liberal on capital assets, until quite recently, causing an over-confidence among borrowers.

A final limiting factor, has been the management control relinquished to credit agency loan supervisors without their acceptance of the responsibility to use that control in planning, evaluating and making the decisions that go with such managerial control. It appears that the arrangement is comparable to joint ownership with one of the owners jealously guarding his "rights" of management, but not willing to assume the possible risks of his making decisions which would result from his assuming the responsibility of the management factor withheld.

Management and Consultant Services

Farm record and accounting services provided by Cooperative Extension Service, Farm Bureau, Commercial banks, and other institutions in many states do not exist in Alaska. Farm management specialists and consultants, along with association field-men, are not available. Fertilizer, feed, and agricultural engineering consultants, being elsewhere supplied by commercial companies and processors are not available. Farm publications, both commercial and institutional, are very limited and do not adequately cover information needs of Alaska farmers. The

burden of supplying such information falls upon the Cooperative Extension Service, the Experiment Station, and the Division of Agriculture, which are limited in available information and staff specialization and are not programmed to the range of informational needs.

Ranch Problems

Alaska's accessible agricultural lands are generally over-priced for agricultural use. Most ranchers operate on leased government land, with consequent uncertainty of tenure and reluctance to make desirable improvements. State agricultural land disposal prices when combined with costs of surveying, access roads, transportation costs to and from market and service centers discourage ranch development. Access is a critical problem in most ranching and farming areas not served by commercial carriers. Many farming areas that have road access are without adequate commercial transport service or are faced with high intra-state freight rates. Nearly all farm supplies must come from "outside"; consequently time in transit can be an additional complication. Conflicts of range use between wildlife and domestic livestock, in some areas, provides a further complication.

Other Problems

Vagaries of military procurement of agricultural produce in Alaska provides a critical element of uncertainty, particularly in that

military markets have been the focus for Alaska producers due to the absence of other marketing structures, and is another restrictive factor to new entry into farming.

CHAPTER III

GOALS AND OBJECTIVES FOR AGRICULTURAL DEVELOPMENT IN ALASKA

> A second method of problem recognition consists of determining the gaps between the actual achievements and the goals of individuals or society. Here one looks at the goals, implied or stated, of the individuals or society and determines whether or not the individual or society has achieved these goals. If there is a gap between the achievements and the goal, the gap becomes the problem for study. The alternative methods for closing the gap, in fact, become hypotheses for testing and verification. 15/

An understanding and appreciation of the occurrence of events in time can often be enhanced by a careful review of goals and policies that have in the past and will in the future structure agricultural settlement and growth in developing areas. Certain reservations must be recognized, however, when reviewing goals and policies concerned with agricultural development. Heady identifies one of the problems in pursuing this approach as:

> Our inability to identify a set of values and goals for American agriculture which is, in part, a reflection of the characteristics of values themselves; value systems provide internalized guides, invested with a high degree of effect and meaning of participants. . . . of necessity . . . These emotionally-laden characteristics of value-goal systems need be kept in mind constantly as agricultural adjustment proposals are made. 16/

15/ R. J. Hildreth and E. L. Castle, "Identification of Problems", in Methods of Land Economics Research, W. L. Gibson, Jr., et al., eds. (Lincoln: University of Nebraska Press, 1966) p. 24.

16/ Earl O. Heady, "The Concern with Goals and Values", in Some Selected Papers on Goals and Values in Agricultural Policy, Proceedings of Ames Conference, June 27-29, 1960, p. 13.

Another reservation regarding the review of goals and objectives which must be recognized is that policies and programs carried out do not necessarily correspond with implied or stated goals. Spengler points out that, "It is possible, of course, that salutary change may be retarded by deliberate action, as when codes continued to prescribe outmoded technology. . . .". 17/ Policies once implemented may be considered as final blueprints for present and future development and may not have been modified and reoriented to policy goals and objectives. Consequently, programs carried out may be deterrents to attainment of intended general goals and objectives for development.

Still another consideration is the "will and commitment to progress" of the individuals implementing various programs and of the individuals affected by the programs in question. For example, the goal of maintaining the status quo may be of higher order or priority than goals of progress and development.

On the positive side, however, are sound reasons for reviewing goals and objectives as well as policies for carrying out programs aimed at attaining said goals. By definition, goals should reflect a desired ultimate status towards which purposeful action is continually directed, without specific time limits, representing the summation of objectives. Spengler emphasizes that,

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17/ Joseph Spengler, "Social Evolution and the Theory of Economic Development", in Social Change in Developing Areas, Herbert R. Barringer, et al., eds. (Cambridge, Mass.: Schenkman Publishing Company, Inc., 1965), p. 253.

> today more than ever, social change in general and economic development in particular are the deliberate change-producing actions on the part of men, groups, and agencies situated in a society . . . anticipations of the future, together with action in the present to make possible what men want in the future, is the focus of a great deal of activity; it is therefore a major force in the present giving shape to the future. 18/

Goals then are the focus of change and reflect the focus of change over time. Even though they may not be precisely reflective of change that has occurred, they do provide a basis for useful comparison between "desired ultimate status" and development that has actually occurred and thus provide an opportunity for an increased understanding and appreciation of the occurrence of events in time as they relate to agricultural settlement and growth of the agricultural industry.

Federal Goals and Objectives for General Economic Development

When one looks toward the future of Alaska's agricultural industry it is indeed like looking through rolling clouds to a far distant horizon. One must search through a number of clouded goals and policy issues regarding economic development in the state.

Before statehood Federal goals for the territory were limited in scope and drifted with the shifting winds of politics and public opinion. 19/ The limited development of goals may have projected an

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18/ Ibid.

19/ George W. Rogers and Richard A. Cooley, Alaska's Population and Economy: Regional Growth, Development and Future Outlook, Institute of Business and Government Research, University of Alaska, 1963, p. 109.

overly cautious attitude in initiating development due to the magnitude of criticisms historically leveled at development policies used in other frontier areas. The need for development planning became critical with Alaska statehood, but a concerted and continuing Federal effort to develop goals and objectives for economic development was not initiated until the early summer of 1964, precipitated by reconstruction planning after Alaska's Good-Friday earthquake.

The most recent expression of key Federal objectives for economic development in Alaska has been summarized by Jones as: (1) the broadening of the civilian economy away from its present degree of Federal dependence; (2) the achievement of maximum returns from existing expenditures; and (3) the proposing of new high-yield programs. 20/ Jones, as Adjunct Professor of Economics, Alaska Methodist University, and the economist member of the Federal Field Committee for Development Planning in Alaska, has reviewed the various segments of the Alaskan economy in terms of the Federal goals and objectives on numerous occasions.

The background from which current Federal goals and objectives have been developed has been summarized by Jones as:

> Following statehood, the need for long-range development became recognized, and the devastating earthquake of March, 1964, provided the dramatic occasion. In view of the need for large-scale Federal assistance to rebuild the stricken areas of the

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20/ Douglas N. Jones, "Alaska's Economy: The State of the State," Alaska Review: Alaska Methodist University, Anchorage, Vol. II, No. 3, pp. 1-38.

> State, it was appropriate that such efforts be channeled toward the rebuilding of facilities in a manner that would contribute to the long-range development of the state. In modified form and with different emphasis direct Federal participation in the development planning program continued. . . .
>
> Although the extensive military buildup in Alaska during World War II and during the Korean crisis hastened the development of the civilian economy by providing roads, airports, seaports, and other capital improvements essential to the economic development, as well as a steady infusion of funds on which related service industries could be built, there was, necessarily, a lag in the translation of this development into a relatively sophisticated, balanced, civilian economy producing goods for export to other states or foreign countries. As a result, the State remains too dependent upon Federal establishment as its major industry, and of equal or greater significance to this context, this type of capital development has added little to the tax base of the state. In short, the state is too dependent upon an import of dollars through the expenditures of the United States Government, without sufficient spin-off into social capital which can broaden the base and, hence, the self-sufficient economy. But if the state has a high degree of dependence on Federal expenditures, it is also true that the volume of expenditure is great enough, if properly directed to have a major impact on the course and direction of the economic growth of the state. 21/

One can extrapolate from Jones' reports the following Federal goals for economic development: (1) to develop a relatively sophisticated, balanced, civilian economy that will generate the needed social overhead capital, without continuing the Federal dependence, and will provide a suitable climate in the private sector for systematic and integrated economic development in these areas where opportunity exists; and (2) to select and plan for the economic development of those areas where there are strong national interests and where strong Federal participation is required in the solution of Alaska's problems in order to

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21/ Ibid.

broaden the development base. Areas of strong national interest include all of the "native" problems; a major portion of the land area of the state, consequently minerals and mineral fuels, forestry products, and to some degree power, communications, research and education, and transportation through finance and regulation.

Because Alaska is only nine years away from territorial status and since the Federal government still provides more than 40 percent of all wage and salary disbursements in the state through direct programs, it is to be expected that the Federal government retains a strong proprietary interest in the economic-development goal and objective formulation for a wide variety of areas and industries within the state.

Agriculture as a Specific Entity in the Discussion of Federal Goals

After perusing through the clouded goals, objectives, and background of the Alaska economy, it is necessary to come to grips with the specific industry in question, agriculture. Due to the rather indefinite situation that has recently existed, a brief review of what appears to have been the policy of the recent past and a brief statement of possible alternative goals of the near future is in order. One must conclude that the policies of the recent past were: (1) to provide and maintain all of those agricultural agencies that are common in other states; (2) to allow each of the agricultural agencies to pursue common agency goals to the extent possible in Alaska

as long as no modification or adaptation to the Alaska environment or situation was suggested or attempted that would in any way upset the status quo; (3) to dominate policy leadership, a continuation of the situation that has existed throughout the full time span of agricultural development in the state.

The above-mentioned policies appear to be predicated on the belief that agricultural production in Alaska was not yet needed. As long as "stateside" production tended to be somewhat in surplus increased production in Alaska would not be within the national interest. It also appears that there has been an almost sacred belief held that at any time Alaska agricultural production is nedded an immediate and direct transferral of knowledge, technology, crops, capital, entrepreneurship, people, and all of the institutions necessary to have a highly productive and successful agricultural industry can immediately be made without modification or adaptation. One is tempted to add, "but the cost of transferral seems exceedingly high, and predicated on past experience, seems highly unlikely."

If one pursues the topic of possible alternative goals for agriculture in the future, four alternative Federal policies appear to have relevant priority for consideration at this time (the first two having been explicitly stated in a Presidential report by the Federal Field Committee for Economic Development Planning in Alaska and the other two being implied or discussed on numerous occasions):

(1) to continue the present yearly investment of men and money under the present goals of existing agency programs, i.e., product research, loans, statistical compilation, dissemination of information, and other normal government assignments;

(2) to carry out a gradual withdrawal of the existing agency activities to a minimum degree of involvement. This alternative would recognize that current expenditures may be considered highly questionable and assumes that limited benefits can be gained from continuing present programs; also that arising problems can be solved with consultant expertese on overnight trips from other agency locations from the "outside";

(3) a third alternative would be to institute a policy of no agricultural policy. This policy would allow great flexibility with no criterion of evaluation, but would provide no opportunity for coordination of agency programs of all levels of government;

(4) to develop a comprehensive program with goals oriented toward agricultural settlement and growth in the modern frontier settlement areas of the sub-arctic. Such a program must consider the availability and suitability of resources, technology, information, research data, agency programs and institutions that would be necessary and suitable in modern frontier settlement areas in the sub-arctic. New and radically different systems of production must be explored. Older systems must be critically reviewed to determine restrictions and

shortcomings. Commodity-project programs oriented to specific [illegible] geographic areas must be developed if private entrepreneurs are to be allowed the opportunity to develop production and marketing firms without an undue wastage of capital and human resources.

The previously mentioned program would be predicated on the belief that agriculture will develop to some degree in the foreseeable future. It must also be predicated on the belief that public investment now will reduce the waste of resources used in unstructured agricultural settlement efforts that are occurring now and will occur in the future. One must assume that the "testing with fire" of the results of such a program would have to come from the "pioneer firms" that attempt to develop in Alaska's "modern frontier environment."

Any of the first three alternatives negates the possibility of an increasing positive Federal contribution to the development of Alaska's agricultural industry. The fourth alternative would allow concentration on facets of development that should have broad application beyond Alaska's borders. Federal concentration on new and radically different systems of production for the northern latitudes could be eminently beneficial to agricultural development. Concentration on new and different crops that would contribute to export potential for Alaska would surely be helpful to the industry. Concentration on institutions and services that would contribute to new-lands settlement in the northern latitudes, both in the social and technical fields, would

be worthy of serious consideration. Concentration on certain food technology and consumer research programs and facilities would provide stimulus to the industry.

Alaska provides a unique climatic location and socio-economic environment, with regard to the northern latitudes, for concentrating on unique problems of the northland. Advantage should be taken of the opportunity. Such a program would not preclude continuation of agency programs now in Alaska, but would provide new emphasis and new stimulus to adaptation and orientation of Federal goals, objectives, policies, and programs that would in turn revitalize the Federal contribution to Alaska's agricultural development.

State Goals and Objectives for Agricultural Development

State goals and objectives, as they relate to agricultural development, are difficult to ascertain beyond those stated or implied within the State constitution with the establishment of various departments and divisions in the State government. The Department of Natural Resources, with its divisions of Agriculture and Lands, has the primary responsibility for agriculture. Other departments less directly involved are the Department of Economic Development and Planning, and the Department of Education. The University of Alaska, while not a division of state government, does have certain designated responsibilities with regard to the agricultural industry. General policy responsibility, however, rests with the State administration.

The Division of Agriculture is primarily a service and regulatory agency, responsible for protection, development 22/, and promotion of agriculture in Alaska. 23/ Annual reports of the Division state that "increasing and supplying more of our food is a large part of Alaska's objective; however, there lies an important future in producing specific commodities for export." General objectives of the division and particular objectives of the individual sections shed some light on the objectives of the division but provide little insight to general goals, objectives, and policies of the State for overall development of the agricultural industry.

The Division of Agriculture encompasses a number of sections: the animal industries section has an objective of control, suppression, and eradication of contagious, infectious, and communicable diseases. The diagnostic laboratory acts as the primary diagnostic service for the state and as the basic research facility for animal diseases which are endemic in the area. The plant industries section is responsible for produce inspection, plant quarantine, seed testing, potato and egg regulation work, weed control, marketing assistance, seed certification, and the compilation of acreage and production figures. The soil conservation section is responsible for promotion of land development and

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22/ Development as used here must be interpreted in a very narrow sense, as providing regulatory services and limited promotion of the industry.

23/ 1965-1966 Annual Reports of the Division of Agriculture, Alaska.

use of proper conservation practices. The Division is required to acquire and diffuse information on agriculture to people of the State and provide prospective settlers and others desiring to engage in agriculture with such information. The Agricultural Revolving Loan Fund has the stated purpose, "to meet the particular needs of the Alaska farmers for low cost farm financing essential to the development of agriculture." Under this program priority is given to loans where suitable financing could not be arranged elsewhere. Programs within the Division of Agriculture vary in stages of development to attain the stated objectives; consequently, evaluation of the contribution to overall agricultural development is difficult.

The Division of Lands has a limited sphere of activity in agricultural development. It has the delegated responsibility of selection, classification, and disposal of agricultural lands through sale, homesteading, or leasing. The purpose of the State's agricultural lands program is to selectively encourage agricultural development when and wherever the time and opportunity seem desirable. The program intent is definitely to encourage agricultural settlement. "State land policies unequivocally encourage allocation of land to agricultural use. This is explicitly stated as a goal in the Alaska Statutes. Additional evidence of the State's policies of encouraging agriculture is found in legislation which was passed by the Fifth Legislature. This authorizes the Commissioner of Natural Resources

to select areas of State land classified as agricultural and contract for the land to be cleared or drained or both at State expense." 24/ The Division of Lands, like the Division of Agriculture, has diligently pursued its responsibilities regarding agricultural development; however, little development has occurred on the agricultural lands made available through the Division's agricultural lands disposal program.

Lack of development and expression of comprehensive state goals, objectives, and policies, appears to have greatly limited the effectiveness of the programs being carried out by the two divisions discussed. Lack of attention to development of a comprehensive policy towards agricultural development has been rationalized by the belief that agriculture is so small that it has a very low priority among the problems faced by the State administration. Such a belief provides little consolation to the individuals who are attempting to develop agricultural firms in the current political, social, and economic environment. Neither does it provide encouragement to other rural residents who are attempting to settle rural areas nor to those who must consider the marginal cost of providing additional roads, schools, power, transportation, mail service, fire and police protection, and the many other commercial services to scattered settlement areas.

24/ Robert C. Haring, et al., Alaska Agricultural Study: Economic Evaluation of the Potential for Agricultural Development in Alaska, Unpublished Report, Institute of Social, Economic, and Government Research, University of Alaska, College, Nov., 1967.

If one pursues the discussion of alternative State goals for development of the agricultural industry, several alternatives are appropriate for discussion: (1) to continue current programs and policies, accepting Federal domination in general policy and program leadership even though agriculture continues in a state of chronic depression; (2) to accept a policy of no agricultural policy, considering that for all times and all places the best thing government can do to foster economic growth in an industry is to limit itself severely, narrowing its scope of operation to the minimum possible, to give the private economy its head to achieve progress. This position ignores the lack of institutions in the underdeveloped economy of Alaska and the need for planning in overall resource development; (3) to develop positive State goals, policies, and programs for agricultural development, giving due recognition to timing and emphasis where greatest opportunities can be identified through sound study and discussion with people who would be involved.

If either of the first two alternatives are considered, little can be said other than that the criticisms made in the past still have the same validity, that was true in territorial days, a complete lack of planning resulting in a lack of coordination and a lack of concentration on problems of agricultural development. The acceptance of either alternative would be based on a continuing burden of self-inflicted colonial attitude due to a lack of a positive state posture in developing goals, objectives, and policies regarding development of the agricultural industry.

The last alternative is predicated on the belief that the State has a positive responsibility to its rural people, and that State leadership in agricultural development can be more responsive to the individuals involved than Federal leadership in Washington. It is also predicated on the belief that agricultural development can contribute to overall economic development, and that the increased commerce resulting will contribute to developments in transportation, communications, secondary road building, social and commercial services in rural areas, and an overall increase in tax base. Such development would eventually contribute to the National economy.

If the third alternative was considered, a number of problems should be given due consideration. Consequently, a number of suggestions are offered. The first problem would be to clarify general goals regarding agricultural settlement and development of the agricultural industry and then to further develop and express a comprehensive agricultural development policy. Such a policy would provide a definitive frame-work from which to plan for agricultural development and would provide direction to all persons working toward the end of improving and expanding agriculture to its full economic potential over time.

A second problem in policy and programming is the general lack of coordination of government agencies and other groups working towards solutions of problems that are directly or indirectly related to

development of the agricultural industry. The problem is due to lack of well defined goals and policies or conflicting objectives of the agencies and groups involved. Much of the confusion and conflict could be alleviated by an agricultural program coordinator, supported by an advisory group representing major interests of the agricultural industry. Liaison between State and Federal agencies, farm and ranch groups, borough governments, processing and distribution interests, and other groups interested in development of rural areas could be of material benefit in concentrating and coordinating resources, and efforts on the problems of development of the industry as well as coordinating agricultural development with development in other industries. There are presently a number of agency groups (committees) such as the Rural Areas Development Committee, the Federal Field Committee's Agricultural Task Force, the Technical Action Panel, the Rural Civil Defense Committee, the Alaska Rural Development Review Committee (Washington, D.C.) and others of lesser scope, but none of these committees have the charged responsibility of developing and coordinating State agricultural development goals and policies. The above-mentioned groups are primarily oriented to Federal and State agencies and do not include farm and ranch groups, the processing and distribution people, or borough governments.

A third problem is the lack of concentration on area commodity-project problems. Geographic separation and environmental differences preclude a general uniform approach throughout the state. The selection of commodity projects by geographic areas followed by a coordinated development program, including all agencies and interested persons, would concentrate resources in such a manner that the probability of success would be greatly enhanced. Commodity projects such as red meat (beef and mutton) on the Kenai Peninsula, Kodiak, the Alaska Peninsula and the Chain; reindeer production on the Seward Peninsula; milk and vegetable production in the Matanuska-Susitna Valley area; vegetable and grain production in the Tanana Valley; and other possible products in all of these areas, as well as possible grass seed, oil seed crops, vegetable seed production, etc., that are not yet developed as commercial crops, could all benefit from a coordinated program of planning research, education, and service programs. It is necessary to consider all facets of production, market structure and facilities, promotional development, investment capital and credit, service programs such as research, education, product inspection and control, etc., if a commodity production project is to have a chance to succeed.

Several other areas of programming that can contribute greatly to agricultural development are research, education and service programs oriented to feasibility studies, followed by development planning and promotion where applicable. There are currently a number of groups

within the state, as well as a number of "outside" groups from time to time, carrying on research oriented to agriculture. It would greatly enhance the chances of beneficial development if research were more closely coordinated to well-defined and known objectives which could be provided by a well-defined agricultural development policy for the state. The coordinating function could be provided through the suggested agricultural coordinator and his advisory committee. The development of such a research coordinating function oriented to a state agriculture development should be conducive to attracting a much broader active participation from research units of the U. S. Department of Agriculture. The continued fragmentation and dispersal of research efforts adds little to the solution of development problems as long as such problems are not recognized in research programs, or are not integrated into a well-defined program of development.

The current state of educational programs oriented to expanding agriculture and rural development leaves a noticeable opportunity to expand. Currently, there is no University degree program oriented to any major phase of agriculture, even though the sub-arctic environment and a concentration of research and teaching resources provides the opportunity to develop well-rounded programs oriented to sub-arctic rural and agricultural development. Agriculture broadly defined should include rural people, agricultural products, agricultural related business, utilization of the many resources in the rural environment, rural recreation, and the production and living environment. Using this

broad definition of agriculture, Cooperative Extension could expand its program noticeably to assist in overall Rural Economic Development. The State Department of Vocational Education could develop a variety of educational programs oriented to areas, i.e., native village, agriculture business, vocational agriculture, sub-arctic technical biology and agriculture vocations, as well as agricultural related business and vocation. Adult vocational agriculture programs are conspicuous by their absence. A very broad program of education could be developed in vocational agriculture, related agriculture businesses, native village adult programs, etc., that would greatly contribute to rural development in the long run. The University's Division of State-Wide Services could expand its program of off-campus and short courses to fulfill a need for education programs oriented to rural development. Programs oriented to small business management, village economic development, rural sociology programs oriented to village cultural and economic changes, etc., would assist in accelerating rural economic development.

Service, and development and planning programs, could well be expanded in their orientation to development aspects of agriculture product assembly, processing, storage and distribution. There is an unmet need in developing feasibility and development planning studies. There is also an unmet need for a liaison between current and prospective agricultural producers and processors and all of the

State and Federal agencies that would give due consideration to ideas, opinions and desires of those actually involved in agriculture as a livelihood. The current feeling of many agricultural producers and rural residents is they have no voice in agriculture policy and program development.

CHAPTER IV

THEORETICAL ASPECTS OF AGRICULTURAL DEVELOPMENT PROBLEMS

> Land settlement, especially as a pioneering venture, has fired many people's imagination. As a measure for tackling land problems, it has an almost universal appeal. There is hardly a country in the world which has not undertaken, at one time or another, a land settlement program. . . . The high rate of failures in land settlement projects would almost certainly have been reduced if past experience had been properly evaluated, lessons drawn, and guidelines established for future programs. 25/

The purpose of this chapter is to treat certain philosophical and theoretical aspects of agricultural development in regions where settlement has been or is being attempted in Alaska. Development programs in Alaska have been plagued by continuing conflicts of philosophies, values, and beliefs regarding goals for agricultural settlement and development and the means for accomplishing them. Undue recognition has been given the proprietary attitudes of individuals who firmly adhere to various and widely divergent philosophies, values, and beliefs, in the development of agency programs and policies, and has resulted in incomplete planning and inadequate direction in agricultural settlement and development efforts. Individual settlers have also held diligently to the various philosophies and consequently have pursued social goals, relegating

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25/ D. Christodoulou. "Land Settlement: Some Oft-Neglected Basic Issues," Monthly Bulletin of Agricultural Economics and Statistics, F. A. O., Vol. 14, No. 10, October, 1965, pp. 1-6.

economic goals to positions of secondary importance until the pioneering stages of the settlement efforts have been accomplished. The results have been that few settlers have stayed on the land and that the rural sector of the Alaskan economy remains relatively undeveloped.

The Conflicting "Philosophies"

Three distinct philosophies are involved in the ongoing conflict regarding agricultural settlement and development.

The "Blood, Sweat, and Tears Philosophy" of agricultural settlement has been held very dear by many homesteaders who came to Alaska looking for the "last frontier". It has been said that this group of people was attempting to escape from the pressures of modern society. This philosophy has a much broader acceptance however; since it is expressed most firmly by people of the cities who may or may not have come from farms; by people of the towns who have lost contact with "the beautiful and quiet repose of the country life"; by rural people who are looking for the opportunity to continue the pursuit of virtues of the rural life which Richard Hofstadter has so aptly described:

> . . . Its hero was the yeoman farmer, its central conception the notion that he is the ideal man and the ideal citizen. . . . The yeoman, who owned a small farm and worked it with the aid of his family, was the incarnation of the simple, honest, independent, healthy, happy human being. Because he lived in close communion with beneficent nature, his life was believed to have a wholesomeness and integrity impossible for the depraved population of cities. His well-being was not merely physical, it was moral;

> it was not merely personal, it was the central source of civic virtue; it was not merely secular but religious, for God had made the land and called man to cultivate it . . . 26/

When this expression of the central theme of Agrarianism is combined with beliefs encompassed in The Work Ethic, as expressed by John Brewster 27/ some years back, one arrives at a penetrating insight into the philosophy held dear by many of the individual "homesteaders".

One may briefly summarize the combination of beliefs that go to make up the "blood, sweat, and tears philosophy" by saying, "the primary goal of the individual homesteader, who seeks out a remote and difficult location, is to prove his own worth to himself and his peers through his own efforts in developing a going farm through homesteading in 'the last frontier'." Such an individual holds the yeoman farmer in high regard, but at the same time considers that he must be a self-made man and the greater the difficulty the higher the status attained. This individual wants no interference from anyone, but demands his status recognition when expressing desires or opinions. Due recognition has been given this philosophy by politicians and policy makers, and has been rationalized by saying that our modern society needs this safety valve provided by the "blood, sweat, and tears" type of settlement opportunity on the "last frontier".

26/ Richard Hofstadter, The Age of Reform: From Bryan to F. D. R., (New York: Alfred A. Knopf, 1956), p. 24.

27/ John W. Brewster, "Societal Values and Goals in Respect to Agriculture", in Some Selected Papers on Goals and Values in Agricultural Policy, Ames Conference, June 27-29, 1960, Center for Agricultural and Economic Adjustment, Iowa State University.

The "Family Farm Philosophy" has had its strongest proponents in policy makers and agency people of the United States Department of Agriculture. An agriculture of predominantly family farms has been a dominant goal in public policy concerning the structure of agriculture in the United States for a long time. The Homestead Act of 1862, the Federal Land Bank Act of 1916, the Resettlement Administration and the Farm Security Administration of the 1930's, the Farmers Home Administration, the Federal Extension Service, and many of the later government agencies have had as a primary objective the maintenance of the "family farm". The belief that nothing must impinge upon the values of the family farm has always been foremost in basic policy.

The socio-political philosophy underlying the family farm ideology is strongly associated with agrarianism, but does have certain additions. First, a close look at the agrarian culture:

> People in rural America are generally characterized by a conservatism and resistance to change. The spirit of individualism is strong, and nowhere is there a stronger sense of tradition and conservatism than in the cotton South. The prevailing economy, together with its land tenure system and other supporting institutions, has social, political and racial, as well as economic, complications. There is a deep attachment to the agrarian way of life, and the habits and institutional patterns of the region are deeply embedded in the thinking and behavior of the people. Programs must carry a strong appeal in order to overcome the tendency to cling to the old and resist that which is new. 28/

28/ L. J. Norton, et al., "Adjustments in Southern Agriculture with Special Reference to Cotton", Journal of Farm Economics, 1946, pp. 341-379.

One sees the idyllic yeoman farmer somewhat tarnished by a traditional conservatism and a strong resistance to change, clinging to the old and resisting what is new.

There are subtle interpretations to the philosophy, as the family farm is interpreted as being small, with a certain subsistence implication. There is also the implication of extreme frugality, and the necessity of scrimping and saving to succeed. A critical implication is that there is a difference between the family farm and the commercially competitive farm, and thus an industry that is oriented to a semi-subsistence status quo. The philosophy thus does not appear growth oriented, particularly in a frontier environment.

The "Long-Range Planning Philosophy" of agricultural settlement and growth departs drastically from the values and beliefs of the other two philosophies. It is predicated on the belief that the scientific approach may be used to solve major problems in the most efficient manner possible. Goals for agricultural settlement would be determined after a methodical review of all interests: individuals, organized groups of people, agencies, political subdivisions, and state and national governments. Once final goals for settlement were assumed to have been determined, scientists from all disciplines could be drawn upon to cooperate with the planners in laying out plans for settlement. Information needs would then determine objectives for research programs. The scope of the settlement program would determine the administrative

structure for coordinating and integrating the overall program. State and Federal Governments would provide means and legal structure for implementing and continuing the settlement program in order to attain the goals initially determined.

This philosophy is predicated on an almost mystical faith in the technology ethic. The technology ethic has gained great support in developing areas. The ethic has developed as a result of the commonly expressed belief that technology can bail us out of any difficulty if proper planning and research are carried out to provide and implement the needed technology, and increasing capital requirements. Such changes usually involve noticeable changes in scale of farm businesses. The increased capital requirements and associated technological development places a strong emphasis on sound management decision. When we add the belief that government should be the guiding force in such a social and economic endeavor and that government is the only entity that is large enough to carry out such a program, we then have much of the "technological ethic" as it is expressed in the settlement areas. The ethic has strong reinforcement from planners and researchers.

The Conflict

Those who support most adamantly the "blood, sweat, and tears philosophy" of agricultural settlement and development look to goals of the unique individual who still searches for the opportunity to express his individualism to the utmost. The environment that he looks for is undisturbed nature, where he will be free from social coercion.

Those who disagree with this philosophy point out that the socio-economic conditions of our society have changed so rapidly and so completely that we cannot afford the luxury of having individuals in our society who do not assume the responsibility of making their full contribution to the attainment of society's goals and objectives. Furthermore, the type of settlement occurring as a result of following this philosophy may actually be a detriment to attaining the goals associated with an accelerated rate of settlement in the fringe areas of the sub-arctic regions. The critics go on to say that subsistence settlers are psychological misfits in our modern day society, and consequently, society has the responsibility to "help" them adjust to the modern society as it "actually exists".

The "family farm philosophy" of agricultural settlement is rationalized by saying that the small family farm was the predominant form of farm business throughout the frontier migration, and due to its unquestionable success, it is the only suitable way to settle the rural areas of Alaska. Those who disagree with the "family farm philosophy" point out that people of the mid-Twentieth Century are conditioned to the good life we know, and are totally unsuited to the hardships that our grandfathers took as a matter of course. They also point out that such an inefficient means of settlement brings about a malallocation of human and capital resources because so many settlers sink all of their capital, and several years of their

time in an attempt to develop a family farm, but fail in the attempt to develop a production unit. The settler must then accept his losses and start looking for a new life. The continuing dream of finally developing a family farm causes the individual to hold the land and other capital resources in an undeveloped state and thus precludes the uniform development of the area. The resulting sporatic development causes a very high cost of providing public services to individuals residing in those rural areas. Those who speak against the family farm philosophy, as it is espoused in Alaska, conclude that the social, economic and political environment of the modern frontier settlement areas is so different from the frontier of the great western migration that we must unlearn much of our past experience before we can successfully approach the problems of settlement in the sub-arctic regions of Alaska.

The "long-range planning philosophy" of agricultural settlement tends to follow an organic school of thought. Proponents of the philosophy appear to believe the "facts" from their particular disciplines can eventually be organized into a body of knowledge adequate for this specific purpose at hand. First one must plan a program of settlement, and then research all of those problems identified by the physical scientists involved as "appropriate" and empirically researchable, assuming that because scientists are special entities that they are cognizant of all social problems, which

cannot be researched anyway. Thus the resulting "research facts" can be put in "the plan" and settlement and development will occur. If settlement does not occur, Government can make the plan work.

Critics of the "long-range planning philosophy" point out that such plans are seldom complete and comprehensive to the overall problems of settlement and development. They continue to point out that the social factor of the private sector of the economy in question is not considered, that even though rural people are rapidly taking on characteristics of the urban society, they still have certain characteristics that are the stimulus of frontier settlement. A further major criticism is that personal goals and objectives of the individual in settlement programs are given no consideration, and these goals are one of the critical factors in causing successful settlement to occur. A final major criticism that may be leveled is that planning efforts are most often not problem oriented; that research, service, and institution plans are oriented to planners' preconceptions rather than to the unique problems of the particular situation that is being considered.

The conflict of philosophies may be summarized by pointing out the emphasis of the "blood, sweat, and tears philosophy" is oriented to the individual and to the individual's goals. The pursuit of this philosophy emphasizes spontaneous individual scattered settlement without structured social and economic institutions that contribute to the settlement effort. It must be recognized that the attainment

of goals predicated on this philosophy would exclude the possibility of attaining general goals for rapid and uniform settlement and development of the agricultural industry and particularly general program and project type efforts.

The "family farm philosophy", as espoused in Alaska, is oriented to the maintenance of existing farm units and existing government agencies in a status quo situation. When diligently pursued, this philosophy emphasizes small farms that have great difficulty remaining economically competitive, and generally excludes new entry and the development of large commercial farms that can take full advantage of economies of scale and the introduction of new and capital intensive technology. The philosophy is oriented to the perpetuation of an old mature agricultural community and has little to offer to the pursuit of new settlement and development. It does not exclude the spontaneous homestead but does not offer any encouragement or recognition of particular needs of homestead development.

The "long-range planning philosophy" is mutually exclusive with the two previously mentioned philosophies of settlement and development. It is oriented to a programmed settlement and development effort, primarily based on physical research efforts and generally excludes social goals and programs, as well as individual goals and aspirations, from the planning frame of reference. Overall goals and program components are too often determined by the proprietary interests and attitudes of administrative authoritism. There appears to be a definite

separation and alientation between the planning group and the people in the agricultural industry.

In reviewing the conflict of philosophies regarding settlement, one must conclude that if only the goal of an accelerated rate of settlement and rural development is considered that the conflict may well act as a deterrent. The complete process of development is not well understood, consequently, one must treat theoretical aspects of settlement and development problems arising out of the philosophical conflicts discussed and hopefully contribute to a fuller understanding of agricultural settlement and growth in the sub-arctic fringe of rural Alaska.

Theoretical Aspects of Farm Development In Newly Settled Regions

Why is it that certain newly settled regions appear quite successful, and others fail so completely, in becoming economically developed in their agricultural sector? The question must be considered at two levels, first at the level of an overall settlement program, and second at the level of the individual farm firm. Comprehensive and detailed planning has been said to be the focus of success of any settlement or agricultural development program, whether it be at the overall program level or at the firm level.

Christodoulou 29/ suggests that "Very rarely is it realized that land settlement projects are intrinsically multipurpose undertakings." Many people are critically involved, with widely diverse interests, values and beliefs. Consequently, many issues and problems, both social and economic, must be given due consideration to understand which will contribute to or detract from the development program.

When existing programs are being reviewed or new settlement or development programs are being considered, the process must start with: (1) the purpose of the settlement or development effort, (2) recognition and review of the full range of objectives of all persons, agencies, and levels of government involved, and (3) resolution or reconciliation of the conflicts. When this is completed, the planning process may be effectively started. Christodoulou summarized this initial step, "Sound advanced planning should include setting out, in clear terms, the purpose of the project, the reconciliation of conflicting objectives, and the setting up of priorities." 30/

When the process of evaluation of the potential for success of current potential development programs is being carried out, many factors, other than direct inputs of a project, must of necessity be considered. "Land holding has a special fascination, encouraging

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29/ D. Christodoulou, "Land Settlement: Some Oft-Neglected Basic Issues", Monthly Bulletin of Agricultural Economics and Statistics, F. A. O., Vol. 14, No. 10, October, 1965, pp. 1-6.

30/ Ibid.

exaggerated expectations which often cloud realistic assessment of the chances of success." 31/ Planners as well as settlers often let their enthusiasm over-ride realistic expectations, but the opposite can and does happen. Development progress does occur where one could not foresee the potential. Hendrix attributes the unique success of such development to "their own will and commitment to progress and upon their own policies and programs." Such a factor may be nebulous and difficult to recognize, and may be nearly impossible to measure, but this does not alleviate the critical importance of including it in assessment of projects or programs. 32/

One further inclusion needs to be made in this initial stage. That is, "These changes will come about from within in a form and manner consistent with the values, culture, and aspirations of the people. Imported capital, technology and institutions can constitute important catalysts to institutional change, but . . ." 33/

31/ Ibid.

32/ William E. Hendrix, "The Experience of More Rapidly Developing Countries", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, p. 24.

33/ John F. Timmons, "Agricultural Development Through Modifying Land Tenure Arrangements", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, p. 97.

McPherson expands upon the same general thought:

> . . . but in low income countries productive new inputs as well as the distributive system and demand for these inputs remains to be developed. . . . Land, technology, and capital are important - but in order to be productive they must be developed, organized, and operated. These functions can be performed only by humans. 34/

The stimulus to develop and the carrying out of development will come from the human resource.

Some thought should be given to necessary preconditions for agricultural development. Parker, in discussing priorities for development and investment, refers to the complexity of the problems faced:

> The complexity of the process is further illustrated by Millikan's six preconditions for agricultural development. There must be: (1) The will to develop agriculture present in the minds of at least some of the national and local leadership; (2) At least some modicum of political stability and continuity in the country; (3) A minimal corps of administrative and organizational talent and competence; (4) A corps of nationals trained in agriculture; (5) Expanding markets for the products of agriculture; and (6) Both domestic and foreign resources available to supply the necessary inputs for agricultural modernization. 35/

34/ W. W. McPherson, "Input Markets and Economic Development", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 99-117.

35/ F. W. Parker, "Priorities in Agricultural Development and Investment", in Iowa State University Center of Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 175-199.

Returning to Christodoulou's discussion, one finds the suggestion that advanced planning should be assessed in terms of expected costs and benefits, because through this type of analysis the authorities involved can ascertain the magnitute of the program considered and decide whether they can afford the venture. If this step is to be taken, one must raise the question, "What goes to make up the preliminary plan?" Lewis, in discussing the actual settlement phase, suggests the following factors as being critical to the success of any planned settlement effort: (1) choosing the right place; (2) choosing the right settlers; (3) physical preparation of the site before the settlers arrive; (4) settlers capital; (5) the organization of group activities; (6) the acreage per settler; (7) the conditions of tenure; and one might add "recognition of compatibility and conflict of individual goals and values with those held by the administrative organization for the settlement project as a whole." 36/ Lewis emphasized the settlement phase of a project, but did not include carefully defined goals for a settlement project nor does he consider the necessary institutions, service and supply centers, processing and distribution systems for agricultural products, or the critical need for development and adaptation of knowledge and technology to implement and accelerate the production process, or the coordination of agencies that are critical to the success of such a project or program.

36/ W. Arthur Lewis, "Thoughts on Land Settlement", in C. K. Eicher and L. W. Witt, Agriculture in Economic Development, McGraw-Hill Book Co., New York, 1964, pp. 299-309.

Lyle W. Shannon, in discussing cultural restraints, focuses on the determinants of production:

> It has frequently been said that land, labor, and capital are the determinants of production. These factors place certain limitations on production, particularly agricultural production. With a given amount of land, labor, and capital, the manner in which people are organized will determine the level of production. Economic development is the process of organizing people for increased production, more efficient distribution, and increased consumption. 37/

If one accepts Shannon's thesis, then the process of development is the process of development of the human resource input. Shannon, however, views development from the very narrow perspective of a fixed resource base in a static situation. Land, labor, and capital are ever changing due to man's ever changing influence. Man's introduction of technology, institutions, changing education and skills, and the ability to bring about the change in nature and mix of other resources leads one to the conclusion that there is no simple solution in deciding what the determinant(s) of production is (are). One must agree with Shannon though, that change comes about from the efforts of the human resource input to the whole process of development. One might say then, that economic development is the process of using the accumulated output of the development of the human resource in the process of organizing all resources for increased production, more efficient distribution, and increased consumption

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37/ Lyle W. Shannon, "Overcoming Cultural Restraints", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 66-79.

to benefit the peoples of a given economic society. The pursuit of knowledge of the development process appears then to be the pursuit of knowledge regarding the development of those inputs resulting from the human resource.

Johnson 38/ has emphasized the belief that there is no simple solution to the problem of transforming traditional agriculture, and no magic mix that will work in all places at all times. "However, the combination that can be adopted to environmental conditions and which will succeed in a particular area can be learned." He lists two requisites for the learning process, (1) understanding how traditional agriculture functions in different areas within each country and understand the "why" of present conditions, and (2) finding out what is known about the potential results of combinations of improved technologies that can serve as a basis for field programs to improve production and marketing in a specific area. One must agree with the need for such steps to be carried out; however, one would expect certain deficiencies in current knowledge, the resolution of which must also be included in program planning.

38/ Sherman E. Johnson, "Combining Knowledge, Incentives, and Means to Accelerate Agricultural Development", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 209-223.

Moseman 39/ reminds us that "well-planned research can and should demonstrate the potential for progress in the agricultural sector and encourage as well as guide increased national investment in agricultural development." Well-planned research should isolate the critical problems that inhibit agricultural development as well as eventually provide us with the knowledge to resolve those problems. The success of such an approach has been effectively demonstrated by the U. S. D. A. and land-grant universities. The ultimate goals of a development program is to institutionalize agricultural progress, and this requires a steady flow of research knowledge that must increase in volume and quantity--flows of basic, applied, and adapted knowledge as new knowledge is an indispensible input. New knowledge is created by basic research and is almost indispensible to applied research. Applied research, however, produces what we generally call "new technology", and it is the "new technology" that becomes incorporated into the production process. 40/

39/ Albert H. Moseman, "Research Needed for Technological Knowledge in Agricultural Development", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 224-237.

40/ Lee R. Martin, "Basic Considerations in Transforming Traditional Agriculture", in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 48-65.

Research must be focused to the actual development problems if it is to contribute to the development process. Moseman suggests that coordinated and integrated efforts are undoubtedly necessary,

> Some innovations may be derived from adaptive research in order to fit more productive materials and methods from advanced agriculture to new soils and climatic conditions. But, in some instances, where past research and production experience has been deficient, integrated and interdisciplinary research programs should be undertaken to deepen and broaden understanding of agricultural production processes. . . . the slow and costly "cut and try" procedure for adopting innovations must give way to studied and guided modification of materials and methods. 41/

Research people recognize the need for ascertaining the need for fertilizer use and other approved practices and they stress the need for well-rounded research programs. Some are real pessimists about the possibility of achieving any progress in the undeveloped areas on the basis of current knowledge. One is often left with the impression that progress will have to wait on the development of new research that is vastly more productive than inputs now available. Unfortunately, though, not even that which is known has been made available to farmers in a usable form. 42/

There are certain cautions that must be kept in mind when considering the research input in the planning of development programs and projects.

41/ Moseman, loc. cit.

42/ Johnson, loc. cit.

> Too often the well-trained scientist in a country with primitive agriculture feels that he must be concerned with the so-called fundamental research in order to maintain his stature in the international community of scientists. He suspects that he might be downgraded if he devotes his research efforts to producing something useful. 43/

One must keep in mind that:

> The information process most urgently needed in the intermediate and long-run future are information adaptation and applied research - that in requirements for human talent, applied research and information are as demanding, or more so, as basic research and human capital formation. . . . that greater individual initiative is a prerequisite for dynamic increase in agricultural output. . . . the interactions among scholars are an important source of stimulation and creativity; this implies that a critical mass of scholarship is necessary before the required volume and quality of results forthcoming . . . 44/

Basic research for northern agricultural regions may not vary greatly from that of more temperate zones; however, there must be different emphasis, depending on differences in climate, resources and economic factors. In all new development areas, there is a great need for research to develop policies and knowledge to utilize the natural and other resources efficiently and economically. Alaska has faced many problems of communication, education, civic and social development, and supply of consumer goods and markets. Economic growth based on material resources and feasibility of utilization have often been overlooked or overshadowed by more pressing military programs. Agriculture has made a certain amount of progress, but the institutions

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43/ Moseman, loc. cit.

44/ Ibid.

that characterize a mature and stabilized community are undeveloped or have lacked the freedom to expand and develop their normal growth.

Aamodt goes on to critically focus on the Alaska situation,

> The situation is not greatly unlike some of the countries emerging as independent states in many parts of the world, that were formerly controlled or governed by colonial powers. These emerging countries have much in common with Alaska in developing institutions that will guide and fortify the new governments and their expanding independent economies. In all these new states there is great need for research to develop policies and patterns, to utilize the natural resources efficiently and economically. Whether a country is "underdeveloped" or "advanced", is a relative matter and frequently refers to a particular field of development. It is usually applied to countries, or areas, that have not had time, or have failed to develop their resources and modern institutions. . . . The transition period from territorial exploitation to progressive and stabilized statehood requires assistance from the governing powers in the same spirit that colonial powers and other advanced countries are now providing assistance to former colonies and other underdeveloped states. Alaska has been granted political equality but labors under a burden of past inaction in the development of institutions basic to an independent cultural, social, and economically balanced state. 45/

In view of Aamodt's discussion of the Alaska situation, it appears necessary to take a brief look at institutional services and the part they play in the development process. Booth describes one viewpoint of the part that institutions play:

45/ Olaf S. Aamodt, Northern Agriculture Research, An address given at the 14th Alaska Science Conference, Alaska Division, American Association for the Advancement of Science, Anchorage, Alaska, August 27, 1963.

> Empirical theorizing typically consists in searching economic history for generalizations concerning conditions that have stimulated, and barriers that have inhibited, economic growth. The discovered stimulants and barriers have as often been institutions of society and states of nature as they have been economic variables. . . . Barriers to economic growth are more institutional in character. Or, rather, institutions can easily become barriers since they are static and usually invented to fit a given environment. 46/

There are numerous reasons for believing that the character of class structure and other features of social organization would have a strong influence on attitudes, incentives, and motivations of structuring both social and economic institutions relevant to the development process. However, as we are pursuing the topic of institutions from an economic viewpoint, we are searching for those conditions which may influence entrepreneurship, capital accumulation and development, technological change, and resource development. 47/ Parsons expresses the belief that institutions function in economic affairs as the systemizers of social action and explains this belief by saying:

46/ E. J. R. Booth, "The Present State of Knowledge About Economic Growth", in Optimizing Institutions for Economic Growth, Proceedings from conference held at Gainesville, Florida, May 5-6, 1964, sponsored jointly by Agricultural Policy Institute of North Carolina State and the Southern Land Economics Regional Committee.

47/ W. W. McPherson, "Overview of Southern Economic Growth", Proceedings from conference held at Gainesville, Florida, May 5-6, 1964, sponsored jointly by Agricultural Policy Institute of North Carolina State and the Southern Land Economics Regional Committee, pp. 26-27.

> Perhaps the simplest way to suggest the approximate nature of institutions is to note that institutions are the procedural or social aspects of an economic system which the input/output, resource-commodity transformation functions are the substantive aspect. 48/

Emphasis is often placed on the deliberate change in institutions, particularly as supplements to, as adaptations of, or as substitutes for existing institutions. One must take a bit broader perspective, as Aamodt has suggested for Alaska, due to the undeveloped character of the agricultural industry. Many institutions are underdeveloped, due to a number of causes, but many do not exist. One of the most difficult problems in modification or development of institutions in such a situation is posed by power problems and the vested interests which grow up around any institutional configuration when economic power is reinforced by political and social status.

Moseman, in discussing field programs for agricultural development, suggests that certain external institutional services may have direct bearing on the development process. They are: (1) basic and applied research (as previously discussed); (2) education and training; (3) farm supply facilities; (4) credit facilities; (5) marketing facilities; (6) price assurances; and (7) in some instances, large

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48/ Kenneth H. Parsons, "Institutional Innovations in Economic Development," Proceedings from conference held at Gainesville, Florida, May 5-6, 1964, sponsored jointly by Agricultural Policy Institute of North Carolina State and the Southern Land Economics Regional Committee, pp. 81-87.

scale land and water improvement projects. 49/ One cannot disagree with Moseman that the services of such institutions are of primary concern in the planning or evaluation process when reviewing preliminary plans for development projects and programs or reviewing those already in existence, and as Moseman also reminds us, ". . . a field development program needs administrative understanding and support at the highest levels of government, and clean channels of authority, and responsibility for program operation."

Baker, in discussing capital restraints affect on production, emphasizes the importance of institutions with regard to credit and capital development. He expresses the belief that,

> To transform agriculture from subsistence to a commercial state, farms must use better quality managerial skills and capital than is used in traditional agriculture. Both are required. When capital alone is added or improved, the new capital is misused and is not as productive as expected. Similarly, improvements in the human agent alone generates selective migration from agriculture, a migration that leaves a low quality of managerial skills in agriculture itself. . . . 50/

Baker goes on to argue that capital restraints, resulting from institutional policies and beliefs, are strategic in attracting capital into or keeping capital out of the agricultural industry. The principal implication of Baker's discussion is that research and

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49/ Moseman, loc cit.

50/ C. W. Baker, "Limited Capital as a Restraint on Agricultural Development," in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press, Ames, Iowa, 1965, pp. 118-131.

education in financial management must accompany research and education in technical production and farm management in order to alleviate the restrictive institutional affects.

Heady counters with the belief that technical knowledge may be more of a limiting factor than capital. Heady expresses his belief:

> We have posed the hypothesis that the supply of capital and its price is more important than restraints in the supply of technical knowledge in bringing forth productivity in some regions of "less developed" agriculture. . . capital is not the dominant restraint on all farms which employ techniques resulting in low productivity of particular inputs. If capital were expanded moderately on its average cultivator unit (in Southeast Asia) restraints in technical knowledge would soon dominate. Capital and technical knowledge can be substituted for each other only to a limited extent. 51/

As Heady goes on to discuss the difficulty and cost of obtaining knowledge with regard to the production sector, he focuses more and more on the situation as its exists in Alaska. Knowledge can be obtained, but "it always has some cost attached because time and other outlays are required to 'go fetch it'." The relative cost certainly increases as the supply is restricted, and the cost is definitely greater in distant and undeveloped locations than in areas of advanced and mature agriculture. "There is need and reason, therefore, why the supply of knowledge should be increased relatively more in undeveloped than in developed agriculture."

51/ Earl O. Heady, "Priorities in the Adoption of Improved Farm Technology," in Iowa State University Center for Agricultural and Economic Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 155-174.

Discussions of agricultural development often focused on the settlement aspect or on development of the production sector through research and education or credit restraints, or even on the management input. If marketing is considered, the emphasis is generally placed on improving marketing facilities or lowering costs of marketing. Collins and Holton, however, concentrated on a different aspect of the marketing problem. They initiate their discussion with:

> Rarely, however, is it recognized that industrial and agricultural sectors in turn are dependent on the development of a distributive sector to bridge the gap between producer and ultimate consumer. In a sense the goods are not fully "produced" until they reach the hands of the final buyer; new production goals cannot be considered successfully achieved in any viable long run sense unless firm and continuous contact is made with markets. . . . Plans for economic development normally assume that this link between producers and ultimate buyers will be provided more or less automatically as marketing firms spring up in response to price incentive. 52/

One must concur that the implied theory of "spontaneously arising markets" is open to serious question. Collins and Holton seriously question the proposition "that such firms will necessarily appear or, if they do, that they will always provide the kind of marketing services most appropriate for the new production situation." This is especially true in the case of agriculture. Most development plans, as previously mentioned, give attention to simple cost-reduction

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52/ N. R. Collins and R. H. Holton, "Programming Changes in Marketing in Planned Economic Development," in Carl K. Eicher and Lawrence W. Witt, Agriculture in Economic Development, McGraw-Hill Series in International Development, McGraw-Hill: New York, 1964, pp. 359-369.

problems and call for improved physical distribution facilities and new storage and marketing facilities at central wholesale markets, coupled with some form of pure control. Most often the need is a change in organization and operation of the distributive sector, coupled with a much improved liaison with the production sector, thus,

> Effective planning for economic development, then must recognize that expansion of agriculture or agricultural based industries may call for correlative changes in the organization and practices, not just in physical facilities, in the distributive sector. But one can go beyond this and argue that the distribution sector can in fact be the leading sector in economic development. 53/

Fletcher also recognizes and emphasizes the belief that marketing can serve as a leading sector in economic development,

> Marketing is strategically situated to serve as a "leading sector" in the economic development of agriculture . . . that perhaps the most important reason why marketing is not optimally developed is the absence of necessary marketing services . . . special efforts will be required to transform the market sector to meet development goals. 54/

It is interesting to note the implication in most development planning that the distributive sector plays only a passive role in development. Emphasis is placed on removing obstacles in the marketing process

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53/ Ibid.

54/ L. B. Fletcher, "Commodity Markets and Marketing," in Iowa State University Center for Agri. and Econ. Development, Economic Development of Agriculture: The Modernization of Farming, Iowa State University Press: Ames, Iowa, 1965, pp. 132-141.

or reducing the "too high costs of marketing and distribution." Marketing (the distributive sector) can play a very positive role, under certain conditions, by changing demand and cost functions in agriculture and manufacturing in such a way as to encourage their expansion noticeably. 55/

Christodoulou, in discussing the oft-neglected issues of agricultural settlement and growth, reminds us that numerous factors not generally considered in economic evaluations have a significant effect on agricultural settlement and growth success. He points to the following issues as being particularly serious when the primary goals of settlement are: (1) settlement of unpopulated or underpopulated frontier areas and (2) the increase or diversification of agricultural production. The issues are:

> . . . Even when land in the possession of the government is to be used for settlement, the cost of bringing it under cultivation must be carefully assessed. . . . A common fault of settlement programs is to give each settler a holding too small for successful farming and thus incapable of providing an income of the average level found in rural areas of the country concerned. . . . Many settlers are grateful to start and even do well at the beginning, but when the pull of industry or other more remunerative employment is strong, they may be tempted to (and often do) leave the holding. . . . The task facing settlers on the land is often colossal. Men with little managerial experience (or at best with experience under different conditions) and in too many cases with no farming experience are usually expected to practice a new type of agriculture with techniques with which they are unfamiliar and on land whose characteristics they are ignorant. When "new" land has been reclaimed in a region where agriculture has not been practiced before, ignorance of the
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> ....

55/ Collins and Holton, op. cit., p. 360.

> agricultural conditions sometimes extends to the scientist and the advisory service. . . . Newly arrived settlers face acute problems of adaptation to their environment and of building up a harmonious, organic and constructive community life. In many cases, the maximum provision made for them is elementary social welfare, the underlying assumption being that, once put together, they should be able to build up their relations, public life and their communal institutions spontaneously and unaided. . . . Finally, successful community building and a stable human society cannot be promoted by settling people in conditions of isolation from the main stream of the country's economic, social and cultural life. Such isolation will lead to poor subsistence farming and economic hardship, and to an impoverished social and cultural life which will stagnate because of nonrenewal. . . . An often-neglected subject, however, is the method and spirit with which land settlement authorities approach and handle the human and social problems of land settlement. The most prevailing spirit is one of authoritarianism. 56/

Many of the issues and problems discussed fall within the field program or institutional context and many more fall within the social problem or social institutional context, however, the focus of economic development problems outside these two areas may often fall within the problem context of development and growth of the farm business firm.

Baldwin 57/ treats the question of settlement success and differential rates of growth between newly settled regions by using the concept of production-function differences. He emphasizes the belief that while technological conditions of production influence the pattern of growth in an economy at all stages of development, it appears that

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56/ D. Christodoulou, "Land Settlement: Some Oft-Neglected Basic Issues", Monthly Bulletin of Agricultural Economics and Statistics, F. A. O., Vol. 14, No. 10, October, 1965, pp. 1-6.

57/ Robert E. Baldwin, "Patterns of Development in Newly Settled Regions", in Carl K. Eicher and Lawrence W. Witt, Agriculture in Economic Development, McGraw-Hill Series in International Development, McGraw-Hill: New York, 1964, pp. 238-251.

such technological conditions of production can be particularly important in conditioning the potential for growth in nearly settled regions. The procedure used by Baldwin was to contrast the hypothetical development of two different regions with noticeable production function differences. A number of institutional and social factors were included in his discussion.

In the following discussion an approach similar to Baldwin's will be used in contrasting structured and unstructured settlement in the Alaska frontier environment, and differing accomplishments that appear to have resulted from the particular type of settlement effort. Many of Baldwin's assumptions have been incorporated into the discussion, i.e., both regions were sparcely settled; the two types of settlement were going on somewhat simultaneously or "concurrently" with a given and comparable state of technology; both areas were drawing their immigrants and capital from a common populated region; the socio-political environment of the more-populated region was conducive to the development of the sparcely populated (new settlement) region. The new settlement regions were small enough and in a primitive enough state of development so as to have no effect on the given hierarchy of factor and commodity prices prevailing in the state-side regions. Furthermore the newly settled regions in Alaska were of sufficient distance to make the cost of migration quite high. One must also assume that economic development of the Alaska agricultural communities

would have to begin with local markets and suitable commodities for those markets. The final assumption would be that there would be no fear or antagonism from the older more populated region with regard to new and increased production.

Two agricultural settlement areas in Alaska lend themselves to the comparison of structured and unstructured settlement efforts. The Matanuska Colony settlement, along with the later homestead settlement in the Valley, may be construed as being characteristic of structured settlement. The Kenai Peninsula settlement, with its spontaneous individual homesteading, may be construed as characteristic of the unstructured type of settlement. Both areas had certain factors in common: considerable acreage suitable for farming, very limited agricultural experience in the area, very limited road development, sparce rural settlement, and very limited and undeveloped agricultural markets. Both areas were settled on the premise that settlers could initially develop subsistence farm units and later would have the opportunity to develop commercial farms as population increased and markets developed. In both instances farm development costs were very high and settlers did not have the necessary capital to develop farms from raw wilderness. However, results of the two types of settlement were quite different.

The Matanuska Valley

The Matanuska Colony provided a certain amount of planning for settlement and development, a rather large group of settlers starting at one time, a wide range of community services, an agricultural service and supply center, an organized market for agricultural produce, sources of agricultural credit, and became the focus for the development of all agricultural agency programs within the state. The Colony administration and the subsequent agricultural agencies tended to focus on the Valley; thus the "establishment" tended to jealously guard the position of dominance of the Valley that was attained through group settlement in the Valley. Homesteading continued to expand around the colony due to the developed community structure and institutions.

The Colony may be considered a successful experiment in settlement in that it did increase permanent settlement in the Territory, and it may be considered successful in agricultural development in that the Valley has been the one permanent agricultural community in the State and has produced more than half of all agricultural products since production statistics have been collected.

Johnson and Stanton summarized the goals of the Colony as:

> The Matanuska Colony was established for three purposes: (1) to take people off, or keep them off, relief as a result of depression in the United States; (2) to demonstrate whether or not Alaska provided a settlement frontier that could absorb excess population; and (3) to add greater support of the Alaskan economy by production of more locally produced food which would lessen dependence on costly and vulnerable waterborne transportation.

> It was a spur of the moment idea, carried out in the urgency of the times. Its implementation was hampered by the serious absence of all but the most rudimentary knowledge of natural conditions in the settlement area. 58/

Stone summarized topically some of the strengths and weaknesses of the Colony effort:

> Planning. Plans for The Colony were made hurriedly. The project was too complex to design and start action in the six months between late 1934 and early 1935. Even more significant was the nearly complete lack of basic studies on the Matanuska Valley and summaries of experiences in group settlement elsewhere in the world. These two weaknesses--speed and lack of information--were demonstrated throughout all phases of colonization.
>
> Administration. The Alaska Rural Rehabilitation Corporation, a private non-profit agency which was formed for the purpose, has guided the colonization. However, the use of the California Emergency Relief Administration until the ARRC was formed lead to confusion. Too many administrators, in both Washington and Palmer, were inexperienced. Administration was paternalistic and the control was too rigid.
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> Land. The Colony was developed on about 13,000 acres of better farming land in The Valley. All of the acreage was purchased by the ARRC and 17 percent remains unassigned. The 40-acre tracts were too small and the physical qualities of the land were too little know.
>
> Settlers. The original colonists were 903 disadvantaged persons, nearly all of whom were from Michigan, Minnesota, and Wisconsin. Selection was hurried and resulted in the choice of too many people who were not sufficiently adaptable or experienced in farming to remain in The Colony.
>
> Money. About $5,400,000 was granted for colonization. The sum was about five times the estimated figure but at least 40 percent of it is still present in credits. Funds were spent hurriedly and were accounted for poorly. Direct and indirect grants to colonists were large.

58/ Hugh A. Johnson and Keith L. Stanton, Matanuska Valley Memoir: The Story of How One Alaska Community Developed, University of Alaska, Alaska Agricultural Experiment Station, Palmer, Alaska, Bull. 18, 1955, p. 50.

Transportation Facilities. Only the Alaska Railroad and an open network of graveled roads were present at the start of The Colony. Improvement and extension of the roads concurrently with settlement produced confusion. Practically no facilities for transportation by aircraft were available.

Farm Building Program. Practically all housing had to be built and all wells drilled when The Colony began. Construction was poorly timed and control of the distribution of materials was weak. There was too little flexibility in plans for buildings. Many structures were poorly built and wells were expensive to drill because of lack of information on the water table.

Community Facilities. No facilities were present for servicing the colonists when they arrived. The construction of a complete village was poorly timed. Facilities were more than adequate at first. The Matanuska Valley Farmers Cooperating Association was forced on the colonists.

Clearing and Cropping. About 175 acres of the colonists' tracts were already cleared when the colonists arrived. Clearing and farming started late and progressed slowly. Many colonists were too inexperienced to farm under unfamiliar and partly unknown agricultural and marketing conditions. However, by 1948 there were about 8,500 acres of cleared land. Farming, though much was part-time, had become permanent. 59/

Even though many criticisms have been leveled at The Colony settlement effort, the structured settlement effort did produce positive results in developing a permanent agricultural production area. Population growth and market development in the Anchorage area certainly has had a strong contributing influence.

The Kenai Peninsula

Johnson has aptly described the spontaneous nature of settlement on the Kenai Peninsula:

59/ Kirk H. Stone, Alaska Group Settlement: The Matanuska Valley Colony, U. S. Department of Interior, Bureau of Land Management, Washington, D. C., 1950, pp. 84-85.

> . . . an Alaskan Mecca for many venturesome families newly from the States. They flock there each year searching for "free" land and fresh opportunity in a new country. . . . Most new arrivals know little about pioneering or Alaska conditions. They often have no experience in rural living. All too many find that Alaska is a hard bargainer, taking their savings and their hopes, and giving them in return a bit of land which they are powerless to use. Settlement continued to outpace farm development and even interest in farm development. 60/

Johnson went on to say that the Peninsula has received a more intensive private search for farm land and homestead opportunity than any part of Alaska. Government agencies have made studies of the area but the effectiveness of the studies has been dissipated through failure to follow up with sound plans and development programs. To all practical purposes, the settlement efforts on the Peninsula were without planning other than a limited number of land withdrawals that tended to have a common opening date for homesteading. A major part of the homestead effort did not have this in common. There was no program planning. Community services were slow in coming. No organized agricultural produce markets were developed. Agricultural credit sources remained in Palmer, in the Matanuska Valley. Roads were few and primitive, and development of an adequate road system did not occur for many years. Agricultural service and supply firms did not develop on the Peninsula. Locational isolation was severe, both from the social and social institution standpoint, and from the agricultural information and technology standpoint.

60/ Hugh A. Johnson and Robert J. Coffeman, Land Occupancy, Ownership and Use on Homesteads in Alaska's Kenai Peninsula, University of Alaska, Alaska Agricultural Experiment Station, Palmer, Alaska, Bull. 21, 1956.

Johnson, when traveling through the farming areas on the Peninsula in 1958, reported:

> . . . But, beneath this bustle over oil, I was saddened by the numerous signs of decay in settlement on the Kenai Peninsula. Place after place where I had observed the operator make a start at farming now was vacant. Hundreds of acres had been cleared by bulldozing but never broken or seeded to crop. A preponderance of the few acres where settlers had planted crops now were reverting to native grass and brush.
>
> At one place, where I knew the family, the wife briefed me about several neighbors. Most had given up and moved to Anchorage or gone back to the States. She mentioned that eight couples who had settled in that vicinity had broken-up. Generally the wife could not take the isolation, the loneliness, and the crude living conditions of the homestead. Most of the men had worked away from home. 61/

The settlement of the Kenai Peninsula was characterized by a fairly high percentage of bachelors and families without children. Johnson reported for both 1950 and 1955 that the proportions of bachelors (28 percent) and couples with not more than one or two children (25 percent) remained approximately the same. Between the two dates, the proportion of couples without children increased by 7 percent and the proportion of families containing five or more members dropped 7 percent. Living conditions apparently were not conducive for families with children.

The numbers of settlers were large on the Kenai Peninsula but the hardships and isolation of the unstructured settlement took a

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61/ Hugh A. Johnson, "Notes and Observations Made on Trip to Alaska, 1958," Unpublished report.

heavy toll. Agriculture did not develop with any degree of permanency. The cost in human and capital resources was heavy for so little accomplishment.

Growth of the Farm Business Firm in Newly Settled Regions

There has been little or no recognition given the farm firm concept in agricultural settlement and development philosophies and policies with regard to Alaska. Emphasis has been on "farms" and "farmers", with a typical definition of farm being "one or more tracts of land held or operated as a unit of production for agricultural products", and of a farmer, "the head of a household who lives on and/or operates a farm". One must question, however, whether a farmer plus a farm necessarily equates with a farm firm. Mosher reminds us that,

> Agriculture is a specialized kind of production based on growth processes of plants and animals. Farmers manage and stimulate plant and animal growth on farms. The production activities on each farm are a business in which costs and returns are important. 62/

Recognition has been given that agricultural production is the result of combining land, labor, capital, and management in a directed effort to produce some product of economic value. However, it must also be recognized that land, labor, capital, and management are the "inputs" of the farm (business) firm, and the quantity and

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62/ A. T. Mosher, Getting Agriculture Moving, Published for the Agricultural Development Council by Frederich A. Prager Publishing Co.: New York, 1966, p. 13.

proportion of the factor inputs used by the "farm firm" will determine the kind and quantity of agricultural production. The economic success of the farm firm will depend on the price relationship of factor inputs and product outputs, and the strategies employed to assure economic survival of the firm in the short-run and firm growth in the long-run.

One must keep in mind that a firm is made up of a number of physical entities and actions, and is structured by social, economic, and political institutions. The farm firm is a continuing entity that may exist for only a short period or it may exist for many generations with a succession of farm families being involved in its operation. Individuals or agencies, other than the farm operator, may provide much of the capital. All those persons and agencies who participate in the decision-making process to operate the farm firm as a complete business unit go to make up the management resource input. Only a minimal part of the labor input may be provided by the farm operator. Ownership of the land resource may rest within the firm or its use and control may be obtained through rental or leasing. Consequently, the farm business firm encompasses a far broader spectrum than just a "farmer" and a "farm."

The traditional concept of the firm was a static concept oriented to efficiency of the input/output relationship of a "fixed" group of resources.

> Allocation was considered a major problem because the chief resources--land, and to a lesser degree machines and labor force--were considered fixed in amount to the farm firm.

> The fixed resources had to be allocated to the various product enterprises so as to maximize net returns to the firm. 63/

The possibility of an acceleration of profit due to firm growth was not included. Boulding expressed the traditional concept of the firm as,

> The firm is thought of essentially as an input-output process whereby certain inputs or factors or production--land and labor services, capital services, raw materials and so on--are transformed into outputs of saleable products. 64/

Breimyer expressed much the same thought,

> A single managerial unit striving for profit, using two or more resources the supply of at least one of which is variable, and producing product(s) which therefore is (are) variable as to number or quality or both. 65/

The traditional concept viewed the manager, even though a profit maximizer, as a passive reactor to market forces. His major entrepreneurial decision was related to entry into a particular business

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63/ Warren R. Bailey, "Necessary Conditions for Growth of the Farm Business Firm", in Farm Management in the West-Problems of Economic Growth: Research into Economic Growth of the Firm, Conference Proceedings for the Farm Management Research Committee of the Western Agricultural Economic Research Council, Report No. 6, p. 35.

64/ Kenneth E. Boulding and W. Allen Spivey, Linear Programming and the Theory of the Firm, The Macmillan Co.: New York, p. 3.

65/ H. F. Breimyer, The Farm Firm in the Structure of the Agricultural "System", Paper presented at Conference on Implication of Structural Changes in the Economy of the Farm Firm, Chicago, Illinois, October 28, 1964.

activity. From there on the factor market dictated factor combinations and methods of production, and product markets determined the quantity of output. The manager then was the passive manipulator of resources to reflect factor market and product market forces.

A modified firm concept, a managerial theory of the firm, has evolved from studies of industrial firms. The modified theory has escaped from the trap of "a fixed group of resources", and emphasizes the firm as an organized information system geared to the attainment of both monetary and nonmonetary goals. Decision-making is raised to a position of primary importance, becoming both complex and specialized. Both internal and external forces effecting factor inputs and product markets are considered subject to modification through exercising strategies and exerting forces from within the firm. While the traditional firm was purported to be a passive reactor to external forces of factor and product markets, the managerial theory considers the firm to be active in modifying the external environment. 66/

Farm management economists have traditionally accepted the premises of the traditional firm model; consequently, the behavior of the farm firm continues to be interpreted in terms of product and factor market forces. Farm production economics research has been

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66/ R. R. Robinson, "Towards a Growth Theory of the Farm Firm", in Farm Management in the West-Problems of Economic Growth: Research in to Economic Growth of the Firm, Conference Proceedings for the Farm Management Research Committee of the Western Agricultural Economic Council, Report No. 6, p. 5.

oriented to resource allocation and efficiency within the firm, adhering tenaciously to the fixed resource concept of the traditional firm. Neither emphasis is adequate to understand the firm growth process. Firms do not grow automatically, but in response to managerial strategy and human decision. Past emphasis of the traditional firm concept has been on simple small scale farm unit, and the managerial concept has been oriented to a large scale complex economic organization which has considerable control over its own destiny. However, the critical need, in the Alaska settlement and development environment, is to focus on the growth process of the individual farm firm from the small homestead unit to the larger and more complex commercially competive farm firm. Until there is first some explicit recognition of the farm firm concept in development philosophies and policies, and secondly an even more explicit recognition of the growth aspects, strategies, and evaluative criteria, there will be little hope for farm operators to receive assistance in developing farm firms. Decisions will continue to be made with regard to the development and combination of all inputs as individual facets with little recognition of how that input will affect firm growth. Little does it matter how great the availability of technology, how great the potential market, or how profitable the production might be if there are resource restrictions on management and capital that cannot be overcome by the operator due to no recognition of the particular needs for the growth process of the farm firm.

The Growth Process

The economics of firm growth has critical focus on the newlands settlement regions because evaluations in terms of the traditional firm in inadequate to provide the needed direction for firm development. Halter 67/ has discussed aspects of "industrial dynamics" that provide a penetrating insight to the problem focus of firm development as it must be approached in newlands settlement situations. He approaches the problem of firm growth in two aspects, the first concerns an increase in size which is more or less automatic and the second concerns an internal process of development in the firm. He says there is no optimizing procedure built into the industrial dynamics approach or its tools, the philosophy being that social and economic systems are so complex that an optimum for the entire system is difficult or impossible to obtain. Comparisons of new results with the former will provide the validity tests of recommended improvements of the system. Industrial dynamics as an approach to studying management and growth traces the cause and effect information feed back that links decisions to action in an organization.

67/ A. N. Halter, "Simulation as a Means of Studying Growth," in Farm Management in the West-Problems of Economic Growth: Research in to Economic Growth of the Firm, Conference Proceedings for the Farm Management Research Committee of the Western Agricultural Economic Council, Report No. 6, p. 96.

Bailey projects one approach to firm growth:

> In dynamic analysis of firm growth, no production resources are considered fixed to the firm. From an assumed starting state the firm acquires additional resources out of annual income. For growth to occur, the starting state must provide a surplus of cash returns over farm and family living expenses unless the firm is subsidized. The firm actually may include significant non-farm activities, particularly at the start. In fact, non-farm employment of the operator or his wife could be the chief source of new capital in the early stages of firm growth. Returns need not cover depreciation or a return to owned equity in the short-run. In fact, a firm may operate at what would be a long-term net loss, but cover its direct costs and achieve firm growth in the short-run. Rate of growth is maximized when net cash returns is maximized in the short-run. Financial strategies are the core of growth problems. Because no resources are fixed, both the starting and growth resources can be allocated to high return enterprises. 68/

This discourse may well explain why Alaska farmers have not fared well by traditional efficiency measure analysis. They have concentrated on firm growth, whether successful or not, and have been "found wanting" by their critics.

In his discussion, Bailey emphasized five conditions necessary for farm firm growth, (1) excess managerial capacity, (2) business is profitable, (3) minimum starting size, (4) some unused resources, and (5) added resources procurable. There are two underlying assumptions throughout his discussion, (1) a dis-equilibrium of resources in the farm firm, and (2) growth is a matter of managerial objective and is subject to a range of strategies to accomplish the growth objective.

68/ Bailey, op. cit., pp. 36-37.

Certain other premises must be recognized. Growth does not demand superiority in management but does require excess capacity. Growth does not require that the firm be the most efficient firm in the area or group, or even that it be highly efficient. The growth process does necessitate that the growth objective be specifically recognized; that the strategies be profitable in terms of increased net operating margin sufficient to increase family income and additional investment capital for growth in the short-run, and the probability of consolidating all costs and investment requirements in the long-run; and that unused resources must be used advantageously and added resources must be procurable to alleviate restrictive factors to growth, that can be identified through enterprise input/output analysis of past production records or projections for additional high return enterprises in the future.

Acquiring and Combining Economic Resources Into Viable Farm Firms 69/

Traditional economic theory presupposes the goal of profit maximization as the goals of any economic endeavor and assumes away other goals on the basis that other goals do not have a dollar value attached. Farm families have many goals, some of much higher priority than others, the ordering of which may change from day to

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69/ Discussion drawn heavily from a paper presented by the author at the 17th Alaska Science Conference, Alaska Division, American Association for the Advancement of Science, Anchorage, August 31, 1966.

day. Carefully thought-out goals provide a framework for planning the future development of the farm firm and for evaluating progress. Bostwick aptly describes this relationship:

> Management has been defined as the process of selecting appropriate means to a preferred end. If there are no well defined goals, management becomes impossible. These goals must be reasonably explicit if there is to be any logical construction of plans and management decision. . . . After he has established his goals, the manager can begin to shop around for some means to satisfy them. It would be nice if a strategem could begin and end with consideration of only the appropriateness of a given strategem for a given hierarchy of goals. As it is, the manager might begin with such considerations, but must then modify the strategem according to the demands of individual habits and attitudes, social and economic pressures, restrictions placed by available institutions, and so on. 70/

Bostwick has defined management in a manner that is compatible with a managerial theory of firm growth:

> I define management as the art of combining facts and reasonable expectations into a picture of several possible results, and planning actions toward the results most preferred. Under this definition, a good manager is one who most nearly succeeds in correlating expectations and plans to achieve his preferred results. The poor manager is the fellow who misses the boat because of ignorance of the facts, unrealistic expectations, or too little control over his actions.

The acquisition and combination of economic resources into growing and developing farm firms is of primary concern in any farm development program and particularly to the individual farm operator or firm manager. The resources that go to make up any business firm

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70/ Don Bostwick, "Research on Financial Management of Farms," in. Management Strategies in Great Plains Farming, Proceedings of Great Plains Workshop, Great Plains Council Publication, No. 19, August, 1961, p. 71.

and particularly a farm business firm are, as previously mentioned, the general resource classes of land, labor, capital and management. Management, as a resource input or factor of production, poses a most difficult problem for discussion, particularly so, because of the emphasis on development of goals and strategems for attainment of the goals identified.

Management as a Resource Problem

The management input in any farm firm is a complex thing. Many people are involved. The farm operator generally is considered to be the management input. The banker or credit agent may have a critical say in the decision process about what will be produced, how much will be produced, and when it will be produced, and the decision will undoubtedly be influenced by his evaluation of the collateral offered rather than the potential profit to the farm firm. The agricultural supply and service firms may have some voice in decision-making due to the selection of goods made available and services rendered. Researchers will have a definite voice, in Alaska, due to the choice of research projects and information made available to the individual farm firm.

Agricultural firm management in Alaska must be diverse in interests and competence. All stages of production, processing, and distribution may be included in a single firm structure. The problems of firm management are compounded by a limited and immature

agricultural service and supply industry, limited transportation services in many areas, an almost non-existent marketing structure for most agricultural products, along with an absence or immaturity of many of the institutions that go to make a mature agricultural industry.

There is often confusion in making a definitive separation between management and labor as a resource input in a one-man-farm business when the farm operator supplies both management and labor. Thomas and Amick have provided a very useful definitive separation of the Human input into various resource classes:

> There are three distinctly different and mutually exclusive services--labor, supervision, and management. These services may be provided by different people or by one person. They continue with: Labor is the physical implementation of the production process. It includes all human energy inputs in transforming production factors into products. Supervision includes all activities associated with assuring that resources are utilized in accordance with production plans. This is an administrative function of bringing together resources and making arrangements for their utilization in the quantity and kind, at the time and place, and by the method and techniques set forth by the manager. Management consists of making decisions relative to the allocation of the farm's resources. It is the solving of a particular complex of problems . . . determining the product or product combinations to produce, the combination of factors to use in production, and the amount of each product to produce, and the production techniques to employ. 71/

One must recognize that management is a complex process or activity, going far beyond that described by Thomas and Amick. It

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71/ D. Woods Thomas and R. J. Amick, Information Needs in Farm Management, Purdue University, Agricultural Experiment Station, Research Bulletin No. 705, 1960, p. 4.

is the process of developing an overall prospective of the farm business firm and the realities of the business environment in which the firm is located; followed by the recognition of family and business goals and objectives; surveying, gathering and sorting information, ideas and facts; and developing judgments and intuition so necessary in the framework of uncertainty that an Alaskan farm manager must operate. Even the beginning farm operator needs a knowledge of farming and farm practices coupled with managerial capacity and business judgment, and above all must have initiative and ambition.

Functions of Management 72/

Many approaches have been made to the problem of delineating the management factor. The "functions of management" approach is one means of conuptualizing management as a resource or factor input. The functions of management may be listed:

1. Formulating goals or objectives for the firm or unit and goals or objectives for the family that influence farm firm planning and operation.

2. Gathering information, making observations of relevant facts, recognizing and defining problems, and recognizing and evaluating opportunities.

3. Formulating and evaluating various possible alternatives.

4. Making decisions--choosing the alternatives that provide the greatest opportunity for firm growth and attainment of firm and family goals.

72/ The functions of management listed are a composite of those developed initially by Johnson and Haver while at Kentucky and those more recently reported by Nielson synthesized with my own concepts developed over the last several years.

5. Initiating action and carrying out the plans developed.

6. Recognizing and understanding social, political and economic institutions that tend to structure a farm business in the community in which the farm may be located.

7. Bearing responsibility for the decisions made and the actions taken.

8. Evaluating the performance of the farm business, and the progress toward attainment of goals.

The sixth function has been recently added due to the emphasis of industrial psychologists on "recognition of reality" as a choice criterion in selecting management people. Recognition of "institutions" of the agricultural industry and community is one of the realities a manager must face.

The selection of goals for the farm business firm and the farm family is critical. The goal of highest priority will be economic survival. If this goal is not attained other goals matter very little. Other factors that may affect the goals structure of the farm firm are: the stage in the family life cycle of the operator, particular interests of members of the family, social status, participation in community and church activities, and other pressures for social, political and economic conformity. The critical relationship between family and firm goals, and managerial efforts is often overlooked

or misunderstood. Research by Nielson 73/, and Slocum and Brough 74/ point out this critical relationship. They reported that families who made a conscientious effort to think out and articulate goals, made significantly more economic progress than comparable families who did not. It would appear that farm families who gave considerable thought to the composite family and firm goals may have adopted a pattern of deferred gratification in their expenditure plans and turned more of their resources to capital formation. An interesting sidelight to the Washington study was the indication that as goals were clearly defined there was a movement away from joint sharing or responsibility for decisions and towards the assumption of final responsibility by the farm operator. One would assume this indicated an increased input of managerial ability and confidence.

The firm manager (the farm operator) must not only be able to precisely define firm and family goals, but must be able to articulate them fluently as a master salesman because he provides so little of the total management input. He must also have all the characteristics of a pragmatically oriented "operations researcher" to bring together the necessary information, and technology along with managerial

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73/ James Nielson, The Michigan Township Experiment: The Farm Families-Their Attitudes, Goals and Goal Achievement, Michigan State University, Agricultural Experiment Station, Tech. Bull. No. 287, 1962.

74/ W. L. Slocum and O. L. Brough, Jr., Family and Farm Changes Associated with Farm and Home Planning in Washington, Washington Agricultural Experiment Station, Bull. No. 663, May, 1962.

strategies to solve his problems. He must be an entrepreneur of the first order to put together a firm that can remain economically successful. He must have courage and self assurance to face the continuing decisions and fully accept the responsibilities of his actions, in the modern frontier environment of Alaska. Last, but not least, he must have the ability to work his way successfully through the maze of social, political, and economic institutions and agencies. If he has all of these characteristics, then management is not likely to be a resource problem.

Capital as a Resource Problem

Investment capital has become a major factor of production on Alaska farms, and the acquisition, use, and accumulation of farm investment capital is one of the more critical problems facing farm firm management in Alaska. The term "capital" is often equated with the term "credit". Such an equation is misleading. Most discussions of capital start with the traditional definition, capital is produced goods and services withheld from consumption and used in further production. Spitze offers the definition, "Capital is produced goods and services saved from consumption (maintenance and direct satisfaction of man) and used by, or as part of, the

human agent in further production." 75/ Capital, as the term is used in the following discussion of the farm firm, may be considered the dollar investment in all productive resources. While this tends to approach the definition of assets, it allows the inclusion of investment capital not owned by the operator (credit) and that value of the ongoing concern not accounted for by listing of inventory as well as capital invested in developing the management resource. There is also a considerable amount of public capital, i.e., education, research, governmental agricultural services and technology developed by private industry that cannot be accounted for by inventory, but nevertheless is part of the capital stock of the farm firm.

Most economists will agree that the cause of low farm incomes is a lack of adequate productive resources in the individual farm firm. Capital appears to be one of the critical limitations. In reviewing research reports one finds that research concerning credit and capital has traditionally been oriented to the amount of debt held by farm operators, sources of credit, and evaluation of credit agency programs. Farm adjustment research has caused some change in emphasis to include adjustments that could be made and the necessary addition of resources and technology to accomplish the transition.

75/ R. G. F. Spitze, "Determinants of Capital Formation-Conceptual and Factual Consideratives", Capital and Credit Needs in a Changing Agriculture, Iowa State University Press: Ames, 1961, pp. 19-35.

Farm operators, when facing the problem of obtaining control of needed capital to survive in the dairy business, also face the problem of acquiring an optimum set of resources for their farm organizations. Baker and Irwin 76/ found that financing limitations may deter farmers from attaining an economically optimum organization. Lending agencies may restrict loans to finance ventures profitable for the farmer, but unattractive to the lender.

In reviewing problems of capital acquisition, use, and accumulation on Alaska farms, one finds all indications of capital being a critical limiting factor in development and growth of farm firms. Examples of farm firms being too small, due to the limited capital resource, to initiate the growth process are common. Examples of external capital rationing and causing a malallocation of resources in the farm firm are not uncommon. Lender limits, either statutory or philosophical, contribute to both situations, and availability of farm investment capital in Alaska is very limited for above-average sized farm units.

Equity accumulation in Alaska farm firms is not comparable to equity accumulation in farm firms of mature agricultural areas; consequently, Alaska firms are found wanting when evaluated by traditional loan criteria. Until loans are evaluated in terms of

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76/ C. B. Baker, and G. D. Irwin, Effects of Borrowing From Commercial Lenders on Farm Organization, University of Illinois Agricultural Experiment Station, Bull. 671, April, 1961.

economic profitability to the farm firm rather than suitability to the lender, Alaska firms will continue to be found wanting. It is interesting to note that in "mature" agricultural areas credit policies have tended to allow deferment of principal payments for development periods with only partial amortization of principal over long term loan periods, if conditions warrant doing so.

CHAPTER V

A PROFILE OF SELECTED FARM PRODUCTION ENTERPRISES IN ALASKA

The initial farm management study of farming activities in the Matanuska Valley and other farming areas in the state was carried out during 1948 by the Bureau of Agricultural Economics, U.S.D.A. cooperating with the Alaska Agricultural Experiment Station. 77/ Numerous studies and reports followed through the subsequent years dealing with selected aspects of the production sector of the agricultural industry. The original economic study was carried out in response to recognition of the urgent need for additional information when programs for agricultural settlement and development were being considered.

Rapid change and adjustment in agriculture as a whole and the rapidly changing conditions in Alaska, has caused renewed interest in the economic aspects of farm production costs have been more subject to question and controversy than any other data used in analysing the current situation or projecting future potential for the industry. Little consensus can be obtained regarding suitable cost data. The situation is further complicated due to the very limited number of farms of any given type or product specialization.

77/ O. L. Mimms, J. L. Paschal, and W. U. Fuhriman, Some Economic Aspects of Farming in Alaska, with Chief Attention to the Matanuska Valley, Bureau of Agricultural Economics, U.S.D.A. cooperating with Alaska Agricultural Experiment Station, FM-74, January, 1950.

Representative cost data are not available for some enterprises even in the more populated areas. Emphasis in the following discussion will be oriented to costs of farming as they exist, based on the premise that one starts from the status quo to evaluate or project for the future.

In computing costs of production and expected net returns, cost data are specifically applicable to a given situation at a given time. Soils differ from farm to farm, and weather conditions vary between years. Prices paid for resource inputs vary between producers, and cultural practices carried out are not always comparable. Management decisions regarding allocation of fixed costs vary widely and time is a particularly crucial factor as all costs change over time. Consequently, any set of data dealing with costs of production must be used with care.

A number of farm management studies have been carried out in recent years to determine costs of production for various types of farm enterprises in different regions of Alaska. Survey data have been used in most instances to provide critical insight into the current cost situation of agricultural producers under present farm organization and technology. The current situation in Alaska's agricultural production sector has not come about by chance. It has been the result of individual decisions made within the industry, as well as many decisions made by agencies and individuals not immediately

a part of the industry. The tyranny of small decisions has been the lack of overall planning and coordination of development. Reasoning behind the decisions has been quite varied, but has made the industry what it is today. The structure of the current industry provides the base from which changes must occur; consequently, a detailed review of the present cost and income situation should allow more accurate predictions to be made about the industry of the future.

A major emphasis of study was placed on the dairy industry for many years due to its economic importance in terms of numbers of farmers and value of total product. Annual business summaries were collected from dairy farmers for several years. During the summer of 1965 a survey was carried out to determine characteristics of the industry as it existed then. Enterprise studies were made the following year to gain further insight into the cost structure of dairy firms in the Matanuska Valley. Other enterprise studies were carried out to provide cost data on hog production, potato and vegetable production, and one study was carried out by the Bureau of Reclamation regarding potential for beef production, which included cost data.

Characteristics of the Alaska Grade A Dairy Industry, 1965

Location of Supply

In 1965, 30.7 million pounds of milk were produced in Alaska 78/ of which some 95 percent was sold in the commercial Grade A market. The four major areas of production were: The Matanuska Valley-Anchorage area - 16.83 million pounds, the Tanana Valley area - 3.29 million pounds, Southeast Alaska - 0.90 million pounds, and the Kenai Peninsula - 0.78 million. By late 1966, the Matanuska Valley was the only community in the State with more than one commercial Grade A producer, and milk production had declined by some 2.0 million pounds from the previous years' totals.

Producer Characteristics

The "average producer", calculated by averaging survey data 79/ from all farms in the Valley, is a farm unit consisting of some 200 acres of farm land, 46 cows two years old or over, using 1.4 full-time workers (including the operator), family help when available and 35 days of seasonal labor. He produces some 70 acres of silage,

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78/ Agricultural Statistics, Alaska 1965, Alaska Crop and Livestock Reporting Service, Statistical Reporting Service, U. S. Department of Agriculture cooperating with Alaska Division of Agriculture and Alaska Experiment Station.

79/ Survey of all commercial Grade A dairy farms in the Matanuska Valley, made during first half of June, 1965.

55 acres of grain, 20 acres of hay, and 55 acres of pasture of varying quality, on 145 acres of owned land and 55 acres of rented land. He also produces some 379 thousand pounds of milk for sale at an estimated cash cost of production of $8.37 per hundred weight. In doing so, he feeds approximately 93 tons of grain ration, 94 tons of hay, and 390 tons of silage. It is quite probable that he feeds by hand, milks in a walk-through parlor of some type, uses a pipeline milker and bulk tank and is cautiously considering the expansion of his milking herd by some six or seven cows within the next year.

Farm Organization

Farms range in size, when classed by number of acres farmed, from one farm with less than 100 acres to one farm with over 400 acres. The average number of acres farmed is 200, with 35 percent of the land area in silage, 27.5 percent in grain, 10 percent in hay and 27.5 being classed as pasture.

The main crops produced were silage and grain, with 34 farms producing silage and 31 producing grain crops. Hay was produced on 20 farms; however, only half had produced as much as 40 acres. Pasture varied greatly in development, ranging from intensely farmed areas to timber and wasteland.

Size of Herd

When classed by herd size, Matanuska Valley Grade A dairy farms ranged in size from a small herd of less than 20 cows to a large herd of more than 100 cows two years old and over. Approximately 20 percent of the herds were 25 cows or under and an almost equal number were 75 cows or above. Fifty percent of the herds were in the size group of 26-50 cows. The average number of cows per herd was approximately 46, with 74 percent in the milking line and 26 percent dry when the survey was made.

TABLE X. DISTRIBUTION OF HERD SIZE BY CLASS, AS REPORTED BY 41 MATANUSKA VALLEY GRADE A MILK PRODUCERS, JUNE, 1965.

Size of herd (No. of cows)	Number of herds in class (Number)	Percent of all cows (Percent)
Under 25	8	9.4
26 to 50	21	40.6
51 to 75	5	15.5
76 and over.....	7	34.5
Total	41	100.0

There were approximately 9.5 heifers one to two years old per herd indicating a four to five year replacement cycle.

Volume of Production

When classed by volume of production, farms ranged from a small farm producing just over 100 thousand pounds of milk for sale to a

large farm producing over one million pounds in 1964. Seven percent of the farms sold less than 150 thousand pounds of milk and an equal number sold over 750 thousand pounds of milk (Table XI). The ten smallest producers sold just over one and three quarter million pounds of milk while the ten largest sold over seven million pounds.

TABLE XI. DISTRIBUTION OF PRODUCERS AND PRODUCTION BY SIZE GROUP, 41 GRADE A MILK PRODUCERS, FOR CALENDAR YEAR, 1964.

Farm size group production per year (1,000 lbs.)	Number of producers (number)	Percent of producers by group (percent)	Percent of total milk produced by group (percent)
Under 150	3	7.32	2.39
150 to 300	14	34.16	20.43
300 to 450	14	34.16	31.94
450 to 600	4	9.76	13.93
600 to 750	3	7.32	12.72
750 and over. . . .	3	7.32	18.59
Total	41	100.00	100.00

Other Characteristics

Information regarding dairy farm labor requirements was obtained also in the survey of the Matanuska Valley. Seventy percent of the farms were operated by one full-time worker (the operator) with available family help; 22 percent with two full-time workers and 8 percent used more than two full-time workers. Farms operated by one full-time worker, that reported the use of seasonal help, averaged using more than 100 days of seasonal labor.

Slightly over 46 percent of the producers reported sources of income other than dairying. Fifty-four percent indicated that they received all income from dairying. Less than 13 percent indicated less than one-half of their income from dairying.

Slightly over 34 percent of the Grade A milk producers owned all the land they farmed. Thirty-nine percent rented as much as half of their land and less than 5 percent rented as much as three-fourths. No farm operators indicated the rental of all their land. There was noticeable variations in use of rented land between farm size groups.

TABLE XII. DISTRIBUTION RENTED LAND BY FARM SIZE GROUP, 41 DAIRY FARMS, 1964.

Farm size Group (Acres)	Farms (No.)	Land rented (Percent)	Average size of farm (Acres)
Under 120	8	9.85	107
120 to 159	11	48.65	141
160 to 199	5	15.53	173
200 to 239	4	47.80	216
240 to 279	4	24.31	254
280 to 319	3	25.42	298
320 and up	6	33.35	364

Sources of Replacement Cattle. Slightly over 63 percent of the producers planned to raise all of their replacement stock. Twelve percent planned to buy one-fourth, 15 percent planned to buy one-half, approximately 5 percent planned to buy three-fourths

and a like number planned on buying all of their replacements. Recent adjustments in the dairy industry would indicate, however, that expansion and to some degree replacements, have come from dairy herds that are being dispersed in the area.

Feed Inputs and Sources of Feed. During the calendar year 1964, producers fed some 3,800 tons of grain ration, 3,860 tons of hay, 16,000 tons of silage in addition to green chop and pasture. Seventy percent purchased all the grain ration fed, 12 percent purchased all their hay, none purchased all silage fed. However, 15 percent reported feeding no silage and 5 percent reported feeding no hay. Eighty-eight percent produced all silage fed and 60 percent produced all hay fed.

Mechanization of Milking and Feeding Systems. Seven producers reported automated feeding system, 12 partly automated and 22 fed by hand. Thirty-two reported pipeline milking systems, and nine reported bucket-type milkers. All reported bulk tank cooling and storage systems for milk handling. Fifteen producers reported using stanchions, ten with walk-through parlors, nine with side-opening stall parlors, and seven reported using herring bone type milking parlors.

Operational Plans. Twenty-four producers indicated that they felt that their facilities were currently being used to capacity.

Thirteen had expanded their milking herds during 1964 and ten planned some expansion during 1965. Planned expansion ranged from one cow to 20 head with an average of 7.5 cows per herd. Most common reasons given for expansion in 1964 were: Needed more income, to use equipment more fully, available market, had new building space, and to use land more fully. Unavailability of capital was the most frequently mentioned reason for not expanding in 1964; however, it was mentioned by less than 43 percent of those who did not expand. Other reasons mentioned were: Low price of milk, limited building space, shortage of labor and equipment used to capacity. Those who expanded herds during 1964 were predominantly ones with larger herds. The final question on operational plans was regarding future expectations of the cash costs of producing milk. Eleven producers expected cash costs to go down. Nineteen expected them to stay the same and 11 expected cash costs to go up. Respondents who indicated plans for some herd expansion during 1965 were predominantly those with herds ranging from 30 to 50 cows at the time the survey was taken.

Size of One and Two Man Units

The final survey question, one quite critical to the goal structure of future planning, was "How many cows do you consider it takes to make a full-time one-man dairy unit, a full-time two-man dairy unit?" Responses ranged from 15 to 70 cows for a one-man unit,

and averaged just over 35. Twelve thought that one man with occasional family help and seasonal cropping labor should milk 25 or less cows. Twelve thought that such a unit should have 30 to 40 cows. Eight producers indicated a belief that such a unit should have 40 to 50 cows, and eight thought it would be 50 or more.

Responses regarding size of herd for a two-man unit ranged from 34 to 100 cows, with an average figure of approximately 68 cows. Nine respondents thought 50 cows or under were adequate for a two-man unit, while thirteen indicated 60 to 75, thirteen indicated 75 to 90 and six indicated 90 to 100.

Investment, Costs and Receipts

Data were collected from a purposefully selected sample of 15 Valley dairymen at the end of the 1965 calendar year. The sample was selected to include dairies ranging from small to large, yet provide an average size comparable to the earlier survey of all commercial Grade A dairy farms in the Valley.

Size of herds surveyed ranged from 30 to 100 cows. Milk produced per farm ranged from 120,000 pounds to almost 1,200,000 pounds. Milk production per cow in the milking herd ranged from approximately 5,000 to over 13,000 pounds among herds surveyed. Percentage of time cows were in the milking line, ranged from 72 percent to 86 percent.

TABLE XIII. AVERAGE INVESTMENT, COST AND RECEIPTS, 15 MATANUSKA VALLEY DAIRY FARMS, 1965.

		Survey Average
PRODUCTION:		
Total milk per farm	pounds	428,352
Cows	number	45.27
Production per cow 2 years old and over	pounds	9,462
INVESTMENT PER FARM:		
Total investment (including dwelling)	dollars	122,134
Total borrowed capital, Dec. 31, 1965	dollars	64,610
Owner's equity	dollars	57,524
GROSS CASH INCOME RECEIVED:		
Milk Sales	dollars	41,117
Other Sales	dollars	2,537
Total Sales	dollars	43,654
CASH COST OF PRODUCTION:		
Cash expenses paid	dollars	32,754
Unpaid yearly operating expenses a/	dollars	4,147
Total yearly operating expenses b/	dollars	36,901
NET INCOME:		
Business operating margin	dollars	6,753
Opportunity cost of equity investment (5%)	dollars	2,876
Income available to labor and management	dollars	3,877

a/ Depreciation and unpaid interest.

b/ Does not include operator's labor and management, family labor, or return to operators equity.

Investment Per Farm. Survey data were collected on capital investment in physical resources as of December 31, 1965. Investment per farm ranged from $43,500 to almost $300,000. Investment in physical resources included current depreciated values of land and buildings, farm machinery and equipment, all livestock, stored crops and feed and miscellaneous supplies. Average investment for

the 15-farm sample was approximately $122,000. Borrowed capital made up 53 percent of inventory value.

Annual Costs of Production. Annual costs of production include cash operating expenses of the dairy, depreciated values of buildings, machinery, and equipment, as well as difference between interest paid and 5 percent interest on average borrowed capital. Cash operating expenses amounted to $32,754 and unpaid annual operating expenses were $4,147.

Gross Cash Receipts. Gross cash receipts ranged from $11,000 to $118,000. Milk sales averaged $41,117 on the farms surveyed. Sales of other farm products and miscellaneous farm incomes averaged $2,537. Total farm income averaged $43,854. Farm family incomes were undoubtedly some higher due to non-farm incomes.

Net Income. Business operating margin for the group of 15 dairies averaged $6,753. Opportunity cost of operators' equity averaged $2,876 when calculated at 5 percent. Income available to labor and management averaged $3,877.

Farm Expenses and Costs Per Hundredweight of Milk Produced

Farm operating expenses for 1965 are shown in Table XIV. All cash farm operating expenses are included. All farms in the sample included feed enterprises, which contributed to the dairy enterprise, consequently all costs and incomes are attributed to the dairy.

TABLE XIV. FARM EXPENSES AND COSTS PER HUNDRED WEIGHT OF MILK PRODUCED ON 15 MATANUSKA VALLEY DAIRY FARMS, 1965.

Item	Survey Average Total	per cwt.
Hired labor	$ 1,999.31	$0.467
Feed purchased	13,524.77	3.157
Seed and fertilizer	5,263.81	1.229
Machine hire and haul	1,617.84	0.378
Supplies	568.17	0.133
Repairs, auto, equipment improvement	1,376.18	0.368
Veterinary and breeding	523.42	0.126
Gas, oil, fuel	1,299.19	0.303
Taxes	359.87	0.201
Insurance	779.75	0.182
Interest	1,840.59	0.430
Electricity and telephone	1,026.50	0.240
Rent	831.20	0.194
Miscellaneous	1,029.17	0.240
Cash farm operating	32,753.76	7.65
Depreciation and unpaid interest a/	4,147.00	0.97
Annual farm operating	38,900.76	8.62

a/ Estimated at 5 percent.

On concluding the 1965 surveys it was deemed necessary to pursue in depth the costs involved in contributing enterprises on dairy farms in the Valley. Subsequent surveys were carried out regarding costs of producing dairy herd replacements, costs of producing oat-pea silage, barley or oats for grain, and brome or timothy for silage, hay, green-chop or pasture.

Costs of Producing Dairy Herd Replacements

The problem of obtaining good heifers for replacing and expanding dairy herds has become more serious as adjustments continued in Alaska's Grade A dairy industry. Recent adjustments have resulted in mature cows from dispersed herds being used to replace and expand existing herds. Numbers of bred heifers to be used for replacements are very short. The current situation accentuates a long standing question, "What does it cost to raise a dairy herd replacement into the milking line?" If the dairy industry is to expand, the question becomes even more critical due to the distance and environmental shock of importing replacements from "stateside". The following budget reports the results of a study to determine representative costs in Alaska of raising dairy herd replacements and capital requirements of a dairy herd replacement enterprise.

Source of Data

The 1965 study of 41 commercial Grade A dairies showed 63 percent of the producers planning to raise all replacements, 12 percent planning

to raise three-fourths of their replacements, 15 percent planning to raise approximately one-half of their replacements, and only about 5 percent planning to raise no replacements. A purposefully selected sample of eight dairy farms was surveyed during the fall of 1966 to determine total costs of raising herd replacements. A budget was synthesized from reported research on physical requirements and local prices to validate the survey data.

Costs

Emphasis in developing budgets was on total costs of production extending over the period from birth to calving of the replacement heifer. Emphasis was directed in this manner to allow alternative resource use comparisons to be made. The initial budget completed was a synthesis constructed from physical resource requirements gleaned from published literature and the use of current resource prices. Costs were calculated for ten calves starting at birth and ending with seven heifers being placed in the milking line at approximately two years of age. Estimated income received from cull heifers was credited against total costs incurred. Cost per heifer placed in the milking line, after adjustments for sale of culls, was estimated at $585.82.

The survey was then carried out to determine numbers of heifers raised, feeding practices, resource inputs used, and factor costs. Costs were divided into three time periods, by general type of

feeding programs. Total costs per replacement heifer ranged from a low of $537.78 to a high of $629.13 in the sample grouping. Feed costs made up approximately 60 percent of all costs. Labor costs made up some 26 percent of all costs. All other costs accounted for the remaining 14 percent. Most dairymen surveyed selected heifers at birth and did little culling until after production was known in the milking line. The replacement cycle for dairy herds in the Valley was estimated to be approximately four years, based on survey data. Factor costs were taken from farm records, or if not available, were estimated by the farm operator. Interest on total capital used was calculated at 5 percent.

TABLE XV. AVERAGE COST PER HEIFER RAISED AND PLACED IN MILKING HERD, MATANUSKA VALLEY

Cost Item	Low cost group	High cost group	Weighted avg. for all calves in sample
First 2 months			
Milk replacer	$ 12.07	$ 16.67	$ 12.12
Whole milk	-	-	4.68
16% dairy ration	2.36	1.40	1.85
Calf starter and Manna	2.48	7.16	4.73
Hay	3.18	2.25	2.50
Total for 2 Months	$ 20.29	$ 27.48	$ 25.88
2 months - 6 months			
Calf starter	$ 4.50	$ 4.75	$ 3.31
16% dairy ration	15.60	28.63	22.68
Hay	16.97	19.57	18.42
	$ 37.07	$ 52.95	$ 44.41
6 months - Freshening			
16% dairy ration	$ 54.75	$ 80.20	$ 82.20
Hay	73.68	117.63	108.55
Silage	104.74	91.57	68.70
Pasture	17.00	34.87	24.90
	$250.17	$324.26	$284.35
TOTAL FEED COSTS	$307.83	$404.69	$354.64
Other costs			
Labor	$148.66	$154.96	$156.16
Buildings	17.14	23.04	20.58
Bedding	22.50	15.39	16.71
Vet. & medicine	1.50	.78	1.04
Breeding	9.00	10.00	9.10
Insurance	3.05	1.17	2.59
Interest	24.25	27.66	26.27
Misc. cost	4.14	3.09	3.92
	$230.25	$236.18	$236.37
Adjustment for culled heifers	$ -	$ 11.74	$ 5.19
TOTAL COSTS PER HEIFER	$537.78	$629.13	$585.82

Costs of Producing Oat-Pea Crop for Silage

The analysis of individual enterprises, such as is presented in this section of the report regarding contributing enterprises on dairy farms, may lead to erroneous conclusions unless consideration is given as to how each enterprise fits into the farming system as a whole. Dairy is the primary income enterprise, so each of the cropping enterprises should be considered in terms of typical use of the remainder of the resources available to the farm firm, as well as how each enterprise contributes to the success of the dairy enterprise. It is assumed that most, if not all, feed crops will be marketed through the dairy enterprise. It must be noted, however, that oat-pea silage is produced on farms producing other types of livestock, but seldom on single enterprise farms due to the lack of market development for silage.

Source of Data

Survey data regarding factor inputs used, costs, and yields were obtained from eight dairymen who produced oat-pea silage as a major feed input for their dairy operations. The eight farms were selected for spatial distribution throughout the Matanuska Valley, and the full range of herd sizes. Survey data were collected regarding acres of oat-pea crop, yield per acre, land and materials used, costs of raising crop, costs of harvesting crop, general information regarding machinery and production practices on

individual farms, and data regarding capital invested in various resources. Allocation of fixed overhead and investment costs was based on farm business organization decisions made by the farm operator. All costs included in the study reflected current prices, levels of management, technology being used, and enterprise organization on farms within the sample group. Survey data were compared with statistical data, research data, and previous research reports where available.

Land and Materials

Farm land in the Valley is generally level to rolling, but areas that are too rough and too steep for farming are intermingled with the more level areas. Topography and depth of soil as well as rainfall vary noticeably throughout the Valley, consequently, reported yields ranged from 3 tons to 8 tons of silage per acre. Acres of oat-pea crop per farm ranged from 30 acres to 85 acres.

Seeding rates differed between farms as influenced by soils and microclimate of field locations and judgment of the farm operator. Some operators included vetch in the seed mixture. Average seeding rates differed somewhat from rates recommended by Cooperative Extension Service and Alaska Experiment Station. Recommended rates were 40 - 50 pounds of oats and 50 - 60 pounds of peas.

Klebesadel 80/ recommended "to prevent excess lodging of the crop, at least 40 to 50 pounds of oats and no more than 60 to 70 pounds of peas should be planted per acre." Farmers in the sample appear to have used more oats and less peas than recommended to overcome problems of excess moisture in silage.

TABLE XVI. ESTIMATED SEEDING RATES FOR OAT-PEA CROP ON EIGHT SELECTED MATANUSKA VALLEY DAIRY FARMS, 1966

Farm	Component Rates			
	Oats	Peas	Vetch	Total
	(Pounds/acre)			
1	100	33	10	143
2	60	50	-	110
3	90	40	-	130
4	100	20	-	120
5	60	-	50	110
6	100	50	-	150
7	120	35	-	155
8	60	40	15	115
Av.	86	33.5	9.5	129

There were marked differences among farms, both in application rates and analysis of fertilizers used. Average application rates in pounds per acre for major fertilizer nutrients were 47 pounds of N, 67 pounds of P_2O_5, and 38 pounds of K_2O. Recommended rates of application were 300 pounds of 10-20-10 per acre, or 30 pounds of N,

80/ L. J. Klebesadel, Planting Rate of Oats and Peas: Some Yield, Quality, and Cost Considerations, Alaska Agricultural Experiment Station, Forage Research Report No. 4, p. 5.

60 pounds of P_2O_5, and 30 pounds of K_2O. Rates of fertilizer nutrients applied deviated from those recommended, but this may have been due to variability of soils or to type of silage desired by the farm operator.

TABLE XVII. RATES OF APPLICATION OF MAJOR FERTILIZER NUTRIENTS FOR OAT-PEA PRODUCTION ON EIGHT MATANUSKA VALLEY DAIRY FARMS

Farm	Component Rates		
	N	P_2O_5	K_2O
1	73	48	23
2	36	90	36
3	12	48	24
4	48	102	48
5	57	64	64
6	52	40	20
7	45	96	45
8	51	48	48
Av.	47	67	38

Costs

Emphasis in developing budgets was directed to average total costs per acre. All costs were estimated to be full costs for resources used. Labor costs were based on operator's estimates of time and value. Depreciation and obsolescence charges were calculated from acquisition costs of machinery and equipment, using a 10-year scale. Maintenance costs were taken from operator's records, and if not available were calculated at 5 percent of

acquisition cost of the item in question. Costs of purchased materials and supplies were obtained from the operator's records. Return to capital was calculated using the present value of all resources allocated to the oat-pea enterprise and a 5 percent interest rate. Storage costs were not included in average total costs.

Charge per acre of land, including land tax, ranged from $7.65 to $13.60, the most common charge being approximately $12.50.

Raising Crop

Plowing cost per acre ranged from $3.69 to $7.63 because of differences in size and type of equipment used, size of farm unit, and allocation of fixed costs to the oat-pea silage enterprise by farm operator. Plowing costs included gasoline or diesel fuel, oil and grease, depreciation and maintenance on tractor and plow, and labor to carry out the plowing operation. The average cost reported for plowing was $3.93 per acre; one operator disked instead of plowing.

Disking and harrowing costs were consolidated because the two tillage practices were performed together by some operators. Reported costs per acre ranged from $1.26 to $5.80. The average charge for disking and harrowing was $2.81 per acre.

Cultipacking, drilling and fertilizing costs were consolidated into a single cost due to the nature of equipment used and this combining of the three cultural practices by some operators. Cost per acre for these operations ranged from $3.25 to $7.62, averaging $5.03 for all acres reported. Costs varied somewhat due to size and value of equipment used, and number of times over the field.

Harvesting Crop

Direct field cutting of the standing crop was the most common method of harvesting although some acreage was cut with a windrower, then chopped from the windrow. Chopping cost per acre ranged from $5.43 to $13.24, averaging $8.95 for all acres reported. Cost differences were chiefly due to year of purchase and size of equipment, as well as total acres farmed.

Hauling cost varied widely due to differences in equipment used and allocation of fixed costs. Trucks, wagons and combinations were used. Cost ranged from $3.61 to $12.15 per acre. Some equipment was used extensively in the overall farming operation and consequently, fixed costs assigned to hauling the oat-pea crop were very small. Labor cost per acre varied with efficiency of operation, opportunity cost of operator's and family labor, and price of hired labor. It is assumed, however, that the average cost per acre of $7.04 is typical of oat-pea silage enterprises on dairy farms in the Valley area.

Return to Capital

Return to capital was calculated on investment for the full year, due to time pattern of acquisition of inputs and sale or use of product. Charge for capital, per acre, ranged from $4.31 to $7.28, averaging $5.94 on all acres reported. Certain farm business overhead capital may not be included due to the primary income enterprise being dairy, and the difficulty of allocating overhead costs in a multiple enterprise unit.

Total Cost of Production

Total cost of oat-pea production per acre apparently was more dependent on cultural practices, rate of fertilizer application and allocation of fixed costs between enterprises than on economics of scale for the enterprise. Total cost per acre ranged from $65.89 to $91.12. Average total cost per acre on all acres reported was $75.03, based on weighted average cost per acre.

Average total cost per ton of silage was calculated by dividing total cost per acre by average reported production per acre. Yield in tons per acre ranged from 3 to 8 tons, averaging 5.95. Average yield per acre, as reported by the Alaska Crop and Livestock Reporting Service, (preliminary estimates) was 5.7 tons per acre for grain silage for the Matanuska Valley in 1965 and 1966.

Cost per ton of oats and peas ranged from $8.74 to $25.38, and averaged $12.66 on total production in the survey. Using area-wide per-acre production of 5.7 tons per acre, cost per ton would be $13.16, assuming per-acre costs developed in the study to be representative of all oat-pea silage produced.

Due to the limited sale of oat-pea silage, market prices for silage are not readily available; however, the Alaska Crop and Livestock Reporting Service reported grain silage at $18.00 per ton for the 1966 calendar year.

TABLE XVIII. AVERAGE COSTS PER ACRE FOR PRODUCING OAT-PEA CROP ON EIGHT MATANUSKA VALLEY DAIRY FARMS

Item		Mean
Oat-Pea acres per farm		54
Production per acre a/ (tons)		5.95
Land and Materials		
Seed - Oats 86.0#		$ 5.90
Peas 33.5#		3.74
Vetch 9.5#		.84
Fertilizer 47# N, 67# P_2O_5, 39# K_2O		19.01
Charge for land (per acre)		12.09
	Sub-total	$41.58
Raising Crop		
Plow) Tractor)-		$ 3.93
Disk) Tractor)-		2.81
Drill) Cultipacker) Fertilizer) Tractor)-		5.03
	Sub-total	$11.77
Harvesting Crop		
Chopper) Tractor)-		$ 8.95
Hauling Trucks or tractor and wagons		7.04
	Sub-total	$15.99
Return to Capital b/ (Non-land)		5.94
Total Cost of Production		$75.28
Cost per Ton		$12.66

a/ Silage equivalent

b/ Interest on investment is calculated for a full year due to pattern of acquisition of inputs and sale or use of product.

Costs of Producing Barley for Grain

Barley is the second crop enterprise, found on dairy farms, that is a contributing enterprise to the primary income enterprise of dairy, although indirectly in most cases. The barley enterprise differs from other feed crops in that the crop is generally harvested and delivered to the commercial dryer and storage facility for final disposition. The barley crop provides an important component of the feed supply through the commercially mixed ration. Due to having established marketing facilities, barley is grown on farms with livestock enterprises other than dairy and on crop farms where no livestock is kept. Cost of production data were collected from both dairy and non-dairy farms, assuming that the cost data would be generally applicable.

Sources of Data

Data were obtained from nine farm operators who had either raised barley during the 1966 cropping season or had raised barley during several recent years. The nine farms were scattered throughout the Matanuska Valley and ranged from one farm with only 15 acres to farms with approximately 80 acres. Most farms surveyed were generally classed as dairy farms. The range of data collected was comparable to that collected for all other crops. All costs were reflective of current prices, present levels of management and technology being used in the community, and with existing farm enterprise

organization. Survey data were compared to statistical data, previous research reports where available, and with research reports from other geographic areas.

Land and Materials

Farms surveyed were scattered throughout the Valley so the land input tended to be comparable to that discussed in other crop enterprises with a limited amount being of a more rolling nature and located at higher elevations.

Seeding rates for barley ranged from 100 pounds to 150 pounds per acre, and averaged 116 pounds per acre for all acres included in the survey. Recommended seeding rate, by the Experiment Station, was 100 pounds per acre.

TABLE XIX.. ESTIMATED SEEDING RATES AND RATES OF APPLICATION OF MAJOR FERTILIZED NUTRIENTS ON BARLEY CROP ON NINE MATANUSKA VALLEY FARMS

Farm	Seed	N	Component Rates P_2O_5	K_2O
			(Pounds/acre)	
1	100	24	96	48
2	125	24	96	48
3	150	36	77	36
4	100	38	77	38
5	110	50	32	44
6	120	24	48	48
7	120	36	77	36
8	125	37	74	74
9	150	20	80	40
Weighted av. all acres	116	28	85	45

Application rates of major fertilizer nutrients varied between producers due to differing locations, soil types, and operator judgments with regards to need and price. Recommended rates of application by the Experiment Station were 20# N, 40# P_2O_5, and 20# K_2O.

Costs

Emphasis, as in all other crop budgets, was directed to average total costs per acre. Cost estimates were based on operator's farm records and best estimates of time and value if records were not available. Depreciation and obsolescence, maintenance, materials and supplies, and capital costs were all calculated in the same manner as the oat-pea crop budgets. The charge per acre of land was a combination of rental charges and interest on capital invested in land plus land taxes.

Raising Crop

Land preparation practices were not directly comparable in all instances so costs were divided between plowing and disk-harrowing. Plowing costs averaged $4.49 per acre and disk-harrowing averaged $2.46 per acre for all acres in the survey. The operations of cultipacking, drilling seed and fertilizing were grouped due to the number of operators that combined the three operations into a single field operation. The average cost per acre reported was

$3.49 per acre. Spraying for weeds was a common practice. Most operators found it necessary to spray with premerge and occasionally with 2-4-D in the spray mixture. Average cost per acre was reported to be $1.25. Total costs of raising the barley crop were comparable to those estimated for the oat-pea crop.

Harvesting Crop

Harvesting costs for barley were most often reported as the custom charge. The typical charge reported for combining was approximately $15.00, however, the extreme range which included some binding and threshing was from $7.65 per acre to $22.56 per acre. The average reported cost for all acres harvested was $14.27. Hauling costs varied due to part being a custom charge, and part being hauled by the farm operator. Operator's assigned charge varied according to value and size of hauling equipment, and portion of truck costs assigned to the barley enterprise. Drying costs were estimated from farm records and the drying cost schedule of the one commercial dryer in the community.

Return to Capital

The charge for capital was calculated on that capital allocated to the enterprise by the farm operator, and included capital invested in machinery and equipment, annual operating costs,

but does not include investment in land as this is included in the charge for land. Certain farm business overhead costs are not included due to the difficulty of allocation in a multiple enterprise unit.

Total costs of Production

Total costs of production ranged from $70.30 per acre to $115.08 per acre, averaging $82.05 for all acres surveyed. Due to the differing yields per acre, total costs per ton varied considerably more than costs per acre. Costs per ton ranged from $52.70 to $80.26 per ton with the average cost on all tons produced being $61.78. Value per ton of barley, as reported by the Alaska Crop and Livestock Reporting Service, was $80.00 during 1966.

TABLE XX. ESTIMATED COSTS PER ACRE FOR PRODUCING BARLEY ON NINE SELECTED MATANUSKA VALLEY FARMS.

Acres per farm		70.28
Production per acre (tons)		1.328
	Av.	Cost per acre
Land and Materials		
Seed 116# @ $7.09 per cwt.		$ 8.22
Fertilizer 28#N, 85#P_2O_5, 45#K_2O		19.75
Spray materials (2 qts. premerge)		2.51
Land (acre)		11.89
Sub-total		$42.37
Raising Crop		
Plowing		$ 4.49
Disk-harrow		2.46
Cultipack - Drill & Fertilizer		3.49
Spraying		1.25
Sub-total		$11.69
Harvesting Crop		
Combine or Bind & Thresh		$14.27
Hauling		2.71
Drying		6.14
Sub-total		$23.12
Cost of Capital		$ 4.87
Total Costs of Production		$82.05
Total Costs per Ton		$61.78

Costs of Producing Bromegrass-Timothy for Green Chop, Pasture, Hay, and Silage

The bromegrass-timothy enterprise is the third crop enterprise to be considered as a contributing enterprise to dairying on farms in the Matanuska Valley. As with each of the other crop enterprises, the bromegrass-timothy enterprise is found on most livestock farms, but seldom as a single-enterprise farm's primary source of income. The seeded grass crop is the most flexible of all crops in terms of harvesting. Most operators will harvest in the form most appropriate to the time and situation. Grass is most often hayed from the first crop, weather permitting, and used for silage on the second crop. Some portion of the crop will often be pastured, and in many instances, on dairy farms, will be chopped for green feed during the appropriate summer season. The Alaska Crop and Livestock Reporting Service reported some 7,100 acres of seeded grass being harvested in the State during 1966, 5,000 acres of which were harvested in the Matanuska Valley area. The acreage reported was the largest for any single crop, both in the State and in the Valley.

Source of Data

Survey data were obtained from eight farm operators who had harvested seeded grass during the 1966 cropping season. Not all farm operators had harvested seeded grass in all forms reported, but

estimates were obtained with regard to the particular forms of harvest the operator was most familiar with and best estimates for all forms of harvest. Cost estimates were made as if the crop were used for a single harvest purpose for the complete season in each of the harvesting forms. To the extent possible, cost data were obtained from farm records, and where not available best estimates were made. Other research data and cost data were reviewed to further substantiate the data used.

Land and Materials

The land on which the seeded grass crops were grown tended to be of a more rolling nature of thinner profile than that on which other crops were grown, but located in the same general areas of the Valley. Acreage per farm ranged from 36 to 425 acres and averaged 112 acres per farm surveyed. Most seeded grass in the survey was bromegrass.

Establishing the Stand

The seeded grass crop, generally bromegrass, being a perennial, is seeded only at infrequent intervals. Consequently, costs of establishing a stand are separated out as a single budget, and pro-rated over the number of years suggested by the farm operators. Frequent winter kill and intensive harvesting practices limited the stands on farms surveyed to about five years. Seeding rates and

rates of application of major fertilizer nutrients varied according to operator's experience and location within the Valley.

TABLE XXI. ESTIMATED SEEDING RATES AND RATES OF APPLICATION OF MAJOR FERTILIZER NUTRIENTS FOR ESTABLISHING A BROMEGRASS STAND ON EIGHT MATANUSKA VALLEY FARMS.

Farm	Seed	Component Rates N	P_2O_5	K_2O
			(pounds/acre)	
1	12.5	58	64	32
2	6	30	60	30
3	15	20	40	40
4	20	80	115	58
5	15	73	48	23
6	10	70	32	32
7	25	42	90	42
8	25	86	64	64
Ave.	16.3	62	58	34

Recommended rates of major fertilizer nutrient applications, by the Experiment Station, were 60#N, 60#P_2O_5; and 60#K_2O for establishing a stand of bromegrass-timothy.

Costs

Costs, as in all other crop budgets, were obtained from farm operators' records and best judgments with regard to allocation of fixed costs, labor and capital costs among enterprises included in the farm business. Data for bromegrass budgets A through E were obtained from eight dairy farms in the Matanuska Valley.

Budget A - Cost of Establishing Stand of Bromegrass

Item		Average
Bromegrass Acres per Farm		112.
Production per Acre (tons)		-
Land and Materials		
Establishing stand (Seed)		$ 5.97
Fertilizer		22.24
Spray		.38
Charge for land		12.55
	Sub-total	$41.14
Raising Crop		
Plow		$ 3.23
Disk-Harrow		3.95
Cultipack-Drill-Fertilizer		4.29
Spraying		.12
	Sub-total	$11.59
Return to capital investment		3.06
Total Cost of Establishing Stand		$55.79
Average life of stand (years)		4.94

No production was included in the first year budget as expected yields were limited and assumed to be equivalent in value to costs of cleaning up the field during the late summer of the seeding year.

Green chop, Budget B, is a harvest form used by a considerable number of dairymen to offset disadvantages of pasturing during the summer season. It also allows a more intensive use of tilled land than does pasturing and closer control of the total feed mix.

Budget B - Costs of Producing Bromegrass-Green Chop

Item		Average
Bromegrass Acres per Farm		112
Production per Acre (tons)		10.88
Land and Materials		
Establishing stand		$10.38
Fertilizer		45.15
Fence		1.00
Spray		-
Charge for land		12.70
	Sub-total	$69.23
Raising Crop		
Fertilizing		2.32
	Sub-total	$ 2.32
Harvesting Crop		
Chopping		7.23
	Sub-total	$ 7.23
Return to capital investment		4.17
Total Cost of Production		$82.95
Average cost per ton		$ 7.63

Cost estimates, as well as yield estimates, were developed through continuing discussions with farm operators who were most experienced in the particular harvest form. Fertilizer was generally applied in the spring with additional nitrogen fertilizer applied after harvest of the first crop during late June or early July.

Harvesting of the crop in various forms varied from year to year on most farms, due to weather, seasonal growth and summer feed requirements.

Budget C - Costs of Producing Permanent Bromegrass Pasture

Item		Average
Bromegrass Acres per Farm		112
Production per Acre		-
Land and Materials		
Establishing stand		$11.50
Fertilizer		34.34
Fence		3.10
Spray		-
Charge for land		12.25
	Sub-total	$61.19
Raising Crop		
Clip		$ 1.07
Fertilizing		1.80
	Sub-total	$ 2.87
Return to capital investment		2.91
Total Cost of Production		$66.97

Bromegrass production budgets for hay and silage have been separated as to best estimates of costs for each harvest form. The reason for doing so is that weather conditions often preclude successful harvest of the first crop for hay and generally preclude haying of the second crop. However, haying of the seeded grass crops is a

common practice and thus necessitated a budget inclusion. Yield of hay per acre was calculated for two crops harvested in that form. Yield of silage or haylage per acre reported is quite low when compared with experimental results, indicating possible doubling of yield with cultural and harvesting practice changes.

Budget D - Costs of Producing Bromegrass Hay

Item		Average
Bromegrass Acres per Farm		112
Production per Acre (tons)		3.255
Land and Materials		
Establishing stand		$ 7.88
Fertilizer		25.23
Charge for land		8.37
	Sub-total	$41.48
Raising Crop		
Fertilizing		$ 1.68
	Sub-total	$ 1.68
Harvesting Costs		
Mowing-Conditioning		$ 3.65
Rake		1.84
Bale		15.90
Hauling		8.33
	Sub-total	$29.72
Return to capital investment		$ 4.19
Total Cost of Production		$77.07
Average cost per ton		$34.17

Budget E - Costs of Producing Bromegrass Silage

Item		Average
Bromegrass Acres per Farm		112
Production per Acre (tons)		3.67
Land and Materials		
Establishing stand		$ 8.25
Fertilizer		25.54
Charge for land		8.94
	Sub-total	$42.73
Raising Crop		
Fertilizing		$ 1.58
	Sub-total	$ 1.58
Harvesting Costs		
Mow & Chop		$ 5.92
Hay Bind or Windrow		2.04
Hauling		6.70
	Sub-total	$14.66
Return to capital investment		$ 4.10
Total Cost of Production		$63.07
Average cost per ton		$17.18

Costs of establishing stand used in budgets for different harvest forms varied due to size of farm units and particularly due to length of expected time span before reseeding. Harvesting costs differ with time, investment and operating costs of harvesting equipment, and the nature of the harvesting procedure. Storage costs for the harvested crop are not included.

Total Costs of Production

Total costs of production were estimated for each harvest form to include all estimated costs, with the exception of possible business overhead costs that posed a problem of allocation between enterprises. Total costs per acre of green chop were estimated to be $82.95, for pasture $66.97, for hay $77.07 and for silage $63.07.

No sale prices are reported for green chop or pasture. Tame grass hay was reported at $58.79 per ton and tame grass silage at $17.88 per ton, by the Alaska Crop and Livestock Reporting Service.

Costs of Producing Hogs in Alaska 81/

Expressions of interest regarding hog production in Alaska occur at frequent levels. Very little information is readily available as only few hogs have been produced, and a considerable portion of those have been produced on garbage from military bases. Slaughter facilities have been scarce and inadequate until recently. Marketing channels for local pork are relatively undeveloped. Costs of raising hogs in Alaska are difficult to determine because of the small numbers of producers and difficulty of obtaining cost data. Observations of Anchorage and Fairbanks trade channels lead to the belief that typical one and two litter production systems common to many hog

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81/ Wayne E. Burton, Hog Production in Alaska: Some Economic Aspects, Alaska Agricultural Experiment Station cooperating with U. S. Department of Agriculture, Misc. Circ., June, 1964.

producing areas would face serious marketing difficulties in Alaska, as wholesale and retail outlets cannot readily handle "one-shot" marketings of any sizable quantity. Controlled environment confinement production systems of hog production would give Alaska producers the opportunity for monthly farrowing and marketing which would in turn help foster the development of marketing channels for local pork.

Sources of Data

Data for costs of production budgets for hogs were collected from case studies, published research reports from other geographic areas, discussions with members of the Engineering Section at the Alaska Agricultural Experiment Station, local prices for materials and supplies, and discussions with other agricultural specialists. Data from all sources were synthesized into estimates of resource requirements, production practices, and possible investment and production costs.

Physical Production Requirements

Capital requirements for a commercial farrow to finish, controlled environment pork enterprises are quite extensive. Capital requirements estimates included housing, equipment, breeding stock and the necessary operating capital to cover out-of-pocket cost throughout the year. Land may run $200 or more per acre.

Cash housing costs may approach or exceed for: (1) insulated confinement housing (with full slotted floors) $10 per gross square foot of floor space, (2) insulated confinement housing (with partially slotted floor) $9.50 per square foot, (3) insulated confinement with concrete floors $9.00 per square foot. Estimates do not include the operator's labor during the building period. Breeding stock may run $100 or more for sow stock and $150 or more for boar stock. Feed and other out-of-pocket costs may require $400 or more per litter to slaughter age. Capital requirements for an 800-head per year capacity enterprise may thus approach $55,000.

Cost of Production

Cost production data for hogs were developed from case study data for 1962-1963 production years and planning projections for two different systems of production in a controlled environment housing facility. Housing for both options was a 36' by 72' insulated barn with slotted dunging alleys, supplemental heat, and forced air ventilation. 82/ Option A, (Table XXII) was a farrow to finish system with eight sows farrowed each month. Sows were brought into the barn to farrow and moved from the barn as soon as pigs were weaned. Pigs were sorted by size at weaning, and resorted monthly until slaughtered.

82/ Housing estimates developed in cooperation with producers and personnel of the Engineering Section, Alaska Agricultural Experiment Station.

TABLE XXII. COSTS OF PRODUCING HOGS, OPTION A, 1964 */

Investment	Estimate
1. Land (5 acres @ $200 per acre)	$ 1,000
2. Swine (50 sows @ $100, 3 boars @ $150)	5,450
3. Buildings and equipment	
36' x 72' insulated barn with slotted dunging alley and equipment	24,000
20' x 80' pole barn and grain storage	3,000
Pens and miscellaneous equipment	1,000
4. Operating capital (1/2 year's feed cost plus 25%)	19,000
TOTAL CONTINUING INVESTMENT	$53,450
Estimated expenses:	
Feed (575,000 pounds plus pasture)	$31,625
Other out-of-pocket costs (25% of feed cost)	7,900
Interest on 50% of investment (borrowed capital) @ 6%	1,604
Depreciation	2,155
Slaughter and delivery cost @ 3.5¢/lb. dressed carcass	4,200
Total estimated annual cash cost	$47,484
Return to family labor (4800 hrs. @ $2)	9,600
Return to 50% equity @ 6%	1,604
TOTAL ANNUAL COST	$58,688
Total cost of carcass pork, 48.9 cents per pound.	

*/ Assuming 96 to 100 litters of 9 or more pigs farrowed and 8 or more pigs marketed at 200 pounds, an overall feed conversion ratio of 3.5 to 1, labor requirements of 1.9 man-hours per 100 pounds live weight of pork produced.

TABLE XXIII. COSTS OF PRODUCING HOGS, OPTION B, 1964 */

Investment	Estimate
1. Land (5 acres @ $200 per acre)	$ 1,000
2. Swine (36 sows @ $100, 2 boars @ $150)	3,900
3. Buildings and equipment	
36' x 72' barn, etc.	24,000
20' x 80' barn	3,000
Miscellaneous pens, etc.	1,000
4. Operating capital	$15,000
TOTAL CONTINUING INVESTMENT	$47,900
Estimated expenses:	
Feed (431,298 lbs. plus pasture)	$23,721
Other out-of-pocket costs (25% of feed cost)	5,930
Interest on 50% of investment (borrowed capital) @ 6%	1,437
Depreciation	2,155
Slaughter and delivery cost @ 3.5¢/lb. dressed carcass	3,024
Total estimated annual cash costs	$36,267
Returns to family labor (3456 hrs. @ $2)	6,912
Return to 50% equity @ 6%	1,437
TOTAL ANNUAL COST	$44,616
Total cost of carcass pork, 51.64 cents per pound.	

*/ Assuming 75-78 litters with 8 pigs per litter raised, 3.5 to 1 feed ration, and 75 percent dress out, using "farrow to finish in the pen" system. Other standards comparable to Option A.

Option B (Table XXIII) was a production system modification of Option A. The major differences were that only six sows were farrowed each month and litters were left in the farrowing pen until slaughter, with no consolidation or sorting.

Average price received for pork in carcass form was reported at 53.29¢ per pound in 1966 by the Alaska Crop and Livestock Reporting Service.

Costs of Production on Potato-Vegetable Farms

Potatoes have historically been the second largest income commodity produced in Alaska, reaching a peak of 26 percent of the value of all farm commodities with total sales going above one million dollars during 1964. During the mid-1950's potato acreages were around 1,500. In recent years, acres harvested have ranged from 700 to 800. Marketings have ranged from 5,400 tons to 5,700 tons since 1960. Alaska potatoes are marketed as "fresh table stock" with occasional sales for livestock feed; the primary market has been the military contract market.

During the homesteading periods in most communities, potatoes were considered to be the fastest and easiest cash income enterprise to develop. Consequently, chaotic marketing conditions frequently occurred. More recently potatoes have been raised by experienced and highly competent commercial farmers. Acreages are small by "stateside" standards, often ranging from 10 to 60 acres in the Matanuska Valley

and infrequently to larger acreages in the Tanana Valley. Yields in the Tanana Valley tend to run about two tons per acre lower than those in the Matanuska Valley. (Yields in the Matanuska Valley are frequently 10 to 12 tons per acre, with occasional yields of 15 tons of number ones and twos.)

Concern has been expressed by potato producers in the Matanuska Valley, from time to time, regarding possible increased marketings and their competitive position in the overall Alaska potato market. During recent years considerable interest has been expressed in possible development of potato processing facilities of some type within the State. Projected trends of increased processed potato marketings have stimulated such interest and at the same time caused considerable alarm. Increased interest in cost-of-production data was generated as a result of studies being carried out to determine feasibility of some type of potato processing in Alaska.

Characteristics of Potato Production Firms in the Matanuska Valley

Surveys were carried out during the 1965 and 1966 production seasons to determine production costs, firm investments and some general characteristics of firms producing potatoes or potatoes and vegetables. Group interviews and discussions were held to further pursue topics regarding possible production expansion. Survey schedules were completed for seven commercial potato farms, which in

most instances produced other vegetable crops also. Four farm operators reported only potatoes. Three reported head lettuce, two reported cabbage and carrots, and one reported several other vegetable crops. A total of 58 acres of vegetables other than potatoes was reported, or 8.3 acres per farm.

Farm operators in the survey had averaged living in the community for slightly over 21 years, approximately 20 years on the farm, and 17 years raising potatoes. The average owned acreage per farm operator was 217 acres with an additional 24 acres being rented in and 16 acres being rented out. Average cropland reported was 58 acres, unused land 13 acres, and 146 acres woodland. Average acres cleared per farm was approximately 60 acres. Average acreage of potatoes for the sample group during the 1966 cropping season was 35+ acres and ranged from 17 acres to 60 acres, with an average reported yield of just over 11 tons per acre. Yields were generally reported as tons of saleable grade 1's and 2's.

Costs of Production

Capital investment per farm was calculated from detailed inventory and investment data obtained from the farm operators. Acquisition costs and depreciated values were reviewed in order to determine present depreciated investment values.

Annual operating costs were obtained from farm records and delivery costs of potatoes to fulfill contracts were estimated from past costs and 1966 crop yields. Return to capital was calculated at 5 percent. Operator's labor was calculated at $2.50 per hour.

TABLE XXIV. COSTS OF PRODUCING POTATOES ON SEVEN MATANUSKA VALLEY FARMS, 1966.

Production per Farm:		
Acres in farm		217
Acres potatoes		35
Acres other vegetables		8.3
Yield per acre (potatoes) - tons		11
Investment per Farm:		
Land (cleared $250.00 acre & uncleared $70.00)	$25,990	
Buildings a/(including house & family garage @ $24,000)	51,171	
Machinery and equipment	24,789	
Annual operating capital	23,504	
Total Investment	$125,454	
Annual Operating Expense:		acre
Cash operating	$23,504	668.82
Depreciation	4,438	
Total Annual Operating Expense	$27,942	
Return to capital	$ 6,273	
Operator's unpaid labor	$ 5,200	
Full Cost recovery for all resources used on Potato-Vegetable Farms (other than management return)	$39,415	
(Per acre costs)		$910.28
Full cost per cwt. of Potatoes b/		$ 4.12

a/ Potato storage facilities were found on all farms surveyed that made up a major portion of capital investment in buildings.

(Footnote continued on next page)

b/ Other vegetable costs were considered as being comparable per acre with potatoes due to difference in storage costs, length of time from planting to final sale and a number of other factors therefore costs per cwt. are estimated potato equivalents.

It is assumed that the full cost recovery is approximately the cost basis on which Alaska producers have been making decisions. However, if only costs and investment directly related to the potato-vegetable enterprise are considered a somewhat lower figure will be derived.

TABLE XXIV. COSTS OF PRODUCING POTATOES ON SEVEN MATANUSKA VALLEY FARMS, 1966 (Continued)

Annual Operating Expense:		
Cash operating expense	$23,504	
Depreciation	3,838+	
Total Annual Operating	$27,342	
Return to capital	3,523	
Operator's unpaid labor	5,200	
	$36,175	
Per acre costs		$835.38
Full cost per cwt. (except management return)		$ 3.78

From discussions with a number of potato producers and other interested professional agriculturalists, a consensus was reached that unit costs might drop as much as 12 percent with expansion on present farm units. Other conclusions were that land rent for potato land would go up and labor costs would increase causing operators to substitute machinery for labor. Major problem of expansion might be availability of loan capital and new operators might enter the potato industry if storage were available.

Average price received, per hundredweight, by Alaska producers was reported to be $4.80 during the 1966 calendar year.

Costs of Producing Beef Cattle in Alaska

"The Kenai Peninsula and Kodiak Island along with the other islands in the Southwest were the homes of 94 percent of the cattle and calves in Alaska on January 1, 1966." 83/ Stock raising is the leading agricultural enterprise throughout the southwest region of the State, and is the leading agricultural enterprise on the Kenai Peninsula at the present time. Island ranges provide year-long grazing in most instances, even though supplemental feed is generally recommended. Many other areas in the State provide ample seasonal grazing, but require prolonged periods of heavy winter feeding. Varying estimates have been made regarding range carrying capacity. The Bureau of Land Management, U. S. Department of Interior, lease maximums for leases in these islands, exclusive of Chirikof Island, were estimated to be approximately 13,500 animal units. Estimates of ranchers in the area have been noticeably higher. 84/ However, due to the very limited range management research regarding sustained carrying capacity, it is quite possible that future estimates by agency people may be much higher than present estimates.

83/ Alaska Crop and Livestock Reporting Service, Alaska Agricultural Statistics-1965, U. S. Department of Agriculture Statistical Reporting Service, cooperating with Alaska Division of Agriculture and Alaska Experiment Station.

84/ Bureau of Reclamation, Livestock Industry in Alaska: Possibilities for an Integrated Livestock Industry on Kenai Peninsula, Kodiak and Adjoining Islands, Juneau, Alaska: United States Department of the Interior, March, 1967, pp. 30-31.

Most of the islands are hilly or mountainous with irregular coast lines, and are characterized by prominent headlands and sea cliffs, many narrow steep-walled bays, few suitable harbor areas, and extremely difficult waters for moving in supplies and moving out livestock. Other than Kodiak, most of the islands are treeless but covered with grass and forbes. Most of the islands have a maritime climate, tending to have temperature variations that fall within quite narrow limits, and also tend to have considerable wind. Precipitation is abundant throughout the year. Winter precipitation tends to be rain or snow, and snow tends to persist at higher elevations well into the spring. 85/

Ranches throughout the Kenai Peninsula-Islands area tend to be in varying stages of development. As herds have generally been built up through natural increase, they tend to be of mixed ages, and numbers of cows, heifers, calves, and steers. Steers up to four and five years old were reported on ranches during the summer of 1966. Winter feed production has been very limited wherever year-round grazing could be practiced. Due to longer winters and heavy snow on most areas of the Kenai Peninsula, considerable emphasis has been placed on winter feed production and harvest. Leases throughout

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85/ Soil Survey and Vegetation, Northeastern Kodiak Island Area, Alaska, U. S. Department of Agriculture Soil Conservation Service and U. S. Department of Interior Bureau of Land Management, in cooperation with Alaska Agricultural Experiment Station, Soil Survey Series 1956, No. 17, October, 1960.

the islands tend to be stocked at much less than lease capacity and only fractional stocking with regard to rancher estimates of carrying capacity. Interest in expansion of cattle numbers on existing ranches continues, and continuing interest is expressed by interested persons and potential ranchers.

Beef cattle numbers have increased almost every year since statistical data collection was initiated in 1953, reaching a total of some 5,700 head by January, 1968. Beef cow numbers have increased annually since records started in 1954. Steer numbers have tended to remain stable in the last several years.

TABLE XXV. BEEF CATTLE ON ALASKA FARMS, 1953 - 1968 */

	January 1 Inventories			
	1954	1959	1964	1968
Beef cows 2 years old and over	500	1,100	1,700	2,400
Beef heifers 1-2 years old	200	300	600	700
Other calves a/ under 1 year old	100	700	1,000	1,600
Steers 1 year old and over	100	300	700	700
Bulls 1 year old and over	100	100	200	300
All Beef Cattle	1,000	2,500	4,200	5,700

*/ Alaska Agricultural Statistics 1953-1966 and Alaska Agricultural Statistics, 1967.

a/ Includes dairy bull calves along with all beef-type calves.

Remote ranch locations, limited transportation facilities, inadequate slaughter facilities and the absence of distribution channels for Alaskan beef have all posed critical obstacles for Alaska ranchers. Beef slaughter and distribution has been done mainly by small individual ranchers, with only occasional attempts at cooperative efforts. Considerable interest has been expressed by producers and agency people in possible efforts to establish central cooperative slaughter facilities that would be suitable for Federal slaughter and meat inspection, and of sufficient size to facilitate the establishment of marketing channels for Alaskan beef. Progress has been made in increasing slaughter capacity in the ranching areas, but an integrated cooperative livestock feeding, slaughter, and distribution system does not appear imminent.

The Bureau of Reclamation examined prospects for a project-type integrated livestock industry on the Kenai Peninsula during 1966-1967 and concluded that prospects were marginal for growing, feeding and slaughtering beef in the Kenai-Kodiak area. The underlying premiss of the study was that an integrated cooperative project particularly in the feeding and slaughter phases was a necessary condition for growth of the industry. It was assumed that all feed would be grown in the Kenai-Soldotna area, and that all cattle would be produced on the Kenai Peninsula or in the Kodiak area with an alternate feeder import area in Canada. Potential feeder cattle production in the

Aleutian Islands did not appear to be considered in the study, even though feeder lambs from that area were considered.

Sources of Data

A number of sources have been used in compiling the materials used in this review of beef production costs. The more important sources were: The Alaska Crop and Livestock Reporting Service reports, Bureau of Land Management lease records, Alaska Agricultural Experiment Station reports, Bureau of Reclamation study report, and discussions with ranchers and other professional agriculturalists.

Costs of Production

Data with regard to investments, costs and incomes on ranches were sketchy and incomplete. Due to the nature and stages of ranch development, and the remote locations of many ranches, representative data of the present situation were not available. Saunders 86/ estimated feed and probable investment and cost data for the Kenai Peninsula, in 1962, for a 100-cow unit. Annual costs were estimated at $23,055 and annual sales were estimated at $14,860. Reported sales of dressed beef in the Kodiak and Anchorage areas indicated average sale prices were approximately $0.44 per pound.

86/ A. Dale Saunders, Producing Beef for Alaska's Railbelt, A Summary of Expected Costs and Possible Returns, University of Alaska Agricultural Experiment Station, Palmer, Misc. Mimeo., March, 1962.

Several sizes and types of ranch organizations, for both Kodiak and adjacent islands and the Kenai Peninsula, were studied for the Bureau of Reclamation report:

> An economic-size ranching unit on Kodiak and adjacent islands is considered to be about 560 head, where a herd of 300 cows is kept and long yearlings sold. . . . At a reasonable 85 percent calf drop, 300 cows should drop 255 calves. . . . Of course, the number of cows would vary considerably with the operation. Where calves were sold, a cow herd of 472 head would be necessary; with yearling sales, it would take 300 cows; with 2-year olds, 226 cows; and with 3-year olds, 193 cows. 87/

The ranch unit with a cow herd and selling two-year-olds appeared most comparable to the type of ranch operations presently found in the Kodiak and adjacent island area, so investment, costs and revenues discussions will be focused on a unit of that type.

Capital requirements for the ranch operation, as projected by the Bureau of Reclamation, add up to some $202,436. Estimates were based on new acquisition costs for buildings, machinery and equipment, clearing and original land preparation costs, and local prices for cattle and horses.

87/ Bureau of Reclamation, op. cit.

TABLE XXVI. INVESTMENTS, COSTS AND INCOMES FOR CATTLE RANCHES WITH MIXED HERDS, SELLING TWO-YEAR-OLDS */

	Estimated Value
INVESTMENT:	
Land (Clearing costs @ $200 per acre)	$ 20,000
Buildings and Improvements	56,114
Machinery and Equipment	17,572
Livestock (565 mixed cattle and 6 horses)	108,000
Total Capital Inventory	$202,436
ESTIMATED REVENUES:	
Steers (38 - 950# @ 22.5¢)	$ 18,810
Heifers (51 - 870# @ 21¢)	9,318
Cows (31 - 1,000# @ 16¢)	4,960
Bulls (3 - 1,400# @ 18¢)	756
Sub-total	$ 33,844
Value of ranch perquisite	3,600
Total Income	$ 37,444
CASH OPERATING COSTS:	
Grazing Fees (565 head x 10 mo. x .05)	$ 282
Feed, Salt & Minerals	2,425
Fertilizer	2,970
Seed	81
Hired Labor	6,000
Fuel, Oil, Grease	1,012
Insurance	500
Veterinary & Vaccine, etc.	500
Repairs	2,282
Taxes (Total ranch investment @ 10 mills)	2,024
Interest on operating capital	450
Miscellaneous Ranch business expense	750
Total Cash Costs	$ 19,276
Depreciation	3,635
Interest on ranch capital ($202,436 @ 5 percent)	10,121
Wages and Management fee allowed operator	6,372
Total Annual Costs	$ 39,404

*/ Budget data drawn from Bureau of Reclamation Report, assuming cattle sold on Kodiak Island so excluded barge and truck expense to Soldotna.

Budget indicates ranch income to be $1,960 less than a full return to all resources committed. However, interest on ranch capital is calculated on full acquisition value of all resources. Return to operators for living costs and other expenditures would be $14,533. Cattle sales are assumed to be made at Kodiak as slaughter facilities are available there to handle available beef at present.

Prices received by Alaska producers in the beef raising areas were reported to be 44.2¢ per pound and 41¢ per pound dressed weight when all reporting areas are considered. Price differential can be explained by dairy beef slaughter in other farming areas.

Costs of production and prices received were intended to provide further insight into the production sector of the industry at present. Research has primarily been oriented to dairy production and potato production as they are the largest sectors of the industry in numbers of commercial farmers and total cash sales. Poultry and egg sales make up the third largest segment of the industry in most years, but at present there are only two or three large commercial producers in the State. Grain and feed crops are quite important in terms of acreage and value of production, but are produced in combination with animal enterprises and do not show up as separate farm types or major cash sales. The beef and sheep industry is rapidly increasing in importance, but data were not yet available on present production costs and returns.

CHAPTER VI

POTENTIAL FOR AGRICULTURAL DEVELOPMENT

The size and land area of Alaska has caused many misimpressions, with regard to economic agricultural lands, availability of usable water, and areas of usable grazing lands. With present crops and technology, only a small part of Alaska is suitable for commercial farming, probably less than 1 percent of the land area. An additional 2 percent is considered suitable for grazing by sheep or cattle. Most of accessible and potential farm land is concentrated in three major areas, (1) the central Tanana Valley of interior Alaska, (2) the Matanuska-Susitna Valleys of southcentral Alaska, and (3) the western Kenai Lowland area of southcentral Alaska. Small areas in other locations may be suitable, but are inaccessible and production potential is relatively unknown. The main grazing areas, exclusive of reindeer, are Northeastern Kodiak Island, islands adjacent to Kodiak and along the Aleutian chain, and the southern part of the Kenai Peninsula.

Land Suitable For Farming

Standard soil surveys have been completed or are in process of completion for all areas shown in Figure 4. Surveys are expected to continue until a soils map suitable for long-range planning is completed. Remote area surveys have been completed in 16 locations,

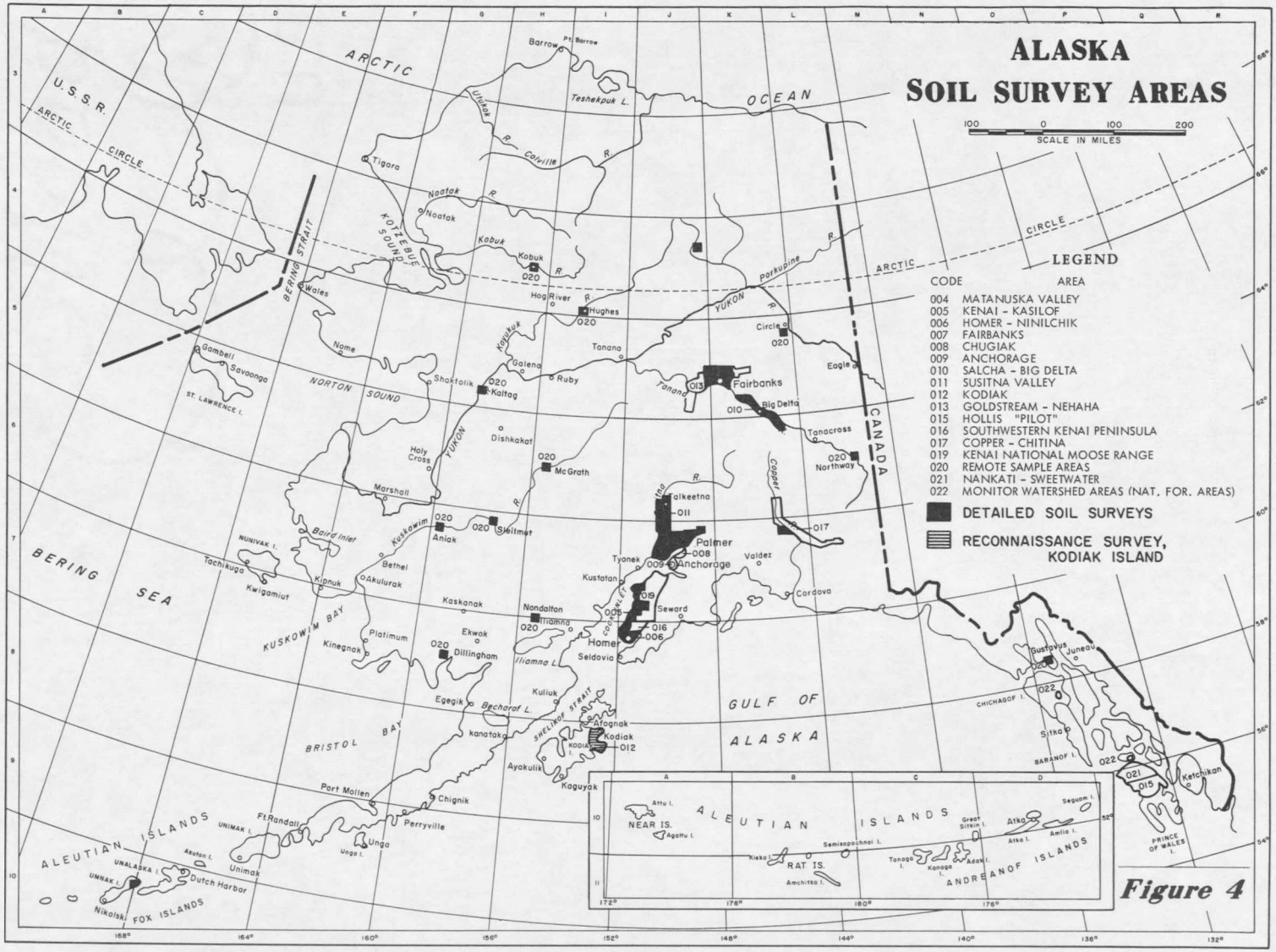

ALASKA
SOIL SURVEY AREAS
100 0 100 200
SCALE IN MILES
LEGEND
CODE AREA
004 MATANUSKA VALLEY
005 KENAI - KASILOF
006 HOMER - NINILCHIK
007 FAIRBANKS
008 CHUGIAK
009 ANCHORAGE
010 SALCHA - BIG DELTA
011 SUSITNA VALLEY
012 KODIAK
013 GOLDSTREAM - NEHAHA
015 HOLLIS "PILOT"
016 SOUTHWESTERN KENAI PENINSULA
017 COPPER - CHITINA
019 KENAI NATIONAL MOOSE RANGE
020 REMOTE SAMPLE AREAS
021 NANKATI - SWEETWATER
022 MONITOR WATERSHED AREAS (NAT. FOR. AREAS)
DETAILED SOIL SURVEYS
RECONNAISSANCE SURVEY, KODIAK ISLAND
ARCTIC OCEAN
U.S.S.R.
ARCTIC CIRCLE
BERING STRAIT
KOTZEBUE SOUND
NORTON SOUND
BERING SEA
KUSKOKWIM BAY
BRISTOL BAY
GULF OF ALASKA
ALEUTIAN ISLANDS
FOX ISLANDS
NEAR IS.
RAT IS.
ANDREANOF ISLANDS
CANADA
YUKON R.
Barrow
Pt. Barrow
Teshekpuk L.
Tigara
Noatak
Kobuk
Hog River
Hughes
Wales
Gambell
Savoonga
ST. LAWRENCE I.
Nome
Shaktolik
Kaltag
Galena
Ruby
Tanana
Circle
Eagle
Fairbanks
Big Delta
Tanacross
Northway
Dishkakat
McGrath
Holy Cross
Marshall
Aniak
Sleitmet
Baird Inlet
Kuskowim
Bethel
Akulurak
Kipnuk
Tachikuga
Kwigamiut
NUNIVAK I.
Kaskanak
Nondalton
Iliamna
Iliamna L.
Platimum
Kinegnak
Ekwok
Dillingham
Egegik
Becharof L.
Kuliuk
Kanatak
Ayakulik
Kaguyak
Afognak
Kodiak
KODIAK I.
SHELIKOF STRAIT
COOK INLET
Seldovia
Homer
Seward
Kustatan
Tyonek
Anchorage
Palmer
Talkeetna
Valdez
Cordova
Copper R.
Gustavus
Juneau
Sitka
CHICHAGOF I.
BARANOF I.
Ketchikan
PRINCE OF WALES I.
Port Moller
Chignik
Perryville
Unga
Unga I.
Ft. Randall
UNIMAK I.
Unimak
Akutan I.
UNALASKA I.
Dutch Harbor
UMNAK I.
Nikolski
Attu I.
Agattu I.
Semisopochnoi I.
Kiska I.
Amchitka I.
Great Sitkin I.
Atka
Atka I.
Amlia I.
Seguam I.
Tanaga I.
Kanaga I.
Adak I.
172°
176°
180°
176°
168°
164°
160°
156°
152°
148°
144°
140°
136°
132°

Figure 4

and are planned for about 20 additional locations. Each remote area survey consists of a 25-square-mile sample area. These sample surveys will provide the basis for a modified reconnaissance survey of the entire state. In the soil surveys, soils are identified and named, and areas characterized by each soil are shown on aerial photographs. In addition, each soil is further classified according to its agricultural value, and is assigned to one of 6 capability classes. (Classes I and V are not used in Alaska). Soils in Classes II and III have limitations that reduce the choice of crops or require special conservation practices, but are suitable for most crops commonly grown in Alaska. Soils in Class IV have severe limitations (steepness, shallowness, or wetness) for cropping. Soils in Classes VI and VII are suitable primarily for pasture, range, or woodland. Soils in Class VIII cannot be used for commercial plant production.

Acreages assigned to each of the land capability classes in each of the survey areas are given in Table XXVII and total acreage summary of Classes II, III and IV are given in Table XXVIII. Major soil association, each of which is made up of a characteristic pattern of a few major soils and several minor soils, are shown for the major farming areas in Figures 5, 6, and 7. Table XXIX gives the approximate proportion of soils, by land capability, in each of these associations.

Other areas of potential farm land in Alaska include the Kenny Lake region (south of Copper Center), portions of the Chitna Valley, and narrow strips of land bordering the Kuskokwim, Yukon and other major rivers of interior Alaska. 88/

TABLE XXVII. SUMMARY OF CAPABILITY CLASSES OF LAND SUITABLE FOR CULTIVATION IN ALASKA

Soil Survey Area (Standard Surveys)	Class II	Class III	Class IV	Class VI	Class VII	Class VIII
	Acres	Acres	Acres	Acres	Acres	Acres
Matanuska Valley	32,280	92,660	86,560	86,050	133,960	17,480
Kenai-Kasilof	76,078	44,585	31,393	15,263	54,155	16,515
Homer-Ninilchik	43,150	48,240	59,750	24,870	76,630	17,860
Fairbanks	75,718	33,086	70,598	11,896	21,388	3,940
Salcha-Big Delta	61,380	124,130	78,970	14,750	25,790	3,940
Susitna Valley a/	114,000	121,000	95,000	79,000	242,000	64,000
N. E. Kodiak Island	-	8,189	12,130	72,281	92,414	122,193
Goldstream-Nenana b/	17,700	15,400	31,000	38,000	43,000	8,800
S. W. Kenai Peninsula a/	54,000	52,000	130,000	110,000	190,000	13,000
Copper-Chitna b/	-	60,000	40,000	30,000	36,000	2,000
Kenai Moose Range a/	107,500	101,900	255,900	194,100	380,300	5,800

a/ Estimates of acreages.

b/ Estimates of acreages in portions of areas covered by Soil Survey.

88/ Above discussion was developed with cooperation of the Alaska Soil Conservation Service, U. S. Department of Agriculture, Palmer.

TABLE XXVIII. SUMMARY IN CAPABILITY CLASS OF LAND SUITABLE FOR CULTIVATION */

	Standard Survey Area (Acres)	Other Areas (Acres)	Total Acres
Class II	581,806	100,000	681,806
Class III	701,190	200,000	901,190
Class IV	891,301	150,000	1,041,301
	Estimated Total Cultivatable Acres		2,624,297

*/ Source: H. W. Cooper, State Conservationist, S.C.S., Mimeo Report, Inventory of Natural Resources, prepared for Agriculture Task Force, Federal Field Committee for Economic Development Planning in Alaska.

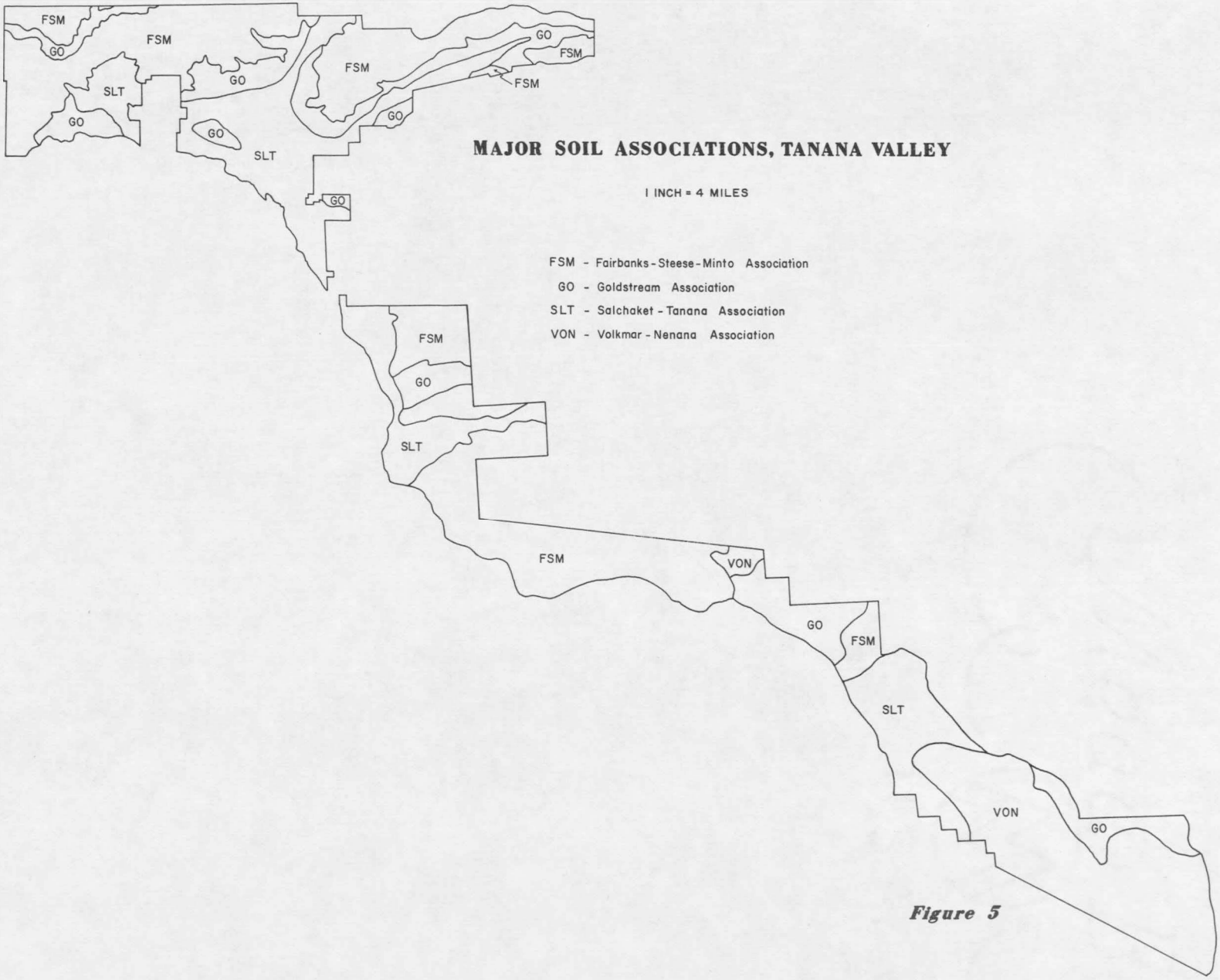
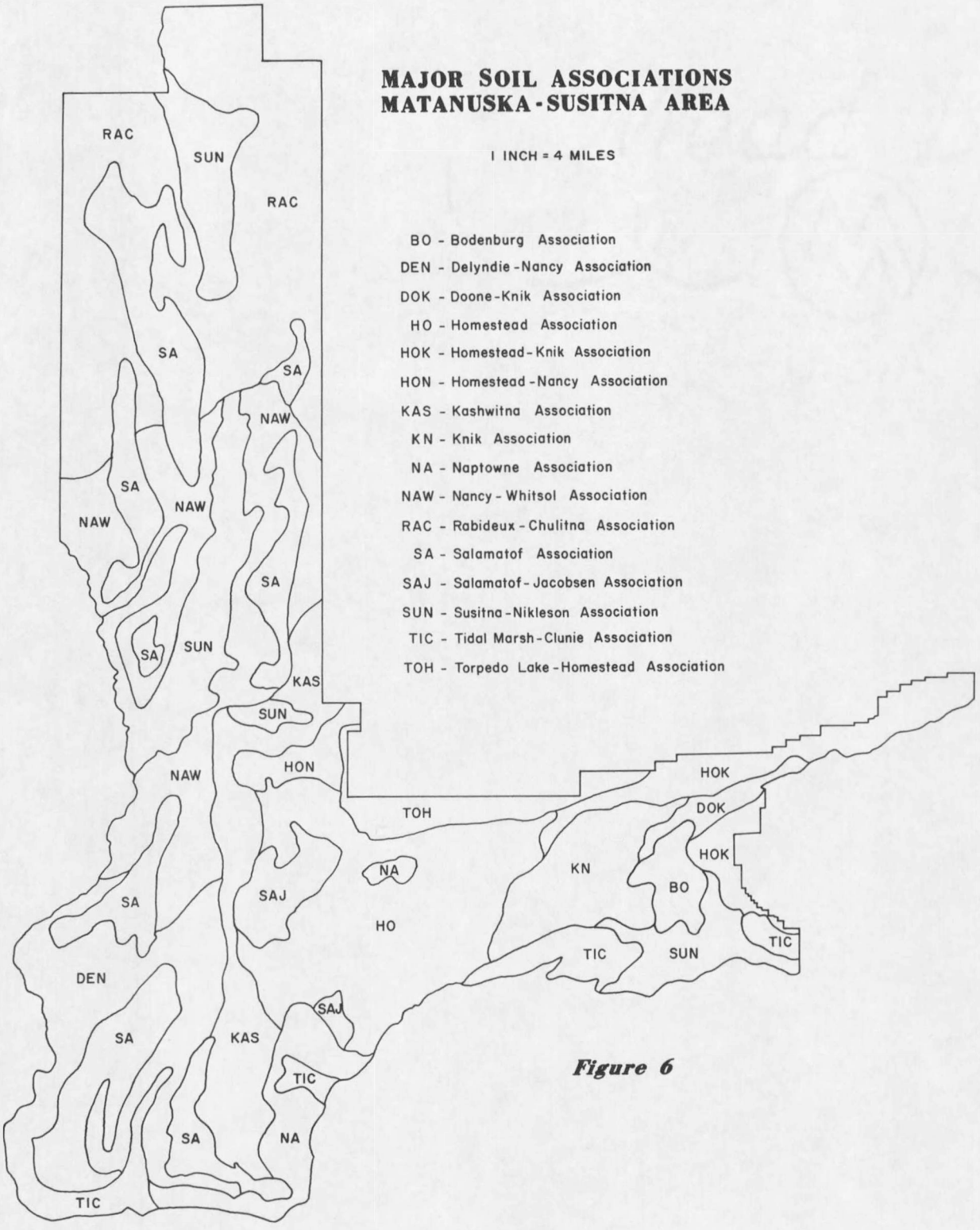

MAJOR SOIL ASSOCIATIONS, TANANA VALLEY
1 INCH = 4 MILES
FSM - Fairbanks - Steese - Minto Association
GO - Goldstream Association
SLT - Salchaket - Tanana Association
VON - Volkmar - Nenana Association
FSM
GO
SLT
VON

Figure 5


MAJOR SOIL ASSOCIATIONS
MATANUSKA-SUSITNA AREA
1 INCH = 4 MILES
BO - Bodenburg Association
DEN - Delyndie-Nancy Association
DOK - Doone-Knik Association
HO - Homestead Association
HOK - Homestead-Knik Association
HON - Homestead-Nancy Association
KAS - Kashwitna Association
KN - Knik Association
NA - Naptowne Association
NAW - Nancy-Whitsol Association
RAC - Rabideux-Chulitna Association
SA - Salamatof Association
SAJ - Salamatof-Jacobsen Association
SUN - Susitna-Nikleson Association
TIC - Tidal Marsh-Clunie Association
TOH - Torpedo Lake-Homestead Association
RAC
SUN
RAC
SA
SA
NAW
SA
NAW
NAW
SA
SA
SUN
KAS
SUN
NAW
HON
HOK
TOH
DOK
HOK
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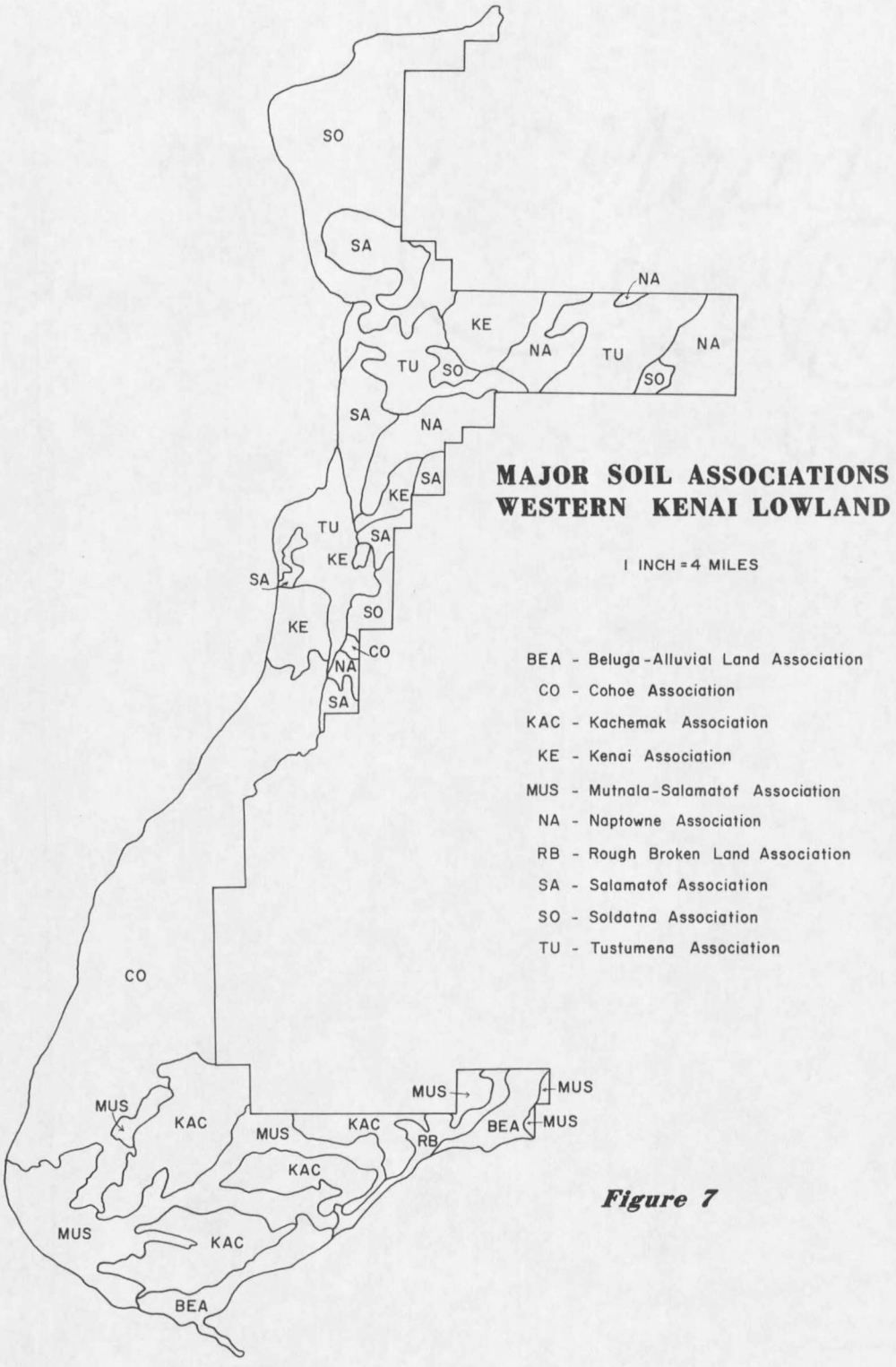
TIC

Figure 6



MAJOR SOIL ASSOCIATIONS WESTERN KENAI LOWLAND

1 INCH = 4 MILES

BEA - Beluga-Alluvial Land Association
CO - Cohoe Association
KAC - Kachemak Association
KE - Kenai Association
MUS - Mutnala-Salamatof Association
NA - Naptowne Association
RB - Rough Broken Land Association
SA - Salamatof Association
SO - Soldatna Association
TU - Tustumena Association

Figure 7

TABLE XXIX. APPROXIMATE PROPORTIONATE EXTENT, BY LAND CLASSES, OF SOILS IN MAJOR SOIL ASSOCIATIONS */

Map Symbol	Major Soil Associations a/	Land Classes II	III	IV	VI	VII	VIII
		%	%	%	%	%	%
	Tanana Valley Area						
FSM	Fairbanks-Steese-Minto Ass'n	10	15	20	25	30	
GO	Goldstream Ass'n	5	10	75		10	
SLT	Salchaket-Tanana Ass'n	40	20	25		10	5
VON	Volkmar-Nenana Ass'n	5	75	10	5	5	
	Matanuska-Susitna Area						
BO	Bodenburg Ass'n	50	30	10	5	5	
DEN	Delyndia-Nancy Ass'n	20	50	5	5	20	
DOK	Doone-Knik Ass'n	30	30	15	10	15	
HO	Homestead Ass'n	5	25	25	25	20	
HOK	Homestead-Knik Ass'n		20	25	25	30	
HON	Homestead-Nancy Ass'n	10	30	25	20	15	
KAS	Kashwitna Ass'n	5	60	15	5	20	
KN	Knik Ass'n		60	20	10	10	
NA	Naptowne Ass'n	15	20	30	20	15	
NAW	Nancy-Whitsol Ass'n	40	35	10	10	5	
RAC	Rabideux-Chulitna Ass'n	10	45	25	5	15	
SA	Salamatof Ass'n		10	10	5	75	
SAJ	Salamatof-Jacobsen Ass'n		10	10	5	75	
SUN	Susitna-Niklason Ass'n	50	25	5	5	5	10
TIC	Tidal Marsh-Clunie Ass'n		5		50	25	20
TON	Torpedo Lake-Homestead Ass'n		10	20	50	20	
	Western Kenai Lowland Area						
BEA	Beluga-Alluvial Land Ass'n	5	5	5	10	5	70
CO	Cohoe Ass'n	40	15	10	5	30	
KAC	Kachemak Ass'n		35	15	15	35	
KE	Kenai Ass'n	5	40	20	20	15	
MUS	Mutnala-Salamatof Ass'n		20	25	20	35	
NA	Naptowne Ass'n	15	20	30	20	15	
RB	Rough Broken Land Ass'n				5	5	90
SA	Salamatof Ass'n		10	10	5	75	
SO	Soldatna Ass'n	45	20	15	10	10	
TU	Tustumena Ass'n	40	20	20	5	15	

*/ Source: Alaska Soil Conservation Service, U.S.D.A., Palmer.

a/ Descriptions in Appendix A.

Land Suitable for Livestock Grazing

The figures shown in Table XXX, as estimated acreages, include potential range areas from the standpoint of suitable vegetation for livestock. Much of the land included might be difficult to use due to the topography and location of the grazing areas. Some areas may have conflicting uses due to current populations of wildlife. Most range areas have an abundance of summer feed; however, range capacity is usually governed by available winter feed, and most areas are currently deficient in winter feed. Most ranch operations in the Aleutian and adjacent islands, and the islands near Kodiak, depend

TABLE XXX. SUMMARY OF RANGE AREAS SUITABLE FOR LIVESTOCK GRAZING */

Location	Estimated Acreage
Domestic Livestock	
Aleutian and adjacent islands	1,500,000 a/
Alaska Peninsula	3,000,000 a/
Kodiak Island	250,000 a/
Nearby Kodiak Islands	225,000 a/
Matanuska-Susitna Valleys	350,000
Copper River Valley	100,000
Kenai Peninsula	150,000
Interior	5,000,000 b/
Total	10,575,000
Reindeer	
Western Coastal Alaska	30,000,000

*/ H. W. Cooper, "Inventory of Natural Resources", paper prepared for the Alaska Agricultural Task Force, Mimeograph, 1966.

a/ Grazing periods of more than 9 months out of a year.

b/ Much of interior Alaska may produce suitable range forage. The estimate is held to the acreage reasonably accessible by road or rail.

on year-round grazing with little supplemental feeding. Many of the mainland range areas require extensive winter feeding.

Reindeer range is generally located along the western coast of Alaska; however, reindeer herds have been kept on several of the islands and at one time were kept in large areas of the interior. Carrying capacities are usually determined by the availability of lichens, the preferred winter feed of reindeer.

Water Suitable for Agricultural Purposes

The general abundance of water in Alaska may be somewhat misleading. Ground-water conditions are highly variable. Surface water may be seasonally unavailable for agricultural use. Availability of ground water over much of interior, western, and northern Alaska, and along the Alaska Range, may generally be associated with the occurrence of permafrost. The quantity and quality of available water are subject to considerable variation also.

Recent experience with limited irrigation tests and a few small farm sprinkler systems has brought forth considerable interest in possibilities of irrigation in a number of areas. Many of the known farming areas of the state are subject to dry periods in the early summer. Irrigation at planting time may be quite critical to vegetable crops, and continued irrigation may be quite important in the Tanana Valley during summer droughts. Limited research in the

Matanuska Valley indicates beneficial results from irrigation on some field crops during particularly dry periods. The very limited research and experience, however, indicates that responses vary widely with microclimate locations.

Surface Water. "Despite an abundance of water generally, there are periods each year when surface waters may not be available. The time and causes for temporary shortages vary with location." 89/ Heavy run-off in the fall, timing of the spring breakup and run-off, and glacial sediment in many streams determine availability of suitable irrigation water. Other than in glacial streams, surface waters in the state are generally of good quality and usually meet irrigation standards. Cooper reported that waters were generally of the calcium-magnesium type with low concentrations of chlorides. However, a few streams on the Kenai Peninsula and in the Tanana Valley carry significant quantities of iron.

Ground Water. Ground-water conditions are highly variable, both in quantity and in quality throughout the state. Moderate to large supplies of ground water can be found in the Palmer area for irrigation use, but, even in the Palmer area, considerable variation is reported.

89/ H. W. Cooper, State Conservationist, S.C.S., U.S.D.A., Mimeo Report, Inventory of Natural Resources, prepared for Agricultural Task Force, Federal Field Committee for Economic Development Planning in Alaska, 1966.

Ground water is used for irrigation in the Tanana Valley also. Much of the interior, western and northern Alaska are troubled with permafrost where ground water is concerned. However, in any given area, permafrost may be absent in the immediate vicinity of lakes and streams or where the ground has thawed to some depth due to the removal of the insulating ground cover.

> On the Arctic Slope, even potentially permeable materials in the overburden and the bedrock are generally frozen to great depth in most places, and there is a likelihood that the unfrozen bedrock strata below will be found to contain saline water in many, if not most, areas. 90/

Iron is the most troublesome chemical in groundwater supplies. It is often quite objectionable for domestic and industrial use, but generally does not hinder water's use for irrigation. Most developed ground-water supplies in the Homer, Kenai, and Fairbanks areas have iron and manganese present. Shallow wells in the Anchorage area have a high iron content. The central part of the Copper River Basin is troubled with ground water of a high salinity content. Coastal communities such as Barrow, Craig, Homer, Kenai, Kotzebu, and Nome have been troubled with the same salinity problem.

Low water temperature, both from wells and streams, can be a serious problem for irrigating most crops. Alaska streams are often cold enough to "shock" plants when the water is used for irrigation in the spring and early summer. Ground-water temperature is less of a problem.

90/ Ibid.

Present and Potential Yield Capabilities

A second important element of "choosing the right place" for agricultural development is yield capabilities, or production potential, of the various land classes. The shortage of comprehensive yield response information on various soils in some of the major areas under study is quite severe. In order to complete initial "best judgment" approximations of yield potential for different land classes, existing information from the Soil Conservation Service was used as a point of departure in a meeting held at the Alaska Experiment Station. Agricultural Experiment Station personnel, along with personnel from S.R.S., S.C.S., A.S.C.S., the State Division of Agriculture, and an E.R.S. consultant cooperated in developing consensus estimates of yield potential for the different crops in the four major farming areas (Tables XXXI, XXXII, XXXIII, XXXIV). Many cells in the Tables were filled in with "informed" estimates and farmer reported yields where comprehensive yield response data were not available.

The yield estimates were developed on the basis of two levels of "management". Estimates under Management Level I were based on estimates of present management levels. Yields under Management Level II were based on the assumption of adaptation of current technology and cultural practices, which on the basis of limited

research findings, suggest that such yields could be obtained. No attempt was made to project yields from expected increases due to research that was in the process at the time of the meeting.

TABLE XXXI. ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: TANANA VALLEY AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. I) */

Land Class	Barley		Oats		Perennial Forage b/		Barley (High Moisture)	
	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/
	(tons/a)		(tons/a)		(tons/a-dry)		(tons/a-dry)	
IIc	.85-1.0	1.3 -1.35	.95-1.0	1.4--1.6	2 -3	3 -4		1.9-2.0
IIe	.85-1.0	1.3 -1.35	.95-1.0	1.4 -1.6	2 -3	3 -4		1.9-2.0
IIs	.85-1.0	1.3 -1.35	.95-1.0	1.4 -1.6	2 -3	3 -4		1.9-2.0
IIIe	.75- .90	1.15-1.25	.85- .95	1.4--1.6	2 -2.5	3 -3.5		1.6-1.7
IIIs	.75- .90	1.15-1.25	.80- .85	1.4 -1.5	2 -2.3	2.5-3.0		1.6-1.7
IIIw					2 -2.5	2.5-3.0		
IVe	.65- .80	1.0 -1.1	.75- .85	1.2 -1.3	1.5-2	2.0-2.5		1.4-1.5
IVs	.55- .65	.75- .85	.65- .80	.80-1.0	.7-1.5	2.0-2.5		1.0-1.1
IVw					.7-1.5	2.0-2.5		
VI								
VII								
VIII								

(Table continued)

TABLE XXXI. (continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: TANANA VALLEY AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. I)

Land Class	Oat-Pea Forage		Rye Grass Forage		Potatoes-Fresh		Potatoes-Process	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a-dry)		(tons/a-dry)		(tons/a)		(tons/a)	
IIc	1-2	3.2-4.0		3.2-4.0	10.5	17.0	8.75	14.0
IIe	1-2	3.2-4.0		3.2-4.0	10.5	17.0	8.75	14.0
IIs	1-2	3.2-4.0		3.2-4.0	10.5	17.0	8.75	14.0
IIIe	1-2	3.2-4.0		3.2-4.0	6.3	9.0	5.5	8.5
IIIs	.7-1.5	2.5-3.5		2.5-3.5	5.5	6.0	3.5	4.5
IIIw	.7-1.5	2.5-3.5		2.5-3.5	3.5	3.5	2.25	2.25
IVe	.7-1.5	2.0-3.0		2.0-3.0				
IVs	.5-1.0	1.5-2.5		1.5-2.5				
IVw								
VI								
VII								
VIII								

(Table continued)

TABLE XXXI. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: TANANA VALLEY AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. I)

Land Class	Carrots		Lettuce		Cabbage-Fresh		Cabbage-Process	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a)		(tons/a)		(tons/a)		(tons/a)	
IIc	8.0	13.5	11.0	15.5	17.0	25.5	21.25	34.0
IIe	6.75	12.5	8.5	10.75	17.0	21.25	19.0	25.5
IIs	6.75	12.5	8.5	15.5	17.0	21.25	19.0	25.5
IIIe			6.25	7.5	15.5	18.0	15.5	18.0
IIIs			2.25	4.25	10.75	14.0	10.75	14.0
IIIw								
IVe								
IVs								
IVw								
VI								
VII								
VIII								

(Table continued)

TABLE XXXI. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: TANANA VALLEY AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. I)

Land Class	Green Peas-Process		Spinach		Summer Squash		Rhubarb	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a)		(tons/a)		(tons/a)		(tons/a)	
IIc	1.6	2.4	5.0	7.0	11.0	22.0	21.25	29.75
IIe	1.6	2.4	4.0	6.0	11.0	22.0	17.0	25.5
IIs	1.6	2.4			11.0	22.0	17.0	25.5
IIIe	1.4	1.6			10.0	16.5	19.0	25.5
IIIs	1.0	1.2			10.0	16.5	6.5	12.75
IIIw							4.25	8.5
IVe	.80	1.2			8.25	13.75	4.25	8.5
IVs							2.1	4.25
IVw							4.25	8.5
VI c/								

*/ Yield estimates were developed through a cooperative effort of the Alaska State Conservationist, S.C.S., an Economic Research Service representative, and the author cooperating with A.A.E.S. scientists, S.C.S. scientists, and other Agency agriculturists.

a/ Management level I is comparable to current levels of attainment while Management level II assumes utilization of currently available technology and cultural practices.

b/ Yield estimates for forage crops are stated on a dry matter basis and can be converted as follows: Hay - DM x 1.22, Silage - DM x 4.0, and haylage - DM x 2.0.

c/ Since there was no response to Land Classes VI, VII, and VIII they have been deleted from this Table.

TABLE XXXII. ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: MATANUSKA-SUSITNA AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. 2) */

Land Class	Barley		Oats		Perennial Forage b/		Barley (High Moisture)	
	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/
	(tons/a)		(tons/a)		(tons/a-dry)		(tons/a-dry)	
IIc	.95-1.1	1.45-1.50	1.05-1.1	1.45-1.6	2-3	3.5-4.5		1.8-2.0
IIe	.95-1.1	1.45-1.50	1.05-1.1	1.45-1.6	2-3	3.5-4.5		1.8-2.0
IIs	(No class IIs land in the area)							
IIIe	.85- .95	1.3 -1.4	.95-1.05	1.4 -1.6	2.0-2.5	3.5-4.0		1.6-1.7
IIIs	.85- .95	1.3 -1.4	.90- .95	1.3 -1.5	2.0-2.3	3.0-3.3		1.6-1.7
IIIw					2.0-2.5	3.0-3.5		
IVe	.70- .85	1.0 -1.1	.85- .95	1.2 -1.3	1.5-2.0	2.5-3.0		1.4-1.5
IVs	.60- .70	.80- .90	.70- .85	.80-1.0	.7-1.5	2.5-3.0		1.0-1.1
IVw					.7-1.5	2.5-3.0		
VI								
VII								
VIII								

(Table continued)

TABLE XXXII. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: MATANUSKA-SUSITNA AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. 2)

Land Class	Oat-Pea Forage		Rye Grass Forage		Potatoes-Fresh		Potatoes-Process	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a-dry)		(tons/a-dry		(tons/a)		(tons/a)	
IIc	1-2	4-5		4-5	15	24	12.5	20.0
IIe	1-2	4-5		4-5	15	24	12.5	20.0
IIs								
IIIe	1-2	4-5		4-5	9	13	8.0	12.0
IIIs	.7-1.5	3-4		3-4	7.5	8.5	5.0	6.5
IIIw	.7-1.5	3-4		3-4	5.0	5.0	3.0	3.0
IVe	.7-1.5	2.5-3.5		2.5-3.5				
IVs	.5-1.0	2.0-3		2-3				
IVw								
VI								
VII								
VIII								

(Table continued)

TABLE XXXII. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: MATANUSKA-SUSITNA AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. 2)

Land Class	Carrots		Lettuce		Cabbage-Fresh		Cabbage-Process	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a)		(tons/a)		(tons/a)		(tons/a)	
IIc	9.0	15.0	13.5	18.0	20.0	30.0	25.0	40.0
IIe	7.5	14.0	10.0	12.5	20.0	30.0	22.5	30.0
IIs								
IIIe			7.5	8.75	18.0	21.0	18.0	21.0
IIIs			2.5	5.0	12.5	16.5	12.5	16.5
IIIw								
IVe								
IVs								
IVw								
VI								
VII								
VIII								

(Table continued)

TABLE XXXII. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: MATANUSKA-SUSITNA AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. 2)

Land Class	Green Peas-Process		Spinach		Summer Squash		Rhubarb	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a)		(tons/a)		(tons/a)		(tons/a)	
IIc	2.0	3.0	5.0	7.0	10	20	25.0	35.0
IIe	2.0	3.0	4.0	6.0	10	20	20.0	30.0
IIs								
IIIe	1.75	2.0			9	15	22.5	30.0
IIIs	1.25	1.5			9	15	7.5	15.0
IIIw							5.0	10.0
IVe	1.0	1.5			7.5	12.5	5.0	10.0
IVs							2.5	5.0
IVw	-						5.0	10.0
VI c/								

*/ Yield estimates were developed through a cooperative effort of the Alaska State Conservationist, S.C.S., an Economic Research Service representative, and the author cooperating with A.A.E.S. scientists, S.C.S. scientists, and other Agency agriculturists.

a/ Management level I is comparable to current levels of attainment while Management level II assumes utilization of currently available technology and cultural practices.

b/ Yield estimates for forage crops are stated on a dry matter basis and can be converted as follows: Hay = DM x 1.22, Silage - DM x 4.0, and haylage = DM x 2.0.

c/ Since there was no response to Land Classes VI, VII, and VIII they have been deleted from this Table.

TABLE XXXIII. ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: WESTERN KENAI LOWLANDS, ALASKA, 1967. (CROP REPORTING DISTRICT NO. 3)*/

Land Class	Barley (High Moisture) Mgt. I	Barley (High Moisture) Mgt. II a/	Oat Forage Mgt. I	Oat Forage Mgt. II a/	Timothy Forage Mgt. I	Timothy Forage Mgt. IIa/	Oat-Pea Forage Mgt. I	Oat-Pea Forage Mgt. II a/
	(tons/a)		(tons/a-dry)		(tons/a-dry)		(tons/a-dry)	
IIc	.75	1.5	.5-1.5	2-3	1-2	2-4		4-6
IIe	.75	1.5	.5-1.5	2-3	1-2	2-4		4-6
IIs			(No IIs in this area)					
IIIe	.75	1.5	.5-1.5	2-3	1-2	2-4		4-6
IIIs	.75	1.5	.5-1.5	2-3	.75-1.5	1.5-3.0		3-5
IIIw	.5	1.0				1.5-3.0		3-5
IVe	.75	1.5	.5-1.0	1.5-2.5	.75-1.5	2.0-3.0		2.5-3.5
IVs					.5 -1.0	1.0-2.0		2.0-3.0
IVw	.50	1.0						
VI								
VII								
VIII								

(Table continued)

TABLE XXXIII. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: WESTERN KENAI LOWLANDS, ALASKA, 1967. (CROP REPORTING DISTRICT NO. 3)

Land Class	Native Grass Forage Mgt. I	Native Grass Forage Mgt. II	Potatoes-fresh Mgt. I	Potatoes-fresh Mgt. II	Potatoes-Process Mgt. I	Potatoes-Process Mgt. II	Lettuce Mgt. I	Lettuce Mgt. II
	(tons/a-dry)		(tons/a)		(tons/a)		(tons/a)	
IIc	.75-1.5	1.5-2.5	7.5	15.0	5.5	12.5	13.5	18.0
IIe	.75-1.5	1.5-2.5	7.5	15.0	5.5	12.5	10.0	12.5
IIs			(No IIs in this area)					
IIIe	.75-1.5	1.5-2.5	10.0	12.5	7.5	9.0		
IIIs	.75-1.5	1.5-2.5	10.0	11.5	7.5	9.0		
IIIw								
IVe	.75-1.5	1.5-2.5						
IVs	.75-1.5	1.5-2.5						
IVw								
VI								
VII								
VIII								

(Table continued)

TABLE XXXIII. (Continued) ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: WESTERN KENAI LOWLANDS, ALASKA, 1967. (CROP REPORTING DISTRICT NO. 3)

Land Class	Carrots		Cabbage-Fresh		Cabbage-Process		Green Peas-Process	
	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II	Mgt. I	Mgt. II
	(tons/a)		(tons/a)		(tons/a)		(tons/a)	
IIc	5.0	10.0	20.0	30.0	25	40	1.0	2.5
IIe	3.75	9.0	20.0	25.0	22.5	30	1.0	2.5
IIs	(No IIs in this area)							
IIIe			18.0	21.0	18.0	21.0	.75	1.0
IIIs			12.5	16.5	12.5	16.5		
IIIw								
IVe								
IVs								
IVw								
VI								
VII								
VIII								

*/ Yield estimates were developed through a cooperative effort of the Alaska State Conservationist, S.C.S., an Economic Research Service representative, and the author cooperating with A.A.E.S. scientists, S.C.S. scientists, and other Agency agriculturists.

a/ Management level I is comparable to current levels of attainment while Management level II assumed utilization of currently available technology and cultural practices.

TABLE XXXIV. ESTIMATED YIELD POTENTIAL BY LAND CAPABILITY CLASS FOR TWO LEVELS OF MANAGEMENT: N. E. KODIAK ISLAND AREA OF ALASKA, 1967. (CROP REPORTING DISTRICT NO. 5) */

Land Class	Barley (High Moisture)		Perennial Forage		Native Grass Forage		Potatoes	
	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/	Mgt. I	Mgt. II a/
	(tons/a-dry)		(tons/a-dry)		(tons/a-dry		(tons/a)	
II	(No class II land in the area)							
IIIe	1.0-1.2	1.5-2.0	1.5-2.5		.5-1.0	1-2	5.0	10.0
IIIs	(No IIIs in the area)							
IIIw			1.0-2.0		.5-1.0	1-2		
IVe	1.0-1.2	1.5-2.0	1.5-2.0		.5-1.0	1-2		
IVs	1.0-1.2	1.5-2.0	1.0-2.0		.5-1.0	1-2		
IVw	(No IVw in the area)							
VI								
VII								
VIII								

*/ Yield estimates were developed through a cooperative effort of the Alaska State Conservationist, S.C.S., an Economic Research Service representative, and the author cooperating with A.A.E.S. scientists, S.C.S. scientists, and other Agency agriculturists.

a/ Management level I is comparable to current levels of attainment while Management level II assumed utilization of currently available technology and cultural practices.

Projected Demand for Agricultural Products That Can Be Grown in Alaska

A major portion of the agricultural products presently consumed within Alaska are produced in "stateside" production areas, and are distributed through long standing food distribution channels. Haring 91/ reported food store sales of $64.3 million exclusive of military commissary food sales during 1964. Only a limited portion of food sales are made up of those products that can be produced in Alaska, but the potential market does appear of a magnitude that elicits considerable interest and attention, particularly in view of the declining portion of the market being supplied by Alaska producers in recent years.

Only intrastate markets were considered due to the lack of export market development and the lack of present emphasis on development of export products. Demand for agricultural products that can presently be produced in Alaska for in-state markets were considered initial parameters for potential production. Maximum demand estimates were calculated, using "best estimates" of per capita consumption and projected population estimates for 1975 and 1985.

91/ Robert C. Haring, et al., "Alaska Agricultural Study, Economic Evaluation of the Potential for Agricultural Development in Alaska", Institute of Social, Economic, and Government Research, University of Alaska, unpublished report.

TABLE XXXV. PROJECTED POPULATION IN ALASKA, BY CROP REPORTING DISTRICT */

Crop Reporting District a/	1965	1975	1985
		(Thousands)	
1. Tanana (District No. 1)	53.6	65.2	83.9
2. Matanuska (District No. 2)	115.5	154.9	227.9
3. Kenai (District No. 3)	11.1	16.4	26.1
4. Southeast (District No. 4)	42.1	59.2	87.6
5. Southwest (District No. 5)	44.9	60.3	87.5
Total	263.2	356.0	513.0

*/ Source: Rampart Project, Case 1.

a/ Figure 1.

Tables XXXVI and XXXVII summarize estimate of expected instate demand. With full recognition of shortcomings of the method and the lack of probability of Alaska producers and distributors capturing any major portion of the market for any crop, demand estimates will nevertheless provide a frame of reference for agricultural development emphasis.

Out-of-state markets for agricultural products may well become a reality within the time period of demand estimate projections. Japanese trading companies have repeatedly expressed interest in the purchase of mutton, beef and reindeer from Alaska sources. Seed potatoes, grass seeds, and other specialty products are often mentioned with regard to "stateside" markets. Reindeer meat has been shipped

"stateside" from time to time, and with market development may well become an important export crop. While out-of-state markets have not yet become a reality to Alaska farmers and trade channels have not yet been developed in most instances, such markets may well become a second parameter for agricultural development projection in the immediate future. The University of Alaska's Japanese trade study could well bring certain foreign market aspects into immediate focus for projecting and planning purposes. Other out-of-state marketing research will undoubtedly expand this second parameter of development projection of planning long before 1985. However, the projection parameter of this study has been limited to intrastate markets.

TABLE XXXVI. ESTIMATED ANNUAL CONSUMPTION OF SELECTED AGRICULTURAL PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT, 1975 */

Item	Unit	Tanana Valley Dist. #1	Matanuska Valley Dist. #2	Kenai Pen. Dist. #3	Southwest Alaska Dist. #5	Total of all Regions a/
Milk	mil. lbs.	16.95	46.47	4.51	6.03	73.96
Potatoes						
Fresh	tons	4,980.	10,843.00	1,148.0	1,696.	18,667.00
Frozen	tons	652.	1,549.0	164.0	226.1	2,591.00
Chips & Shoestrings	tons	391.2	929.4	98.4	226.1	1,641.00
Eggs	mil. doz.	2.173	5.163	0.547	1.005	8.88
Carrots	tons	228.8	542.2	57.4	211.1	1,036.8
		(9.78) b/	(23.24)	(2.46)	(9.045)	(44.53)
Cabbage	tons	260.8	619.96	57.4	211.05	1,149.21
Cauliflower	tons	48.96	116.18	12.3	30.15	97.59
		(3.26)	(7.75)	(0.82)	(3.02)	(14.85)
Lettuce	tons	498.6	1,161.8	123.0	301.50	2,084.9
Brussel sprouts	tons	6.52	15.49	1.64	9.05	32.7
		(3.26)	(7.75)	(0.82)	(3.02)	(14.85)
Peas	tons	9.78	23.24	2.46	6.03	41.51
		(48.96)	(116.18)	(12.3)	(45.23)	(212.67)
Beets	tons	19.56	46.47	4.92	18.09	89.04
Celery	tons	97.8	232.35	24.60	120.60	475.35
Green Onions	tons	32.6	77.45	8.20	30.15	148.40
Rhubarb	tons	16.3	38.73	4.10	15.07	74.20
		(.978)	(2.324)	(.246)	(.905)	(4.453)
Broccoli	tons	16.3	38.73	4.10	15.07	74.20
		(16.3)	(38.73)	(4.10)	(15.07)	(74.20)
Cucumbers	tons	32.6	77.45	8.20	30.15	148.40
Tomatoes	tons	195.6	464.70	49.20	180.90	890.4
Zucchini	tons	3.26	7.75	0.82	3.02	14.85

(Table continued)

TABLE XXXVI. (Continued) ESTIMATED ANNUAL CONSUMPTION OF SELECTED AGRICULTURAL PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT 1975

Item	Unit	Tanana Valley Dist. #1	Matanuska Valley Dist. #2	Kenai Pen. Dist. #3	Southwest Alaska Dist. #5	Total of all Regions
Rutabagas & Turnips	tons	6.52	15.49	1.64	6.03	29.68
Radishes & Parsnips	tons	6.52	15.49	1.64	6.03	29.68
Beef	mil. lbs.	5.542	10.167	1.394	3.015	20.118
Pork	mil. lbs.	2.282	5.442	0.547	1.508	9.779
Lamb & Mutton	mil. lbs.	0.013	0.031	0.003	0.030	0.087
Reindeer	mil. lbs.	0.013	0.031	0.003	0.012	0.059
Other Meat	mil. lbs.	0.326	0.775	0.082	1.508	2.691
Wild Game	mil. lbs.	2.608	5.422	0.574	2.111	10.615

*/ Source: Percapita consumption from Table V x population from Table XXXV.

a/ Southeast not included due to separation of location and proximity to "Stateside" food distribution.

b/ Frozen products.

TABLE XXXVII. ESTIMATED CONSUMPTION OF SELECTED PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT, 1985 */

Item	Unit	Tanana Valley Dist. #1	Matanuska Valley Dist. #2	Kenai Pen. Dist. #3	Southwest Alaska Dist. #5	Total of all Regions a/
Milk	Mil. lbs.	21.8	68.4	7.2	8.8	106.2
Potatoes						
Fresh	tons	6,292.0	15,953.0	1,817.0	3,281.0	27,353.
Frozen	tons	839.0	2,279.0	261.0	438.0	3,817
Chips & Shoestrings	tons	503.0	1,367.0	156.0	438.0	2,461
Eggs	mil. doz.	2.8	7.6	0.9	1.5	13.2
Carrots	tons	293.6	797.6	91.4	175.0	1,357.
		(12.59) b/	(34.19)	(3.9)	(4.38)	(55.06)
Cabbage	tons	325.6	911.6	91.4	175.0	1,503.6
Cauliflower	tons	62.9	170.9	19.6	21.9	275.3
		(4.2)	(11.4)	(1.3)		(16.9)
Lettuce	tons	629.3	1,709.3	195.6	218.8	2,753.0
Brussel sprouts	ton	8.4	22.8	2.6	4.4	38.2
		(4.2)	(11.4)	(1.3)		(16.9)
Peas	tons	12.6	34.2	3.9	4.4	55.9
		(63.0)	(171.0)	(19.5)		(253.5)
Beets	tons	25.2	68.4	7.8	13.1	114.5
Celery	tons	125.9	341.8	29.7	87.5	584.9
Green Onions	tons	41.9	113.9	13.2	43.8	212.8
Rhubarb	tons	21.0	57.0	6.5	8.8	93.3
		(1.26)	(3.42)	(.39)		(5.07)
Broccoli	tons	21.0	57.0	6.5	8.8	93.3
		(21.0)	(57.0)	(6.5)		(84.5)
Cucumbers	tons	41.9	113.9	13.1	21.9	190.8
Tomatoes	tons	251.7	683.7	78.3	131.3	1,145.0
Zucchini	tons	4.2	11.4	1.3	4.4	21.3

(Table continued)

TABLE XXXVII. (Continued) ESTIMATED CONSUMPTION OF SELECTED PRODUCTS IN ALASKA BY CROP REPORTING DISTRICT, 1985

Item	Unit	Tanana Valley Dist. #1	Matanuska Valley Dist. #2	Kenai Pen. Dist. #3	Southwest Alaska Dist. #5	Total of all Regions
Rutabagas & Turnips	tons	8.4	22.8	2.6	4.4	38.2
Radishes & Parsnips	tons	8.4	22.8	2.6	4.4	38.2
Beef	mil. lbs.	7.1	19.4	2.2	4.4	33.1
Pork	mil. lbs.	2.9	8.0	0.9	2.2	14.0
Lamb & Mutton	mil. lbs.	0.017	0.046	0.005	0.044	0.112
Reindeer	mil. lbs.	0.017	0.046	0.005	0.075	0.143
Other Meat	mil. lbs.	1.420	1.140	0.130	1.850	4.540
Wild Game	mil. lbs.	3.4	8.0	0.9	3.0	15.3

*/ Source: Per capita consumption from Table V x population from Table XXXV.

a/ Southeast not included due to separation of location and proximity to "stateside" food distributors.

b/ Frozen products.

Demand estimates were transposed to farm equivalent quantities, and grain and forage estimates were developed for production of meat and milk items. Feed estimates for milk, beef, pork and lamb were calculated for animals used for slaughter or milk production, but estimates for breeding herds and young stock were not generally included.

Required crop acres estimates were made only for highest production estimates under two levels of management from Tables XXXI, XXXII, XXXIII, and XXXIV, to provide emphasis on minimum acreage requirements. Even with recognition of the probability of Alaska producers not capturing a major portion of the market for any product except perhaps milk, potatoes and a few other isolated crops, any major production expansion would soon exhaust classes IIc and IIe land in District 2 and would necessitate using land in other districts or class III land in District 2. Tables XXXVIII and XXXIX provide perspective on potential market size and potential production for the Alaska market. Present cattle and sheep production is found on the lower Kenai Peninsula, Kodiak Island and the Aleutian Islands, so it is expected that production expansion will occur in that area. Commercial Grade A milk production is found almost exclusively in the Matanuska Valley so it is expected that any expansion will initially occur in that area. Vegetable and potato production is found both in the Tanana Valley and Matanuska Valley with limited production on the

Kenai Peninsula, however, production estimates seem, in most instances, to favor expansion in the Matanuska Valley. It must be kept in mind, however, that research effort has been concentrated in the Matanuska Valley and thus knowledge of production potential may be more precise than in other farming areas.

TABLE XXXVIII. PRODUCTION POTENTIAL FOR CROP REPORTING DISTRICTS 1, 2, 3, and 5, 1975.

Item	Demand Farm Equivalent a/	Required Crop Acres Mgt. Level I	Mgt. Level II
		(acres)	(acres)
Milk:	78.13 mil. lbs. a/		
Barley	7,813 tons b/	8,245- 7,103	5,388- 5,209
Oats	4,375 tons b/	4,167- 3,977	3,017- 2,734
Pren. Grass forage	19,532 tons D.M.	9,766- 6,511	5,581- 4,340
or (Oat-Pea forage	19,532 tons D.M.)	19,532- 9,766	4,883- 3,906
Beef:	45.226 mil. lbs. a/		
Barley	31,504 tons c/	33,162-28,640	21,727-21,003
Pren. Grass forage	33,789 tons D.M. c/	33,162-16,581	16,581- 8,291
Pork:	19.558 mil. lbs. a/		
Barley (Mgt. level II)	26,403 tons d/	27,793-24,003	18,209-17,602
Barley (Mgt. level I)	30,304 tons	31,900-27,549	20,900-20,203
Lamb & Mutton:	0.204 mil. lbs. a/		
Barley	137 tons d/	144-125	94-91
Pren. Grass forage	82 tons D.M.	82-41	41-21
Eggs:	9.155 mil. doz. a/		
Potatoes:			
Fresh	19,451 tons a/	1297	810
Process	6,348 tons a/	510	317
Carrots	1,114 tons a/	124	74
Cabbage	1,241 tons a/	62	41
Lettuce	3,920 tons a/	290	218
Peas	285 tons a/	143	95
Summer squash	16 tons a/	1.5	0.73
Rhubarb	79 tons	3.15	2.23

a/ Marketing and Transportation Situation, E.R.S., U.S.D.A., MTS-164, Feb., 1967, (Table 16, p. 39).

b/ Note: Feed required from Alaska Crop and Livestock Reporting Service, S.R.S., U.S.D.A., 1968.

c/ Department of Interior, Bureau of Reclamation, Alaska District Office, Jan., 1967.

d/ Midwest Farm Handbook, Iowa State Press: Ames, Iowa, 6th Edition, 1964.

TABLE XXXIX. PRODUCTION POTENTIAL FOR CROP REPORTING DISTRICTS 1, 2, 3, AND 5, 1985.

Item	Demand Farm Equivalent a/	Required Crop Area Mgt. Level I	Mgt. Level II
		(acres)	(acres)
Milk	112.04 mil. lbs. a/		
Barley	11,204 tons b/	11,794-10,185	7,727- 7,469
Oats	6,274 tons b/	5,975- 5,740	4,327- 3,921
Pren. Grass forage	23.343 tons D.M.	11,672- 7,781	6,670- 5,187
or (Oat-Pea forage	23.343 tons D.M.)	23,343-11,672	5,836- 4,669
Beef:	74.475 mil. lbs. a/		
Barley	51,903 tons c/	52,529-47,185	35,795-34,602
Pren. Grass forage	55,667 tons D.M. c/	55,667-27,834	27,834-13,917
Pork:	28.0 mil. lbs. a/		
Barley (Mgt. Level II)	37,800 tons d/	39,789-34,364	26,069-25,200
Barley (Mgt. Level I)	44,100 tons	46,422-40,091	30,414-29,400
Lamb & Mutton	0.263 mil. lbs. a/		
Barley	176 tons d/	185-160	121-117
Pren. Grass forage	108 tons D.M.	108- 54	54- 27
Eggs:	13.596 mil. doz. a/		
Potatoes:			
Fresh	28,402 tons a/	1893	1183
Process	9.352 tons a/	748	468
Carrots	1,454 tons a/	162	97
Cabbage	1,624 tons a/	81	54
Lettuce	5,176 tons a/	383	288
Peas	347 tons a/	173	116
Summer squash	21.3 tons a/	2	1
Rhubarb	98.4 tons	4	2.8

a/ Marketing and Transportation Situation, E.R.S., U.S.D.A, MTS-164, February, 1967 (Table 16, p. 39).

b/ Note: Feed required from Alaska Crop and Livestock Reporting Service, S.R.S., U.S.D.A., 1968.

c/ Department of Interior, Bureau of Reclamation, Alaska District Office, January, 1967.

d/ Midwest Farm Handbook, Iowa State Press: Ames, Iowa, 6th Edition, 1964.

Production Expansion and Costs of Production

If Alaska producers are to capture a larger part of the expanding demand for agricultural products that can be grown in Alaska, both farm size and farm numbers must be increased along with the concurrent development of marketing systems and facilities. For farm firm development to occur, costs of production must be sufficiently competitive to induce present producers to expand and attract new producers into the industry. Estimates of present and expected investments, costs, and possible revenues for individual farm firms were explored for a number of crops. A number of present cost estimates was discussed in the previous chapter. Differing production levels and sizes of units were explored to indicate additional alternatives for production expansion.

Yield differences were generally attributed to differences in genetic stock used, timing of farming operations, and to improved production practices, none of which were necessarily cost increasing. Some cost differences were to be expected; however, with increased harvesting, storage, and marketing of larger production, budget costs were increased accordingly.

Expansion of Potato Acreage

Alaska's potato industry has been oriented to the fresh table-stock market, and primarily to the military contract market for an extended period of time. Average acreage harvested during the 1960-1965 period was 754 acres. The 1966 harvest was 710 acres and the

1967 harvest was 690 acres. Average costs of production in a survey sample were $4.12 per hundredweight and average reported sale price was $4.86 in the Matanuska Valley, for the 1966 cropping year. Other farming areas undoubtedly had higher production costs due to transportation costs on factor input items and lower yields, but other than the Tanana Valley, prices per hundredweight were higher than in the Matanuska Valley.

Projected demand estimates for 1975 and 1985 indicate some 1,297 and 1,893 acres of fresh table-stock potatoes needed to supply the demand in the four Crop Reporting Districts supplied by present producers (Management level I, yield estimates). Cost estimates for farms averaging 43.3 acres of potatoes could be competitive until prices dropped to $3.31 per cwt. (Table XL), and farms with 80 acres of potatoes could be competitive until prices dropped to $2.83 per cwt. (Table XLI). The 15-ton yields projected in Management level I are being attained by some producers at the present time. The 24-ton yields projected in Management level II are not yet being attained, but are expected with improved seed stock, cultural practices, and management by the 1975 and 1985 projection dates. When this greatly increased yield is attained, expected costs on 80-acre units will be down to $2.34 per cwt., using today's factor input costs.

If Alaska's potato producers are to have the opportunity to capture a major portion of the market in future years, several changes must come about. Potato varieties that will directly compete with those being shipped in from "outside" must come in to common usage by Alaska producers. Sales promotional efforts must be instituted to change new consumers' attitudes with regard to Alaska potatoes. Access into the civilian potato market must be broadened. In the future, some portions of the processing potato market will have to be opened up through development of processing facilities if the Alaska producers are to have the opportunity to produce processing potatoes. Demand estimates for 1985 indicate the opportunity to produce some 748 acres of processing potatoes for french fries, chips and shoestrings. Food technology laboratory facilities will undoubtedly be necessary to overcome some of the current problems of processing Alaska potatoes.

The projected number of 80-acre potato farms in 1975 would be 16 with Management level I, and 10 if Management level II were considered. The number of 80-acre units in 1985 would be 24 with Management level I, and 15 with Management level II, for producing fresh table-stock. An additional half dozen 80-acre producers would be needed to produce processing potatoes in 1975 and an additional nine would be needed in 1985.

In considering possible expansion of potato acreage to satisfy projected demand for 1975 and 1985, it was necessary to inquire into returns to capital for farm firm expansion. Using present prices and costs of production on 80-acre units, operators should be able to bid from 25 percent to 29 percent on new investment capital if such extremes were necessary.

TABLE XL. COSTS OF PRODUCING POTATOES WITH DIFFERENT YIELD LEVELS, MATANUSKA VALLEY (43.3 ACRES POTATOES) */

Acres in Farm			217
Acres in Potatoes			43.3
Production per Farm:			
		Mgt. level I	Mgt. level II
Production (tons)	476.3	649.5	1,039.2
Yield (tons)	11 a/	15	24
Investment per Farm:			
Land	$ 25,900	$ 25,900	$ 25,900
Buildings	51,171	51,171	80,215
Machinery & Equipment	24,789	24,789	24,789
Annual Operating Capital	23,504	26,797	36,462
Total Investment	$125,454	$128,657	$167,366
Annual Operating Expenses:			
Cash Operating	$ 23,504	$ 26,797	$ 36,462
Depreciation	4,438	4,438	5,890
Total Annual Operating	$ 27,942	31,235	42,352
Return to Capital	6,273	6,433	8,368
Operators Unpaid Labor	5,200	5,200	5,200
Total Costs (except Mgt. return)	$ 39,415	$ 42,958	$ 55,920
Cost per acre	$ 910.28	$ 992.10	$1,291.00
Cost per cwt.	$ 4.12	$ 3.31	$ 2.69

*/ Estimates made on proportionate increased storage, harvest, storage and selling costs but other judgments are not made due to no basis of judgment comparison in Alaska. It is assumed that a major portion of the production increase will come from improved genetic stock.

a/ Data Source: Table XXIV, Chapter V.

TABLE XLI. COSTS OF PRODUCING POTATOES WITH DIFFERENT YIELD LEVELS, MATANUSKA VALLEY (80 ACRES POTATOES)

Acres in Farm			217
Acres in Potatoes			80
Production per Farm:			
		Mgt. level I	Mgt. level II
Production (tons)	880	1,200	1,920
Yield (tons per acre)	11	15	24
Investment per Farm: a/			
Land	$ 33,950	$ 33,950	$ 33,950
Buildings	80,215	80,215	113,944
Machinery & Equipment	37,183	37,183	37,183
Annual Operating Capital	37,606	45,542	63,398
Total Investment	$188,954	$196,890	$248,475
Annual Operating Expenses:			
Cash Operating	$ 37,606	$ 45,542	$ 63,398
Depreciation	7,129	7,129	8,815
Total Annual Operating Expenses	$ 44,735	$ 52,671	$ 72,213
Return to Capital	9,448	9,845	12,424
Operators Unpaid Labor	5,200	5,200	5,200
Total Costs (except Mgt. return)	$ 59,383	$ 67,716	$ 89,837
Cost per acre	$ 742.25	$ 846.45	$1,128.00
Cost per cwt.	$ 3.38	$ 2.83	$ 2.34

a/ Cleared land increased proportionately to increased potato acres. Buildings increased proportionately to increased storage needs. Proportionate increase in Machinery investment and proportionate increase in Operating Expenses minus 12 percent as indicated by committee of potato growers.

Vegetables

Potential demand for vegetables that can be grown in Alaska, as shown in Tables XXXVIII and XXXIX indicates that acreages will be quite limited, particularly when one recognizes the limited part of the year that Alaska producers can supply vegetables to the market. Total acreages of those crops for which production potential estimates were made, if total demand were satisfied, would amount to only some 430 to 625 acres in 1975 and 560 to 800 acres in 1985. Development of a multi-product processing facility would undoubtedly allow Alaska producers to capture a larger portion of estimated demand, but development of vegetable farms would be very limited beyond commercial truck gardens and vegetable enterprise on potato-vegetable farms. At present, few if any processing potatoes are grown. No commercial pea production is found in Alaska. Tomatoes and cucumbers are grown in greenhouses if at all. Research and grower experience does indicate some opportunity for greenhouse growing of a number of vegetables. Cost estimates are not yet available on greenhouse vegetable production.

Expansion in Hog Production

Little interest was expressed in past years about hog production due to limited feed supply, no organized marketing structure for Alaska-grown pork and limited knowledge about growing hogs in Alaska's farming areas. The few hogs raised were raised in the proximity of

military bases where dependable supplies of garbage were available. Much of the pork was marketed for sausage making. With the estimated demand for pork in 1975 being equivalent to some 97,750 butcher hogs averaging 200 pounds and increasing to some 138,000 by 1985, there would appear to be an opportunity for development of additional hog enterprises in areas where barley is well adapted or feed supplies are adequate.

Due to climatic conditions, controlled environment housing and year-round production would be expected. Cost estimates have been calculated using two levels of management based on feed conversion ratios of 3.5 to 1 and 3.0 to 1. Two barley prices have also been used, one being the current price of $80.00 per ton and the second being $62.00 per ton from cost estimates in Chapter V. Labor requirements were estimated 1.9 hours per 100 pounds live weight of hogs produced.

Budgets were estimated for an enterprise producing some 800 hogs per year. It would be expected that larger units would develop if the hog enterprise were the primary income enterprise of a farm. Costs per pound live weight would be quite similar if more than one hog house or larger hog houses were used. Acres of barley required would be 250 to 175 for Management level I hog budgets and approximately 215 to 150 on Management level II using average production possibility estimates for barley (Table XLII).

Production costs per pound live weight for hogs were calculated at 24.57¢ with barley at $80.00 per ton and 21.81¢ with barley at $62.00 per ton when Management level I production costs were used. When Management level II costs were used, production costs were calculated at 21.93¢ and 18.76¢ per pound live weight (Table XLII). To make comparisons with reported prices dressed weight (carcass weight) costs per pound were converted to dressed weight and 3.5¢ per pound were added for farm slaughter and delivery. Calculated costs were 36.25¢ and 33.43¢ per pound under Management level I, and 32.74 and 28.66¢ per pound under Management level II. Reported prices for the 1960-1965 period averaged 41.94¢, with 53.10¢ in 1966 and 52.80¢ per pound in 1967. Present levels of production efficiency are far below projected levels in most instances to present costs are above projected levels.

Projected differences between production costs and present prices indicate an opportunity for a considerable expansion in hog production in the State. Estimated consumption of pork in 1975 would indicate up to 122 units and 172 units by 1985. Development of that number of hog units would generate the production of some 17,600 to 20,900 acres of barley production (barley-Management level II) in 1975 and 25,200 to 26,000 acres in 1985. If most efficient levels of hog production producers would be able to supply a major

part of the pork for the Alaska market at 18.76¢ to 21.93¢ per pound live weight. Present prices and costs would indicate that hog producers could be very competitive in bidding for investment capital.

TABLE XLII. ESTIMATED INVESTMENT AND PRODUCTION COSTS FOR THE HOG ENTERPRISE

	Management Level I		Management Level II	
Investment:				
Land (5 Acres)	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Breeding Stock (50 Sows & 3 Boars)	5,450	5,450	5,450	5,450
Buildings & Equipment	28,000	28,000	28,000	28,000
Operating Capital	14,555	11,645	12,476	9,981
Total Continuing Investment	$49,005	$46,095	$46,926	$44,431
	(Barley $80/ton)	(Barley $62/ton)	(Barley $80/ton)	(Barley $62/ton)
Estimated Expenses: a/				
Feed	$23,288	$18,631	$19,961	$15,969
Other Out-of-Pocket Costs	5,822	4,658	4,990	3,992
Interest on 50% of Investment	1,470	1,388	1,408	1,333
Depreciation	2,155	2,155	2,155	2,155
Total Cash Costs	$32,735	$27,327	$28,514	$23,449
Return to Operator & Family Labor	$ 5,100	$ 5,100	$ 5,100	$ 5,100
Return to Equity Investment	1,470	1,470	1,470	1,470
Total Annual Cost	$39,305	$34,897	$35,084	$30,019
Total Cost per Pound (Live Weight)	24.57¢	21.81¢	21.93¢	18.76¢
Total Cost per Pound (Dressed Weight)	36.25¢	33.43¢	32.74¢	28.66¢

a/ Expenses were calculated for 800 butcher hogs of approximately 200 pounds live weight. Labor costs were calculated for 3040 hours at $2.50/hour.

Hog producers, as well as producers of other red meat animals face numerous major obstacles when expansion is considered. Commercial slaughter facilities are quite limited. Research and production practice data are not readily available. Marketing channels for Alaska-produced pork remain to be developed. Capital suppliers have little experience with hog operations and are very reticent in making operating or facility loans. However, opportunities for increased hog production do appear quite good.

Expansion of Dairy Production

Milk production in Alaska has provided the largest single source of farm income in every year since statistical records have been collected. Demand estimates for 1975 and 1985 indicate the possibility for considerable expansion. Demand estimates indicate the need for production from some 6,500 to 7,800 cows in 1975 and 9,300 to 11,200 cows in 1985, (12,000 and 10,000 pounds production per cow respectively). Efficiently organized and operated dairies should be able to produce a major portion of the fresh milk and fresh milk products consumed within the State. Dairy is the one agricultural industry that presently has a developed marketing system to service both the civilian and military markets.

Cost studies in recent years have indicated that larger, more efficiently organized dairy farms can produce milk profitably. Case studies of smaller units have indicated reorganization and expansion

of production can provide the opportunity for additional dairy farms to become profitable. Recent farm surveys (Table XLIII) show the larger farms with a full return to all factor inputs and thus indicate the opportunity for profitable milk production in excess of what is presently being produced. Market prices for milk are reflective of delivered costs of "stateside" milk for processing in Alaska and production costs are reflective of present factor input costs in the Alaska production area.

One case farm, assumed to be somewhat representative of the smaller dairy farms in the Matanuska Valley, was selected to study effects of reorganization and expansion of production.

The expansion alternative was explored by using available resources and estimating additional capital needed for an 80-cow herd. Assumptions were: (1) total farm acreage would be held at current level, (2) crops raised would be limited to barley, oats and peas for silage, and grass for green chop and pasture, (3) field machinery cost and investment would be held at current level, (4) dairy ration and hay would be purchased and, (5) dairy herd would be expanded within limits dictated by capital restriction. Restrictions posed were: (1) oat-pea silage crop would not exceed 100 acres and barley would not exceed 40 acres, (2) herd size would not exceed 80 cows, two years old and over, with necessary replacement stock under two years old, and (3) borrowed capital from all sources would not exceed $150,000.

TABLE LXIII. INVESTMENTS, RECEIPTS, AND COSTS ON ABOVE-AVERAGE SIZED DAIRY FARMS IN THE MATANUSKA VALLEY, 1966 */

	Mean
Production:	
Total milk sold per farm . . . . . pounds	873,869
Cows, 2 yrs. old and over . . . . . number	86
Production per cow 2 yrs. old and over pounds	10,161
Investment per Farm (January 1, 1967)	
Total investment	$187,882
Borrowed capital	79,559
Machinery investment	22,444
Investment per cow 2 yrs. old and over . . .	2,185
Investment per cwt. milk sold.	21.50
Gross Farm Receipts:	
Milk sales	$ 87,678
Other sales.	4,463
Total sales.	92,141
(Price received per cwt.).	10.05
Annual Costs of Production:	
Cash expenses paid (not including interest).	$ 64,234
Depreciation	4,463
Total annual expenses (not including interest)	$ 68,697
Incomes:	
Net operating margin	$ 23,444
Return to operators labor (2920 hours @ $2.50)	7,300
Return to management (at 5% of gross sales)	4,607
Residual return to capital	$ 11,537

Rate of return on invested capital was approximately 6.15 percent.

*/ Farms included in the very limited sample are operated by knowledgeable and experienced farmers operating what has been previously described as two-man units. Production per cow kept was above average for the Valley and investment per unit of production was below average for the Valley.

An estimate was made of facilities and livestock needed to expand the dairy herd to 80 cows. This was transposed into an estimate of additional capital needed, along with expected expenses and income, (Table XLIV).

TABLE XLIV. PROJECTED CHANGES IN INVESTMENT, COSTS AND INCOME FOR CASE FARM A

Current Total Capital Investment in Farm

Current capital investment	$149,909

Proposed Additions:

Cattle Shed, 60' x 100'	7,000
Barn yard, manure storage, feeders, etc.	12,000
Added grain handling equipment	2,800
Machine storage shed	3,000
Addition to house	9,000
40 cows @ $500	20,000
Additional equipment for milking facilities, etc.	5,200
Proposed added capital investment	$ 59,000

Proposed Total Capital Investment

Current capital plus proposed additions	$208,900

Projected Operating Expense

	Expense	Projection 1	Projection 2
Feed	$11,791	$24,187	$26,848
Seed and plants	1,132	2,264	2,284
Fertilizer	4,223	4,223	4,223
Gas, oil and fuel	3,077	3,116	3,116
Repairs & Maintenance machinery & equipment	1,035	1,436	1,436
Machine hire	86		
Labor Hired	2,653	8,008	8,008
Vet & Livestock	896	1,792	1,792
Auto upkeep	560	560	560
Repairs & Maintenance plus improvements	862	2,108	2,108
Taxes	560	779	779
Interest	4,214	7,164	7,164
Rent on farm	840	840	840
Insurance	1,014	2,028	2,028
Electricity & telephone	973	1,216	1,216
Truck hauling	20	200	200
Bookkeeping	45	600	600
Miscellaneous	102	308	308
Depreciation	3,282	7,090	7,090
Total Yearly Operation Expense	$36,366	$67,919	$70,584

TABLE XLIV. (Continued) PROJECTED CHANGES IN INVESTMENT, COSTS AND INCOME FOR CASE FARM A

Projected Cash Farm Income

	Current Sales	Projection 1 Sales	Projection 2 Sales
Total Cash Income	$39,299	$82,239	$90,834

Projection No. 1 was developed using current average production per cow in the dairy herd and current price received for milk. Production costs were adjusted, using unit costs, where increased use of resources was expected. Projection No. 2 was developed using trend increase in production per cow and current prices of inputs and output in all enterprises.

The summary of current and projected investments, costs and income indicates that the projected adjustment and expansion of Case Farm A would allow the unit to be moved from an "uneconomic" context to an "economic" context (Table XLV). Projection No. 1 would cover total yearly operating costs, return to equity and a nominal return to operators labor and management. Projection No. 2 would indicate the opportunity to pay a higher rate for resources used in the farm firm throughout, particularly on borrowed and equity capital.

TABLE XLV. SUMMARY OF 1965 AND PROJECTED INVESTMENT, EXPENSES AND INCOME

Production:	1965	Projected 1	Projected 2 a/
Total milk per farm..pounds	378,500	776,200	858,900
Cows 2 years old and over . . . . . number	39	80	80
Production per cow . pounds	9,700	9,700	10,740
Average, herd milked.percent	72.3	80	80
Investment per Farm:			
Total investment (includes dwelling	149,909	208,909	208,909
Total borrowed capital . .	84,277	143,277	143,277
Owner's equity	65,632	65,632	65,632
Gross Cash Income Received:			
Total for milk sold . . .	37,126	80,310	88,914
Other sales	2,173	1,920	1,920
Total sales	39,299	82,239	90,834
Cash Cost of Production:			
Cash expenses paid	29,433	60,829	63,494
Unpaid yearly operating expenses	6,933	7,090	7,090
Total yearly operating costs.	36,366	67,919	70,584
Net Income:			
Business operating margin	2,933	14,320	20,250
Return to equity @ 5 percent	3,282	3,282	3,282
Net income to labor & management	-349	11,038	16,968

a/ Calculated with production increase due to improved practice and technology.

The case study indicated economically beneficial results from expansion of the unit and further benefits from increased production technology and increased input of the management factor.

Cost estimates for dairy farms averaging some 85 cows producing at the 10,000 pound level would indicate the opportunity for up to 92 herds in 1975 and 130 herds in 1985. One might also project some 76 herds in 1975 and 109 herds in 1985 if production per cow were at the 12,000 pound level. Larger herds were not estimated due to the expectation that economies of scale would be realized with the herds averaging approximately 85 cows.

Expansion of dairy herds towards the number needed to supply estimated quantities of milk needed in 1975 and 1985 would generate the opportunity for increasing barley, oat and forage crop production towards acreage estimates in Tables XXXVIII and XXXIX (5,209 acres barley, 2,734 acres oats, and approximately 4,000 acres forage - Management level II, 1975, and 7,469 acres barley, 3,921 acres oats, and approximately 5,000 acres forage - Management level II, 1985). Cost estimates throughout are predicated on present milk prices and factor input costs.

Expansion of Beef Production

Projected demand estimates for beef for the years 1975 and 1985 indicate the opportunity for a considerable expansion in the beef cattle industry. Continuing increases in beef cattle numbers

provide an indication that ranchers are attempting to develop an industry to take advantage of the market opportunity. The Bureau of Reclamation report 92/ indicates both technological and economic hurdles of major proportion that must be overcome if ranchers are to have the opportunity to take full advantage of the expanding market for beef. The Bureau report assumed a cooperatively developed and integrated industry. Major segments of the study indicated that the plan was not economically feasible at this time. If the beef cattle industry does develop, then feed and grain production will necessarily have to develop, presumably on the Kenai Peninsula to support the developing industry. For this to occur, it will be necessary to expand research and development efforts in feed and beef production.

Expansion of Sheep Production

Sheep ranches are located on Umnak and Unalaska Islands and have concentrated on wool production due to isolation of location. Demand estimates for lamb and mutton for Alaska markets indicate a market for some 1,850 to 2,000 lambs by 1975 and some 2,500 lambs by 1985. It would appear that distance and lack of transportation will preclude any general emphasis on supplying lambs into the Alaska market within the time span of this study. Limited development of sheep production may well occur on the Kenai Peninsula.

92/ Bureau of Reclamation, Livestock Industry in Alaska: Possibilities for an Integrated Livestock Industry on Kenai Peninsula, Kodiak and Adjoining Islands, Juneau, Alaska: United States Department of the Interior, March, 1967.

The greatest potential for development within the initial market parameter appears to be in dairy (milk), pork, potatoes and vegetables, and to a lesser extent in beef and sheep. Dairy and pork production would certainly generate a considerable increase in grain and forage production, which in turn could develop increased production which could allow decreasing costs in the feed producing sector of the industry and stimulate beef and sheep production.

CHAPTER VII

SUMMARY

Alaska's agricultural development has been slow and limited. Only a small portion of those crops that can be grown in Alaska are being supplied into the market by Alaskan producers. Production deficits exist for many products where costs of production estimates indicate profitable production opportunities. Alaskan farm operators are faced with many problems when considering possible expansion, some of which are: farms scattered in widely separated geographic locations, inadequate development of some elements of the intermediate marketing structure for Alaska farm products, absence of public facilities in more remote locations, limited development capital, lack of technical production and production practices information in suitable package form, lack of management and consultant services, and the requirement that all stages of production, processing, and distribution be combined into a single farm firm in many instances.

Goals, objectives, policies and programs of all levels of government have not been oriented to the development and growth of Alaska's agricultural industry. Recent emphasis on long-range development planning has brought about an increased interest in evaluating potential development in agriculture. Federal goals emphasizing new and different systems of production suited to the northern latitudes, crops that would contribute to export potential, institutions and

services that would contribute to new lands settlement efforts in the northern latitudes, in both social and technical fields, all would be of benefit to Alaska's developing agricultural industry. State goals and action programs oriented to specific area commodity-project problems would provide direction to expanded education programs, focused and applied research, feasibility and development planning studies, and liaison between present and prospective agricultural producers and processors, and all of the State and Federal agencies.

There must be recognition and a sensitive blending of conflicting settlement philosophies with regard to additional settlement efforts. Long range planning must be fully cognizant of development theory particularly suited to the modern frontier type of settlement. It is important to recognize that changes come about from within an area in a form and manner consistent with the values, culture, and aspirations of the people specifically involved. If the beliefs and aspirations of the people in the industry are fully recognized, then research, education, and service programs may be developed that will assist in bringing them to fruition and development will occur. New technology and development of a marketing infrastructure can both demonstrate and stimulate development and growth in the agricultural industry. It is through these factors that capital can be encouraged to flow into the development efforts. The social and psychological factors cannot be overlooked in the development process. Development is the result of people's actions with relation to social, political, and economic institutions.

All facets of production, processing, and distribution must be blended with respect to time and stage of development. Capital must be made available when and where economic opportunities present themselves. Markets may become the leading sector of development. Many small but critical issues are often overlooked. Any of these overlooked factors may deter all efforts to accomplish new settlement and growth of the developing industry. Unstructured settlement is often a fruitless and costly process, particularly for those people who are attempting the settlement effort.

Development theory and theory of firm growth are both fields that are pursued with great vigor, but at the same time are difficult to focus on a single unique settlement situation. Alaska's agricultural firms are growth oriented and will be so for an extended period of time. Decision making is growth oriented and must be recognized in this critical role. Excess management capacity is critically important for growth to occur in the individual firm. Stratagems for growth must be conditioned with individuals habits, social and economic pressures, and restrictions placed upon them by available institutions. The management factor as applied to small agricultural firms is often ill-understood and thus is withheld from full usage.

Alaska's dairy farming started in a subsistence environment and has had extreme difficulty in outgrowing its early social and economic environment. Farms are generally small and incomes are less than

families aspire to. The average producer of a 1965 survey operated some 200 acres, kept some 46 cows two-years-old and over, used one-half man year of additional labor, produced 70 acres of silage, 55 acres of grain, 20 acres of hay, and 55 acres of pasture of varying quality. For the average dairy to be economically competitive, it would be necessary to reorganize and increase to some 80 to 85 cows, increase average production to some 10,000 pounds per cow or more, and concentrate on both economic and technological factors in the production process. Total investment in the competitive unit would approach $200,000, using typical depreciated values.

Survey data showed dairy herd replacements costing some $585.82 to raise in the Matanuska Valley. Oat-pea silage cost $12.66 per ton to put in the silo. Barley cost $61.78 to put in commercial storage and dry to acceptable moisture content. Perennial grass forage cost some $55.79 per acre to establish a stand, $7.97 per ton for green chop, $66.97 per acre each year for permanent pasture, $34.17 per ton of hay harvested, and $17.88 per ton of silage in the silo at present levels of yield. Estimated costs of production for hogs indicate that carcass pork can be produced for about 36.25¢ per pound dressed weight. Present costs of producing potatoes in the Matanuska Valley are $4.12 per hundredweight with farm costs and farm organizations as they presently exist. Projected costs with present factor input prices and limited increase in size indicate costs of $2.97 when a management cost is included. Costs

of production for beef were drawn from another study and were not calculated on a per-unit basis; however, price received for carcass beef in the Southwest Crop Reporting District was 44.2¢ during 1966 and beef herds continued to grow. This would indicate costs were at or less than that figure.

The potential for agricultural development appears encouraging. Suitable land for crop production is in excess of that needed to supply present demand for agricultural products that can be grown in Alaska. Estimated consumption is expected to increase beyond the production potential of presently cleared and farmed acreage before 1975 and far beyond such acreage by 1985. If any major portion of the projected markets for those dates is captured by Alaska producers, much new acreage will have to be brought into production. Estimated production potential on all classes of land are beyond that presently being attained by typical producers, however, most efficient producers are now attaining Management level I estimates. Management level II estimates of production potential will necessitate a much higher level of technology and a much higher level of management input. Demand estimates transposed to farm level equivalents provide first production parameters for farm development planning. Present prices and costs of production indicate opportunities for expansion of potato acreages, vegetable acreages, noticeable expansion of hog production, and milk production. Expansion of beef production, using available cost data, appears questionable. However, expansion of beef cattle numbers

continues and slaughter facilities are being built. It would appear that additional study of the beef industry must be implemented to assist in developing an economically viable industry.

Conclusions

The conclusions of this study are in accord with the hypothesis presented in Chapter I. Some agricultural production is economically sound at the present time as shown by costs of production data and prices received by farmers for products sold. An economic opportunity for further growth of the agricultural industry does exist as shown by cost budgets and production deficits of several agricultural products that can be produced in Alaska. As in most production areas, continuing progress and adjustments must be made in production, processing, and distribution of agricultural products. Certain deterrents to growth appear more acute and of greater relative magnitude than for other agricultural areas in the United States.

A brief historical review of agricultural development in Alaska leads one to the conclusion that little emphasis or direction has been exhibited at the policy making level to accomplish positive and continuing agricultural development and growth. Illusions about settlement and development experiences of the great westward migration have precluded the pursuit and development of adequate goals, objectives, programs, and policies to accomplish agricultural development in the

"modern frontier" of present day Alaska. While volumes of development theory research are available from other areas, little has been focused or used in the Alaska situation.

Economic and production criteria used in evaluating farm development efforts in Alaska are well-suited to older mature agricultural regions, but are ill-suited to the modern frontier development situations. Evaluation of the management input in Alaska farm firms does not recognize growth strategies nor does it recognize the severe demands placed on managers by isolated location and complex integrated firm structures. Capital requirements for production units are somewhat greater than "stateside" and economies of size are no less critical. Credit policies of Alaskan lenders are geared to small early-farm development situations, while production and income expectations are reflective of a highly competitive commercial agriculture. Limited access to the market is confused with poor farming operations. Family goal structures are evaluated in terms of agency held objectives.

Past agricultural development has been beset with colonial attitudes towards agricultural development in Alaska. Resources have come into the industry very slowly due to a void of knowledge by investors with regard to production technology, a lack of developed markets for Alaska produced products, social and psychological stresses of scattered settlement, and management input demands that are in excess of that required in "stateside" farming areas.

Economic and social losses resulting from unstructured settlement efforts have created an image of failure that is difficult to dispel.

Alaska's agricultural resources must be combined into larger commercial units if they are to become more economically competitive. Efforts must be concentrated on developing a market infrastructure that provides access to Alaska markets for Alaska produced agricultural products. If potential investors are to become more cognizant of investment opportunities, the flow of research and technological information must be accelerated. The information disseminated must be in a form that allows risk-oriented decisions rather than uncertainty judgments. Agricultural policy must be conducive to and encourage economically opportune agricultural development. Ideas, beliefs and aspirations of the people within the farming sector of the industry must be given due recognition when policies and plans are formulated.

Development of farm firms in Alaska's sub-arctic and modern frontier environment is inhibited by a multitude of problems part of which are economic and part of which are of a noneconomic nature. Federal and State agricultural policies conducive to agricultural development would set the stage for solution of numerous problems, both economic and noneconomic. Concentration of research, education, and service programs on specific and identifiable area-commodity problems would generate solutions to what often appears insurmountable problems to the individual. The provision of consultant services

with regard to feasibility studies and development planning for present and potential farm operators, as well as management consultant services for ongoing farm firms would alleviate a large number of firm development problems. Intermediate market structure development, even if it means active public participation to the point of ownership and operation in certain instances, and direct assess into the market at some point are critical ingredients in firm development in Alaska.

One must be cognizant that there are factors that will negate economic opportunities for agricultural settlement and growth as well as opportunities for agricultural firm development. Many people coming from other agricultural regions find the burden of isolation from family and friends to be unbearable. Others find the contrast between "home" and a "homestead" too great. Lack of road access and other public services can be a strong deterrent to agricultural development. Taxation policies are not conducive to agricultural development and do not encourage such development.

Throughout this thesis non-agricultural development alternatives have been ignored in an attempt to concentrate only on the problems of agriculture. The error of omission was undoubtedly great, particularly with regard to non-agricultural alternatives for agricultural investment capital, however, certain public funding is committed to agriculture and many agricultural producers do not recognize non-agricultural alternatives due to personal or family goals. It was in this context that non-agricultural alternatives were ignored.

Suggestions for Further Research

In pursuing the question of agricultural development in Alaska, certain areas of inquiry appeared in need of further research emphasis. It is suggested that further research emphasis be placed on beef cattle and ranch development, the process of capital accumulation in developing areas, possible export markets and marketing systems, the development of economic and social institutions and particularly the sequence of implementing the development process in a modern frontier environment.

A beef cattle industry is developing in spite of the lack of information and adopted technology. The development of that industry could be greatly facilitated with a much greater research emphasis. Capital development and accumulation problems appear quite great throughout the industry. Continuing interest is expressed with regard to export markets, but the level of research knowledge appears to be quite deficient. The particular part that economic and social institutions play in developing agricultural areas does not appear to be well understood. Finally, the sequence of development efforts in new lands settlement regions, as well as underdeveloped areas, i.e., public development funds followed by private enterprise capital, appear worthy of considerable research efforts. Alaska's agricultural development areas seem to offer the opportunity to study certain aspects of the development process and procedures due to the situation

of being part of a highly developed country with resources, technology, services and agencies already available, high education levels, and yet the relatively undeveloped status of the industry cannot be explained in economic relationships between factor inputs and product prices.

APPENDIX

APPENDIX A

Brief descriptions of each of the major soil associations in the surveyed areas follow:

Tanana Valley Area

Fairbanks-Steese-Minto Association (FSM). - This association occurs on high hills and ridges bordering the alluvial plains of the Tanana and tributary rivers. Elevations range from about 650 feet to 2000 feet. Soils consist of micaceous silty loess over bedrock (principally schist). The silty material is many feet thick on lower slopes, but thins to only a few inches on the higher ridges. Large buried ice masses are common in the footslopes, and may result in irregular pitting after clearing. Soils on the south-facing slopes are generally well drained and free of permafrost, and support forests of white spruce, birch, and aspen. Soils on north-slopes and in drainageways are perennially frozen and poorly drained, and support sparse forests of black spruce.

Goldstream Association (GO). - This association occurs in broad, nearly level, portions of the alluvial plains. Most of the soils are perennially frozen under natural conditions and are poorly drained. Artificial drainage would be necessary to bring these soils into production. Even after drainage, the choice of crops in most areas would be restricted by low soil temperatures in the spring. Black spruce is the principal tree on these soils; many areas support only sedges and brush.

Salchaket-Tanana Association (SLT). - This association occurs on the broad nearly level alluvial plains. Most of the soils are formed in waterlaid sediments over coarse gravelly substrata. Many of them are well drained and free of permafrost. Others are somewhat poorly drained with frozen substrata, but these soils can be farmed after clearing and the subsequent lowering of the permafrost table. Forests of white spruce, aspen, and birch are dominant on the well drained sites, but black spruce and willows grown on the somewhat poorly soils.

Volkmar-Nenana Association (VON). - This association occurs on nearly level to gently sloping outwash plains and terraces and on undulating to rolling gravelly moraines in the vicinity of Delta Junction. Low stabilized dunes also occur, especially near the flood-plains of major streams. The dominant soils are well drained and moderately well drained shallow silt loams over gravelly substrata. Permafrost is generally deep or absent. The well drained soils support

a forest of white spruce, birch, and aspen, but the moderately well drained soils are covered with dense forests of black spruce. Much of the area has been burned in recent years, and large areas have been cleared for farms. Strong winds are common.

Matanuska-Susitna Area

Bodenburg Association (BO). - This association occupies broad nearly level to undulating terraces in the vicinity of Palmer. The soils are formed in moderately deep to deep windlaid silty material over gravelly substrata. These are the most intensively farmed soils in Alaska. Much of the area is cleared, but remnants of the original forest of white spruce and birch remain. Strong winds in the area create a soil blowing hazard.

Delyndia-Nancy Association (DEN). - This association occurs in the southern part of the Susitna Valley, bordering major rivers and large muskegs. Well drained shallow to moderately deep silty soils over fine sandy substrata are dominant. Slopes are mostly nearly level to moderate. Forests of white spruce and birch cover virtually the entire area.

Doone-Knik Association (DOK). - This association occupies high nearly level terraces and rolling to hilly moraines bordering the Matanuska River northeast of Palmer. The soils are mostly well drained, and consist of windlaid silts that are shallow to moderately deep over gravelly substrata. Most of the area is forested, but a number of dairy and vegetable farms exist. Strong winds are common especially in winter.

Homestead Association (HO). - This association occurs on rolling to steep moraines and nearly level outwash plains in the western Matanuska Valley. The area is dotted with lakes and muskegs. The upland soils are mostly well drained, and consist of shallow to very shallow silt loam over gravelly material. Most of the land has been taken up by homesteads, but few are fully developed. Second growth forests of aspen, birch, and white spruce cover most of the area. The soils are best suited for crops that require only shallow tillage, or for forestry.

Homestead-Knik Association (HOK). - This association occurs in the eastern part of the area on hilly moraines, high terraces, and benchlike ridges bordering mountain footslopes. The soils are mostly well drained shallow silt loams over gravelly substrata. The soils are mostly covered with forests of white spruce and birch, but dairy farms exist on the more gently sloping terrain.

Homestead-Nancy Association (HON). - This association occupies hilly moraines, benchlike ridges, and high terraces in the vicinity of Willow. The landscape is complex, with many streams, lakes and muskegs. The well drained upland soils are shallow to moderately deep silt loams over gravelly substrata. All soils are mostly forested, but a few homesteads are being developed.

Kashwitna Association (KAS). - This association occurs on level to rolling outwash plains and terraces, and on rolling moraines bordering the mountains. The principal soils are well drained shallow silt loams over gravelly substrata. White spruce, birch, and aspen cover most of the area. With increased accessibility, the broad outwash plain in the southern part of the area will probably be more intensively utilized.

Knik Association (KN). - This association occupies terraces, hilly moraines, and steep ridges in the eastern part of the area. Most of the soils are well drained, and consist of shallow silt loams over gravelly substrata. The steeper parts of the association are forested, but much of the level to rolling land is cleared and farmed. White spruce, birch, and aspen are the principal trees. Many lakes in the area have been developed for recreation and homesites.

Naptowne Association (NA). - This association occupies rolling to hilly moraines, mostly in the southern part of the area. Many poorly drained soils are included in the association, but the dominant soils are well drained shallow to moderately deep silt loams over moderately firm gravelly substrata. Some of the soils are stony. In general, the forests are relatively mature and consist principally of white spruce and birch. There has been little agricultural development.

Nancy-Whitsol Association (NAW). - This association occupies level to rolling terraces of the Susitna River. The soils are dominantly well drained moderately deep to deep silt loams over loose sand or gravel. For the most part, they are covered by forests of white spruce and birch, but a number of areas have been homesteaded.

Rabideux-Chulitna Association (RAC). - This association occurs on terraces and moraines in the northern part of the area. The dominant soils are well drained and consist of shallow to moderately deep silt loams over sand or gravel. The soils are mostly forested (white spruce and birch), but a few areas have been cleared.

Salamatof Association (SA). - This association occupies large muskegs in various parts of the area. The soils are dominantly very poorly drained peats. Poorly drained mineral soils occur at the edges of the muskegs. Mosses and shrubs are the principal vegetation, but black spruce covers many areas. For the most part, soils in this association are not suited for farming.

Salamatof-Jacobsen Association (SAJ). - Soils in this association are similar to those in the Salamatof Association, but many of the very poorly drained areas have stony mineral soils rather than peats. They are equally unsuitable for farming.

Susitna-Niklason Association (SUN). - This association occupies broad floodplains of the major rivers. Some areas are subject to occasional spring floods, but in most places this is not severe enough to prevent farming. The soils are mostly stratified silts and sands, are well drained, and are shallow to deep over loose gravelly substrata. They are generally covered with forests of white spruce, cottonwood, and birch.

Tidal Marsh-Clunie Association (TIC). - This association occurs on nearly level tidal plains bordering Knik Arm and Cook Inlet. The soils are mostly poorly drained silty clays and very poorly drained peats. Parts of the area are occasionally inundated by exceptionally high tides. These areas are largely treeless and support a dense vegetation of sedges, grasses, and associated plants of coastal meadows. They are suitable for grazing and, at times, for the production of wild hay.

Torpedo Lake-Homestead Association (TOH). - This association occupies footslopes of the Talkeetna Mountains. The area consists of many small drainageways and seep spots separated by narrow ridges and knolls. The soils in the drainageways are poorly drained and have firm clayey subsoils. The soils of the ridges and knolls are well drained and consist of shallow and very shallow silt loams over gravelly substrata. Forests of white spruce, birch, and aspen occupy the well drained sites below elevations of 1000 feet. Grasses and alder occur above that elevation and in the poorly drained sites. The area has only limited suitability for farming, but parts of it may be used for summer grazing.

Western Kenai Lowland Area

Beluga-Alluvial Land Association (BEA). - This association occurs in two areas--the slopes between Kachemak Bay and the Caribou Hills, and the Fox River Valley at the head of Kachemak Bay. On the slopes north of Kachemak Bay, most soils consist of poorly drained stratified materials affected by seep water, but are fairly easily drained to produce good farm land. These soils also occur in the Fox River Valley, but there most soils are frequently flooded alluvial deposits. This land can be used only for grazing.

Cohoe Association (CO). - This association occupies much of the area west of the Caribou Hills. The land is generally nearly level to moderately sloping, though steep slopes also occur. The area is dissected by broad deeply incised valleys. The upland soils are mostly well drained moderately deep to deep silt loams over layered substrata. The soils in the valley bottoms and in some depressions in the uplands are poorly drained. Many are peats. The well drained soils support a forest dominated by white spruce and birch. The wet soils support grasses, sedges, shrubs, and black spruce. Only a relatively few areas have been cleared for farming.

Kachemak Association (KAC). - This association occurs on the rolling to steep Caribou Hills in the southern part of the area. The soils are well drained shallow silt loams over sandy and silty sediments. The native vegetations are tall grass and associated plants, with scattered groves of Sitka spruce. A few farms exist at lower elevations in the hills and several areas are being grazed, but the area is mostly in its native condition. It appears to have good potential as range land.

Kenai Association (KE). - This association occurs on hilly moraines in the northern part of the Kenai Lowland. Most of the area has an irregular, choppy topography. The principal soils are well drained shallow silt loams over firm glacial till. The area is covered by forests of white spruce, birch, and aspen. Only a few places have been cleared for farming.

Mutnala-Salamatof Association (MUS). - This association occurs in areas of glacial till bordering Kachemak Bay and in valleys in the Caribou Hills. It consists for the most part of a complex pattern of well drained knolls and very poorly drained peats, but along drainageways in the Caribou Hills the well drained soils occur on side slopes and the peats and poorly drained mineral soils on the valley bottoms. The well drained soils consist of shallow silt loams over glacial till or sedimentary strata. They are covered by Sitka spruce and birch. The peats support low growing shrubs or, in places, a black spruce forest.

Naptowne Association (NA). - This association occurs in areas of glacial till in the northern part of the Kenai Lowland. The association is described in the Matanuska-Susitna Area.

Rough Broken Land Association (RB). - Areas of rough broken land occur on escarpments bordering the Caribou Hills, on canyon walls of streams that flow into Kachemak Bay, and on sea cliffs. All of these areas are steep with eroding, scaling sides. They are either barren or covered with alder thickets. These escarpments have no agricultural value.

Salamatof Association (SA). - This association occurs in large muskegs in the northern part of the Kenai Lowland. It is described in the Matanuska-Susitna Area.

Soldatna Association (SO). - This association occurs on broad outwash plains and terraces, and on coarse-textured moraines in the northern part of the Lowland. The principal soils are shallow to moderately deep silt loams over loose gravelly substrata. Most of the area is covered by forests of white spruce and birch. Many places, especially north of Kenai, have been cleared for farms, industrial sites, and homesites.

Tustumena Association (TU). - This association occupies broad terraces bordering the Kenai and Kasilof Rivers. The principal soils are shallow to moderately deep silt loams over loose gravelly substrata. The area is covered by a rather spindly forest of young white spruce, aspen, and birch. Sizable areas have been cleared.

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