1032

AGRICULTURAL POTENTIAL IN ALASKA

HEARINGS

BEFORE THE

SUBCOMMITTEE ON AGRICULTURAL PRODUCTION, MARKETING, AND STABILIZATION OF PRICES

OF THE

COMMITTEE ON AGRICULTURE AND FORESTRY

UNITED STATES SENATE

NINETY-FOURTH CONGRESS

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AGRICULTURAL POTENTIAL IN ALASKA

MONDAY, AUGUST 16, 1976

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL PRODUCTION,
MARKETING, AND STABILIZATION OF PRICES OF THE
COMMITTEE ON AGRICULTURE AND FORESTRY,
Palmer, Alaska.

The subcommittee met, pursuant to notice, at 10:45 a.m. in the city hall. Hon. Walter D. Huddleston (chairman of the subcommittee), presiding.

Present: Senator Huddleston.

Also present: Senator Gravel.

STATEMENT OF HON. MIKE GRAVEL, A U.S. SENATOR FROM ALASKA

Senator GRAVEL. Good morning. Thank you all for coming. I would just like to say that it is good to be back home and spending time in this beautiful valley. Senator Huddleston has agreed to take time from his busy schedule and travel to our State to hold Senate hearings under the auspices of the Subcommittee on Agricultural Production, Marketing, and Stabilization of Prices, of the Committee on Agriculture and Forestry, which he chairs. I want to welcome him to our great State and let him know how much we appreciate his using this recess to come and learn about Alaska; I'm sure his constituents would prefer he spent the time in his home State tending to the needs and problems of Kentucky. We're grateful, Senator, for your so generously giving of your time to enable the people in Alaska to have an expanded voice in Congress.

STATEMENT OF HON. WALTER D. HUDDLESTON, A U.S. SENATOR FROM KENTUCKY

Senator HUDDLESTON. Thank you very much, Senator Gravel. First, I would like to express my appreciation to Senator Gravel and his staff and all the people in Alaska that we've come into contact with so far in our visit here for their hospitality. This is my first trip to Alaska. There are three other Senators who are with us on this trip and interested in various aspects of your life and the economic situation that exists in this State. We'll all have a better understanding of some of the problems you experience in Alaska, and that will be very helpful to us when we get back to Washington and go about making national policy.

It's customary for a Senator opening a hearing to make a fairly long statement about the purpose of the hearing. However, since our time is rather short, I'm going to keep my remarks very brief. I'd rather listen, of course, than talk. An old friend of mine, Will Rogers, who met an untimely fate—as a matter of fact, in this State—used to say "You ain't learning nothing when you're talking." So I came here to learn and not to do a lot of talking myself. Before we leave your State at the end of this week, we will have conducted several hearings of this nature dealing with agriculture and forestry.

Ordinarily, my subcommittee hears testimony from what might be called the mainstream of commercial agriculture. We hear about millions of bushels of grain and problems of large feedlots and the price of cotton. We expect these hearings to be quite different.

We know the climate in Alaska is unique. We know that you don't have a long growing season that is required for many crops. Here the question is one of agricultural self-sufficiency and whether that can be obtained, particularly as Alaska's population continues to grow.

Because of the unusual situation here, we're anxious to see what can be done by researchers and farmers to increase food production in Alaska and determine what, if any, role the Federal Government ought to be taking in this endeavor.

I must ask each witness to keep the oral testimony as short as possible; however, any written statements that you may have will be made part of the complete hearing record. Those persons who are not scheduled to testify may submit a written statement for the record by presenting their written comments to Warren Oxford, here on my left, of the committee's staff.

With that we will begin with our first witness for this morning, State Senator Jalmar Kertulla.

Senator GRAVEL. I would like to introduce one young lady, Sharon Long, of my Washington staff.

Senator HUDDLESTON. Senator?

STATEMENT OF HON. JALMAR KERTULLA, ALASKA STATE SENATOR, PALMER, ALASKA

Senator KERTULLA. Senator Huddleston, Senator Gravel, and staff, normally I wouldn't wish to be first on a docket but I have to be in another part of this State later in the day, so I very much appreciate being here and having the opportunity to testify at this time.

Briefly to diverge and I'll be brief, a very good friend of mine, Paul S. McComas, Dr. McComas of Burkesville, Ky., came to Alaska and taught genetics here. Professor of mine, later professor at Kentucky. Tremendous person, still farms and runs a considerable show in Burkesville and someday you may wander out to that part of the State.

Senator HUDDLESTON. I begun my wandering there. I was born at Burkesville, Ky.

Senator KERTULLA. Then perhaps you know the McComas family.

Senator HUDDLESTON. I know the name down there, yes.

Senator KERTULLA. We really appreciate your coming and those in farming and those connected with scientific development of agriculture here, I know, appreciate the U.S. Senators being here, Mr. Chairman.

I talked briefly a few days ago with the Director of Agriculture, Mr. Linn, and Dr. Logsdon, a long-time scientist here and administrator with the experimental program of this State and we've come to a conclusion. Also talking with some agriculturists at the production level that there's a feeling that there's a beginning of agriculture, that there's a new start. The Governor has appointed a task force. There's some ad hoc committees and there's some decisions being made we hope to make legislatively in the State, and we hope to have cooperation from the Federal Government and the Federal Legislature in many of these areas.

I'm going to read from a statement that is entirely—and comment briefly as I go along—it's entirely a stream of consciousness, almost without a comma change. I made it in the last hour thinking I'd have to be here earlier, and that's the reason I read it and not turn it in. Or turn it in but comment as I went along. This comes off the top of my head with a 40-year background in agriculture and having touched virtually all phases or at least having experienced virtually all phases of Alaskan agricultural development.

I think the Federal Government can help this State develop agriculture to provide for its own domestic by assisting the development of scale sufficient to amortize the total infrastructure. At this stage we need the lands and intelligent utilization and development programs of these lands. This has again become primarily a Federal responsibility. To wit, the Native land claims programs, the D–2 programs, and the State perhaps has less than 1 million acres of agriculture lands up to 17 million potential at this time.

We need competitive and adequate transportation facilities from the lands to the marketplaces including the seaports. We need funds for assistance to the experimental and materials plants. Uniquely, this State's huge geographic area has never been assisted except with some staffing for its plant materials laboratory.

I quarterbacked the intelligence of members that are in this audience and wrote the plant materials laboratory program for this State. The only State one; the rest are Federal. We need Federal assistance in the continuation and particularly in the experimental phases.

We need gatherers to collect products from the world at this latitude for Alaskan trial. No use reinventing the wheel. We need funds for processing and we need competitively priced power, not the least of which can be considered as the "Devil's Canyon" project for the railbelt electrical distribution. This will be a black and a brown out area in the early 1980's. We must have electrical power, fossil fuel or preferably, I think, hydro in this case. Senator Gravel has been very active in this area.

We need continued Federal assistance and development of the Alaskan Railroad and retention federally of that Alaska Railroad or at least a public corporation so that the railroad can be built and directed into two of the key interior agricultural areas.

Early Alaska agriculture had everything to do with the railroad. Not the very earliest that came in the gold rushes or the cities of Southeastern, the port cities, but the Alaska Railroad promoted agriculture along its sites. Sent out agents and indeed cooperated with this Federal development. The 1,000-mile authorization of the railroad should be programed over a period of time to completion.

The development of an economy of scale that will lead to competitive prices in Alaska for our products requires strong consideration of export. To get the size to compete for the local sale and processing production, you're going to have to scale the size. There's a very small domestic market limited to the very few products at the present time that you can develop to an economic benefit of Alaska.

I've spent over 40 years in Alaska. I've been involved in all phases of agriculture in the State and I personally visited every Alaskan agricultural development and compared them to similar latitudes in Canada and Europe, as well as the American northern Midwest, and I feel that the scientists and the producers as joint experimenters have pretty well proven that there can be a productive Alaskan agriculture.

But stage 2 is upon us now, and that's the development of an economic Alaskan agriculture and it's upon us as cooperators between private enterprise, State, and Federal Government to proceed. We need all these ingredients.

I might say that I really appreciate this time. Military, I've sat with three people with tremendous agricultural background; economists, scientists, and you could develop a whole theory that the last 20 years of agriculture, at least the immediate decade preceding this and the 20 years back, had a great deal to do with the military. The military fostered and built and destroyed it.

Do what you can to see to it that a continuing military market is available to us and it's an every year battle to get our products on that shelf.

I thank you very, very much for your time, Senator, and I really—for many years I have been impressed with having the opportunity to meet with a U.S. Senate committee on a subject as dear and close to us as the agricultural. Senator Huddleston, God bless you, and thank you for coming.

Senator HUDDLESTON. Thank you, Senator. I appreciate your coming and I recognize that you have to leave early.

Senator GRAVEL. Jay, will someone be expanding on this military purchase problem?

Senator KERTULLA. I suspect there will be people here. Certainly there are people that are capable of it. Paul Hubert is one of the dealers in Seward but there are others here that know it, and I hope that they will expand upon it because that's one thing we can do immediately.

Senator HUDDLESTON. I'm sure we will explore that thoroughly. We're going to be meeting with the military, also, during this trip, and we'll look into that aspect.

Senator KERTULLA. Thank you.

Senator HUDDLESTON. State Representative Al Ose.

STATEMENT OF HON. AL OSE, ALASKA STATE REPRESENTATIVE, PALMER, ALASKA

Mr. OSE. Thank you, Senator Huddleston and Senator Gravel and staff and members. I know we're pressed for time. We have many more that are here to speak so I will make mine brief and try not to duplicate anything that is going to be said by the others. I have talked with several of them.

The State wants to take an active part in facing the problem of agriculture and at last they are. They've come up with a task force which is looking into the problem and trying to solve, which we know is a difficult problem.

But the personal—the renewable resources must be a top priority. This is not just a local problem with agriculture but it's statewide. We must convince the rest of the State that they can take a very active part and help not only themselves but also us in developing agriculture. We must get them involved and to see the necessity of it and the importance of agriculture.

Agriculture has always been considered the backbone of our social and economics throughout the United States. Having been born in North Dakota, we went through this problem years ago and we've come out on top. It was always the same problem that is it going to go or isn't it going to go. The Federal Government had to get involved and did get involved through the tree claims, the act which a lot of farmers use by planting trees to obtain land. Also through the Homestead Act. They must—the Federal Government, in leasing out this land, also must consider the potential of the farmland and make this available. We're having the project of the Devil's Canyon project which will make electricity and also hopefully it will make water available, but we do have the problem of getting incentive for the farmers to get back on the farm. We need it and with the help of the Federal Government I'm sure this can be accomplished.

Certainly want to thank you for taking time out to be here and I know you're going to hear some good testimony from the rest of this group. Thank you very much.

Senator HUDDLESTON. Do you see that there is present now an adequate State-Federal partnership relative to farming? I'm referring to the various agencies that are here; are they working together and toward essentially the same goal?

Mr. OSE. Yes, they are. We have several committees working together for one common end. I've got to say that, that they are and hopefully they will continue and to get support of that. Financial support also of the Federal Government to continue as such.

Senator HUDDLESTON. We'd be happy to have you join us at the table.

Mr. OSE. All right. Thank you very much.

Senator HUDDLESTON. Is Mayor Larson here yet? I think what we'd like to do is group some of the remaining witnesses, have you come up at the same time, make your statements individually, and then we'll have you here together for questioning. We'll start with Mr.

Bouwens of the Matanuska Valley Breeders Association and then hear from Mr. Nash who is president of Matanuska-Maid, Inc. The people in the back are having a little difficulty hearing, so if you gentlemen will speak as loud as you can it will be helpful to them. Mr. Bouwens.

STATEMENT OF WAYNE BOUWENS, PRESIDENT, MATANUSKA VALLEY BREEDERS ASSOCIATION, PALMER, ALASKA

Mr. BOUWENS. My name is Wayne Bouwens. I've been in the valley for 40 years. I operate a dairy farm. I've been asked to testify. I believe that agriculture has a big future in Alaska, but we're young and we need all the Federal and State help we can get. Everyone you talk to says agriculture is going down the drain. Well, I don't think so. The reason they say this is due to the land acquisitions and subdivisions moving in. I think that the Federal Government and the State government are going to have to step in and do something to protect our agricultural land. We don't have that much agricultural land left, but we do have lots of subdivision-type land left. We have hills galore and mountainsides galore that we can level off for building. We can go out south of town—the best farmland we have—and dig down 4 feet to gravel to build a building on. The rich top soil has to be removed and deposited elsewhere.

Agriculture has a future, I believe, but it's hard for a man to get into it because of land acquisition.

Senator HUDDLESTON. What a lot of States, I think, find is that the same land that is best for crop production or agriculture use is also the same land that seems to be the most desirable for subdividing and putting factories on due to the accessibility.

Mr. BOUWENS. Well, I disagree. I think we've got land side by side that's suitable for agriculture. I think this land that is suitable for agriculture should be reserved. The State, Federal Government, or the borough government or someone is going to have to go in and buy it up, and use the hilly land for building. There's nothing wrong with leveling off a hillside to put a house on.

Well, I think that's all I've got.

Senator HUDDLESTON. Mr. Nash.

STATEMENT OF JOHN NASH, PRESIDENT, MATANUSKA-MAID, INC., PALMER, ALASKA

Mr. NASH. Distinguished Senators, I want to thank you for being here like my predecessors. I agree with Mr. Bouwens. I think one of our major problems for the continuation or expansion of agriculture in Alaska is the land situation. It's been quoted—not my figure—but I think it's pretty accurate that less than 1 percent of the total land in Alaska is in private ownership.

For the last 8 or 10 years we've had tremendous problems because of this. Of course, the State under the Statehood Act has selected a certain amount of land and the borough is then under a mandatory Borough's Act that selects land. And then the Natives Claims came along and we've had most of Alaska tied up one way or the other so it's not available especially for the agriculturist.

I think traditionally agriculture has started and reached a viable state on relatively cheap land, almost free land in places, and this we do not seem to have in Alaska anymore. I think if we feel that it is important to have agriculture in Alaska, and I think it is, that both the State and the Federal Government must make agricultural land available at a price and in a manner that an agriculturist can get them and use them.

I don't have the answer or even a faint suggestion of how to go about this. I know there are a number of ways it can be done. You people have the expertise for this, but—and I think that we must be very careful to guard these agricultural lands that—lands that are suitable that they don't fall into other purposes now so it renders them unsuitable for agriculturing purpose. I think that we have to watchdog this very carefully. I'm a little bit offbeat, perhaps. I think that we have a responsibility to future generations to do this and we have had a lot of research and a lot of study groups determining how best to make agriculture viable in Alaska.

First, let me say I'm not against research. I think research is wonderful, but we have recently had a flurry of—oh, publicity, let's say, for corporate agriculture in Alaska, that this is the only way to go. Now, I do not happen to believe this because we all have owned stock in corporations and as a stockholder we asked the corporation to turn a profit. That's what they are guided by, and the development of new raw agricultural lands is kind of a social economic experiment and corporations do not do this, I do not believe. You're going to have to make it so the individual can go out there and take his chance on this new raw land before you're going to get the development.

With that thought in mind, I thank you.

Senator HUDDLESTON. Are you suggesting that the land ought to be made available to individuals who want to use it specifically for farming?

Mr. NASH. Yes.

Senator HUDDLESTON. Is there enough incentive, at the present time, enough market for agricultural products to justify a person making that kind of an investment and taking that risk?

Mr. NASH. Not on any large scale. The development of one would have to follow or precede, whichever, the old question—which, the chicken or the egg. You've got to plant over here or you've got the production, but it would have to—it'd have to increase in both capacities on a scale commensurate with the other. We do not have the production right now to satisfy our local needs. I'm talking about, say, rail-belt area when I say local needs. It could increase—everything could double. A farmer's production could double and no problem.

Senator HUDDLESTON. You're both dairy farmers?

Mr. NASH. No. I'm a grain and hay farmer.

Senator HUDDLESTON. You're a dairy farmer?

Mr. BOUWENS. Dairy, right.

Senator HUDDLESTON. Are you having any difficulty as far as marketing your product?

Mr. BOUWENS. No; no problem at all. We have a good market.

Senator HUDDLESTON. Do you raise most of your feed?

Mr. BOUWENS. Yes.

Senator HUDDLESTON. How do you market your product, Mr. Nash?

Mr. NASH. My products are all marketed through our cooperative except for some hay. My grain is made into livestock feed and it goes to feed Mr. Bouwens' dairy herd, for instance.

Senator HUDDLESTON. What's your situation relating to fertilizer, the availability?

Mr. NASH. Fertilizer is our largest expense in farming up here and, of course, they have been available. Two years ago we had a little bit of a scare but we have been able to get them. We need great amounts.

Senator HUDDLESTON. Is most of it shipped in?

Mr. NASH. Nearly all of it; yes.

Mr. BOUWENS. Freight rates are a problem. Truckers just put in for another 5 percent increase in rates which makes about an 18-percent raise in the last year, so this reflects back on local farmers.

Senator HUDDLESTON. Well, anything that you have to haul in from the lower 48 is going to be rather expensive.

Mr. NASH. That's true.

Senator HUDDLESTON. Adds to your cost.

Mr. NASH. Well, of course, that's our competition out there, too, so it cuts both ways.

Senator GRAVEL. Does the urea plant offer any type of fertilizer? Do we have any indigenous materials for petrochemical capacity to satisfy our own fertilizer needs rather than importing? Could you use urea?

Mr. NASH. It is available. Some use it. In our cool climates here, our cool soils, it is not the best type of nitrogen fertilizer that can be used. It's just about like that. Put a pencil to it—whether or not it's cheaper than shipped in ammonia nitrate. This would be a wonderful thing if we had a fertilizer plant that would make complex formulas of fertilizer available to us, and I think we have the materials in the State to do this.

Senator GRAVEL. Is there a chance of a byproduct from the existing plant? Has anybody investigated what it would take to satisfy your specific fertilizer needs from the gas we have?

Mr. NASH. I'm not aware if there has been such a study made.

Senator GRAVEL. Fertilizer is your largest cost and we have indigenous fertilizer that we're exporting to farmers in the lower 48. We should be able to cream off something for our use.

Mr. NASH. Certainly. Another thing that would be a great advantage to us is we have acid soils in a good bit of our agriculture area and if there was agriculture limestone available in the State, it'd be a great aid. If we had, say, a cement plant, it might be a byproduct of a cement plant. We're always caught in Alaska on the economy of scale. We do not have a large enough production to afford a plant or vice versa. You can't produce if you don't have a plant.

Senator HUDDLESTON. It's back to the chicken and egg again. You can't produce fertilizer until you have more than 1 percent of your land producing agricultural products.

Mr. NASH. Right.

Senator HUDDLESTON. Same thing with your agricultural land.

Senator GRAVEL. Let me impart one bit of information. I met with the Kaiser people with respect to the Susitna project and even with construction of two dams the economic scales are not sufficient to build a cement plant in Alaska. So I would say it's not an occurrence in the foreseeable future to have a cement plant in Alaska for that byproduct. If we could find another way to get that kind of line through another means rather than a byproduct of a cement plant, I think we'd be more on target.

Mr. NASH. There's one other idea on this line, Senator Gravel. It might be if both your Federal and State highway programs would go to a crushed rock program. Agricultural lime might be a byproduct of your rock crushing there. I don't know how much more expensive it might be, and of course you've seen all the river gravel that's put roads here and it's really not very good unless it's screened very well. Crushed rock makes a better road and this ag lime is a byproduct of a crushed rock plant.

Senator GRAVEL. That would be something the State could make as a requirement for the road contractors in the area.

Mr. NASH. Yes.

Senator HUDDLESTON. What kind of help are you getting from the Federal agencies, at the present time, regarding your operations?

Mr. BOUWENS. Well, we get help through OSCS and then, of course, we've got the experimental station suggesting new products, grains, and so forth. That's about it.

Senator HUDDLESTON. What about you, Mr. Nash?

Mr. NASH. Well, certainly all the information gleaned from the experimental station is available to us. One thing I feel we've got a lack of and that is research and control of weeds in Alaska. I know we get back to the economy of scale again. We're not big enough, perhaps. Don't have enough acres in production to justify having a specialist in herbicides on the station staff. We did several years ago and unfortunately the young man died untimely, but we don't have anybody I don't think now who's particularly working on that, and this is probably one of the big problems of our established farmers.

In many States, as you know, sir—in Kentucky agriculture is big business. Your companies that furnish these chemicals or feeds, they furnish a lot of expertise to the farmers. This we do not have in Alaska. We're not even aware of things that go on other places. If we can't glean the information from the experimental station or the extension service, why we'll probably remain ignorant, and if we—I think it'd be well worthwhile to have some research and good research on herbicides on application in Alaska because you cannot transpose information from southern latitudes to Alaska on herbicides as well as many other things because we're cold soils and good climates. They don't react the same here as they do in other places. Application rates have to be different and different chemicals.

Senator HUDDLESTON. Do these poor price programs play any part in your operation?

Mr. NASH. Not really.

Senator HUDDLESTON. Your market price is above support level, I take it?

Mr. NASH. That's right.

Senator HUDDLESTON. In your dairy operation, do you process it yourself at all or do you sell it?

Mr. BOUWENS. No. We ship to Matanuska-Maid Co-Op.

Senator HUDDLESTON. And the co-op processes it?

Mr. BOUWENS. Right.

Senator HUDDLESTON. Senator Gravel, do you have a question?

Senator GRAVEL. The only thing I would want to stress again would be the possibility of somebody making contact with the L & G plant or the urea plant, the Union plant in Kenai, and calculating what your needs would be, and what it would take for them to modify the plant to meet your needs. They're about to embark upon sizable plant modifications which will almost double their capacity. If it didn't require unreasonable changes to produce a product that would be marketed here they might want to make an investment to meet our needs.

Dr. LOGSDON. Excuse me. They have been contacted and they are quite willing to make a commitment of all the urea that Alaska needs.

Senator GRAVEL. But in the proper chemical blend.

Dr. LOGSDON. Well, the urea is the—urea and anhydrous ammonia (ph) are the two products that they make.

Senator GRAVEL. According to Mr. Nash's testimony, we can't just use that same urea in Alaska the way one would outside. It goes through another processing outside, I understand.

Dr. LOGSDON. That I can't say.

Mr. NASH. We really need the blends.

Senator HUDDLESTON. You have a soil-testing service that lets you know what you specifically need?

Mr. NASH. Right.

Mr. BOUWENS. Right.

Senator HUDDLESTON. Gentlemen, thank you very much for your statements.

Mr. NASH. If you have the time, I'd like to invite you to go to the Matanuska-Maid plant at 514 Northern Lights to show that we do have a modern facility in Alaska.

Senator HUDDLESTON. I'd like to do that. Mr. Wayne Long and Mr. Sigmund Restad. These gentlemen represent the Soil Conservation Service. Mr. Long, will you proceed first and then we'll go to Mr. Restad.

STATEMENT OF WEYMETH E. LONG, STATE CONSERVATIONIST, SOIL CONSERVATION SERVICE, U.S. DEPARTMENT OF AGRICULTURE, ANCHORAGE, ALASKA

Mr. LONG. Thank you, Mr. Chairman, Senator Gravel, and staff members.

I'm Weymeth E. Long, State conservationist for the Soil Conservation Service in Alaska and we work on a statewide basis. I'll limit my comments, Senator, because of the lack of time, to our role in agriculture and as we provide assistance in the State of Alaska. In 1968 we had, or I should say my predecessor, had the wisdom to initiate what we call the exploratory soil survey. This soil survey covered the entire State of Alaska. We completed this field work in

about 1974. The report will be scheduled for printing in 1978 and will be available to all people. In the interim period, we are making data available to people on a demand basis. This includes maps, interpretations, what have you.

This field survey, while it is a very broad brush survey, I'd like to stress that it was actually made in the field. This is logistically quite difficult with a State the size of Alaska and we had our difficulties. It involved using helicopters, boats, et cetera to make these field surveys. We started out by making detail surveys on sample areas for about 10,000 acres and then we used these as a base to expand the survey to similar areas in the State.

The significance of this survey is that in the agricultural potential study prepared by the Alaska Rural Development Council—copies available for the record—it was the basis for determining the potential of the total agricultural lands in the State. Mr. Restad, I believe you will agree, think back on this, that it was our belief at that time we started this survey we had something in the neighborhood of 2 to 2½ million acres of tillable agricultural lands. As a result of this survey we identified areas in large blocks in which 25 to 50 percent or more of the land is suited to tillage. In total these large blocks measure about 15½ million acres as identified on page 21 and as explained in chapter 3 of the report entitled "Alaska's Agricultural Potential."*

If we looked at the survey more intensely and include smaller blocks of land, we have something in the neighborhood of 20 million acres suitable for tillage. In terms of total land mass in Alaska, this amounts only to 4 or 5 percent of the land. However, in terms of agricultural areas, suited not only from the standpoint of soils but climatically suited, this is a large area. Recognizing this probably will not all become available at any point in time as this will depend upon many decisions that will be made by both the State and Federal Governments.

In terms of Alaska soils, our soils are generally silty loams to sandy loam soils, that are very subject to erosion, both by wind and water. It's important, then, that as we develop our agricultural areas that we do provide adequate protection to these soils and that we plan and develop these areas that are suited and not disturb those that are unsuited.

To make these selections we will need more detailed information as these areas are planned and become available for agricultural use. With more detailed surveys we can identify those lands best suited and eliminating those that are not well suited or marginal for agriculture. Hopefully in this manner we will not have to have a large remedial program for correcting problems.

We need to be able to furnish the technical assistance necessary to prevent problems. This assistance is spelled out in my written submission. The Soil Conservation Service as you very well know, provides an array of technical assistance.

Research has been mentioned by previous speakers. We do have many needs in the research arena to provide us the information neces-

*Retained in committee files.

sary to advise farmers, the planners, and other land users. This data is not directly transferrable from other States and quite often must be modified to Alaska. Some will apply to Alaska.

In terms of production, just on the outside chance that it may be overlooked or not brought to your attention, I have included a page from the "Agroborealis" that lists some of the crops that can be grown in Alaska. Production of these crops are compared to the national averages.

Quite often we don't think of Alaska in terms of the red meat industry. We think strictly about tillable agriculture, and I think it's important that we recognize that there's approximately 18 million acres well suited for grazing sheep and cattle. Also in terms of the Alaska red meat industry we have the potential to raise reindeer as is being done now by the Native groups on something like 220 million acres. Certainly not all of these will be utilized in that manner, but also, these areas will need soil surveys and range surveys so that these lands are utilized properly, not overgrazed, thereby creating problems.

It's our observation that the lands can produce significant yields of adapted varieties of small grains, forage, vegetables, and red meat. However, it's important from our standpoint that only those lands well suited to production be developed and that it be done properly. This is probably one area where we still have the opportunity to do the job right the first time around.

I believe, Mr. Chairman, if afforded the opportunity our Service working with the other agencies and we do have excellent agency interrelationship that we can help through our soil surveys and our other technical programs in making a contribution to the agricultural development in Alaska.

And that is my statement, Senator.

Senator HUDDLESTON. Mr. Restad, do you want to make your statement now?

STATEMENT OF SIGMUND RESTAD, SECRETARY, ALASKA ASSOCIATION OF SOIL CONSERVATION SUBDISTRICTS, PALMER, ALASKA

Mr. RESTAD. I'll make a few brief statements. I have a background in Alaska agriculture that goes back to 1958. Been involved in agricultural research and administration of agricultural programs. Been an active participant in the rural development council that put out the bulletin that Wayne just mentioned since its inception in Alaska and have been active with the State association of soil conservation districts for—since its inception about 10 years ago.

Wayne mentioned previously of the agriculture resource that Alaska has which it being only 4 percent of agriculture's total land. Alaska's total land mass is still a very sizeable productive piece of land with capability of production that should be and could be of major emphasis in the national interest. I think that some of the things that we need to concern ourselves with in the development of this type of a resource is that the land in itself is rather valueless as it stands and it needs development in the manner that Wayne suggested.

We need to make sure we don't create another Midwest dust bowl in the 10 non-Yukon flats (ph). We also need to consider a land use

program that would make this land allowable for agriculture production when it is needed. Single use legislation of extremely large blocks of land that does not provide for really the best use that land would put—could be put to is not very good planning as I see it.

One of the areas that come into conflict in this area, I think, is the Yukon flats when we look at the D–2 land selection. There's no reason why migratory waterfowl can't get along in the lowlands and agriculture production get along very fine on the drylands and it should actually be beneficial to the migratory waterfowl instead of being set aside in a single use category.

I think that when we look at the development of agricultural production and as mentioned here earlier this morning we run into this chicken and the egg situation. We must develop some sort of a team approach between Federal, State, and private agencies in such a manner that we're able to develop the market capability along with the productive capability of land. We can ill afford to let ourselves in for a homestead pattern that takes two or three generations to get the land developed on a piecemeal basis and then only to find out when it does that there isn't enough market for a sizable production.

A dairyman spoke about not having a surplus situation at the present time, but it isn't too many years ago that they were faced with that sort of situation, as I'm sure Senator Gravel well remembers. If we're going to go into large area production, unless we have some sort of stable market we're going to have the same situation.

There's a need for us to, I think, develop Alaska in such a way that we provide a plan and we utilize our resources to the very best of their ability. We have energy resources in Alaska and we have included, in some cases, heat that could be utilized in agricultural processing and that sort of area if the right kind of package could be put together.

We have—we need to look very closely if we decide to develop sizable markets that we look at rural markets and the efficiency from not only production dollar standpoint but an efficiency of energy utilization. It seems again it might be improper to ship lots of fertilizer potential to the South for production that could be just as well done here and then export it to the Pacific rim, for example.

I realize that this is a long ways down the road, but when we start looking at research projects, research ought to be well ahead of production so that we have some of those problems answered by research instead of being answered by productive mistakes or production mistakes.

I think in general that this provides most of the statements I would like to make. I'm sure many of them will cover some of them in more detail than I. I'd just like to reiterate that we're not going to have really successful production unless we are able to satisfy the other components that go with it.

One of these components is transportation and of this 15 to 20 million acres that Wayne talked about, much of it is presently not accessible by anything but airplane and we are not going to get very well developed on that basis. So we need—and have an opportunity to do an excellent job of planning. It's going to take a financial resource of everyone that has the capability and the responsibility and I feel that the Federal Government has a responsibility in this development as well as anyone else.

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When the Native groups do get their lands in private hands, they will be the largest private landowners in the country and they're going to be asking for and probably should receive the kind of technical service that any other private landholder asks for in Kentucky or Iowa or anywhere else.

Senator HUDDLESTON. You make a good point. While your problems are unique and substantial, due to the configuration of this great State, the opportunity to plan now and do it right the first time is one that many States ignored, and consequently are having difficulties now.

Seems to me that one thing that we can almost be sure of is that the population up here is going to continue to increase. It has been increasing at a rather remarkable rate and this will bring other problems on the whole economy and on the facilities that are available. There is legislation now in Congress, which has already cleared the Senate, that would require the kind of inventory of land nationwide that has already been undertaken here. I understand that the Federal/State Land Use Planning Commission has done a tremendous amount of work and already produced documents on the nature of the land that's here in this State.

I think that provides an opportunity to try to get the agriculture interests and needs well established, and hopefully they will be recognized when the D–2 problem is finally resolved.

Seems to me, too, that you're saying that a major problem is this so-called infrastructure which provides the processing plants, the distribution system, and the production facilities, that are needed along with the fertilizer and all of the other things that go into production. Hopefully, these things will all come as more emphasis is placed on agriculture and more effort is placed on meeting not only the needs of the State but considering the export market as well, that may be available to production here.

Mr. LONG. Senator, what you said is entirely true. We did work with the Land Use Planning Commission. Again, I want to emphasize that much of the data available is on a very broad base. This is one of the biggest problems we in the resource field have is the need for more comprehensive detailed information. It's such a horrendous job in terms of the size of our State and in terms of our staffing to obtain detailed data to really get down to the specific planning, of say, 40 acres. The data is just not available or it's becoming available rather slowly. We lack basic research data to provide proper resource management techniques. We can't transpose information from North Dakota or Montana and bring it here because of the difference in climate, daylight hours, et cetera. If we do transfer information we need to try it first and make the necessary adjustments so it works as good here as it has elsewhere.

Mr. RESTAD. Over the years and there's a lot of research available that's been mentioned earlier, this research has been pretty much concentrated to those small areas of development that we have now, and when we get into new land areas then we run into problems that are different and we just don't have the staffing or capability to get in there and do the job right.

Senator HUDDLESTON. So you will be in need of considerable research effort in the foreseeable future as new lands open up. Presumably they will be devoted to agriculture.

Mr. LONG. Not only in varieties and modifications of crop varieties but also in the technical aspects, the management tools, proper management.

Senator HUDDLESTON. You have a wide variety of temperature ranges in this State.

Mr. LONG. Yes; there's quite a climatic difference. In fact, what we do successfully in the Kenai Peninsula won't necessarily work here in the Matanuska Valley, nor will it necessarily work in the interior. These climatic areas are quite different in terms of the crops that can be grown, the management techniques required to be a successful producer, and so on.

Senator GRAVEL. Have you been contacted by any of the Native regional corporations, with respect to information you have on soil surveys? Have their lands people been in touch with you?

Mr. LONG. Senator, we have had up to this year three permanent people on our soils staff. I've added two more people this year and we have six detail soils scientists from other parts of the Nation. In fact, I have one from Kentucky this summer assisting in soil surveys. In terms of assistance to the Native groups we are providing range and soil surveys on about 4½ to 5 million acres this year. We are using earth imagery and every vehicle we know of to speed and move our surveys along. We are making detailed soil surveys in an undeveloped area that Mr. Restad mentioned. This area near Nena covers something in the neighborhood of about 470,000 acres. This is our second year of surveying in the Nenani area and this involves Native lands. This area will be part of the Doyon region. Doyon is, or will be, one of the largest private landholders, probably in the world.

We are and will be providing soil surveys as well as other technical assistance. Until now the Native groups in my judgment had been spending most of their time selecting their lands. Now they're starting to realize that 15 years down the road they are going to start paying taxes on these lands. They are going to have to do something with them, so I know that the demand for technical assistance is going to increase and this could far exceed our capacity to address all requests in a timely manner.

Senator HUDDLESTON. What do you see specifically that Soil Conservation Service could provide you here—because of your unique situation—that may not apply to the other States?

Mr. LONG. In the past we've had and it's been mentioned virtually a status quo agriculture situation because there were no lands available. Now we have 40-some million acres transferring to the private arena or Native groups, 102 million going to State and Federal lands that may be available in various manners for various types of developments. In that sense, we will need, as Senator Gravel just mentioned, more detailed inventories and evaluations of this area's resources. I think it's going to be the first demand, at least by the Native groups. They will want to know what are their resource opportunities? Then the weighing of the trade-offs from various land uses. Do you raise timber;

do you produce cattle; do you raise grains or develop their wildlife potential? What are all of the viable alternatives in terms of land use. We can provide assistance in that direction.

Through our Washington office and technical service center we have the opportunity to utilize specialists on detail that I may not have on my staff. I think this works very well. With the assistance of our Washington office we also use staff on detail from other States.

Senator HUDDLESTON. Are they working with you on that?

Mr. LONG. Yes.

Senator HUDDLESTON. Cooperating and——

Mr. LONG. Our administrator has been quite receptive and in fact, Sig, in the last 2 years I think we have about doubled our staff, from 12 to 22 permanent people. So I would consider that our administrator within the constraints that he's faced with, both budgetary and personnel, that he's helping us. He recognizes our needs and the opportunities to assist others.

Senator GRAVEL. Have you made any kind of a recommendation—this is addressed to either of you—to higher authority at the Federal level as to how the Federal Government should think regarding methods of transferring the land to farm use? Is there any kind of new thinking going on in that area? As you know, historically, an individual acquires a homestead and got a piece of land as a result of his labors and as you point out, Sig, it often just locks a person into poverty because the economic unit isn't sufficient. Have you given any thought to how we would define those economic units and then how we would transfer that to the public domain? Anything going on in that area?

Mr. RESTAD. There's considerable thoughts in working. I'm sure some of the people later on in the hearing will—may touch on this. A group of three people, one from our staff, one from the Division of Agriculture, one from the economic development, visited with the Canadians this summer. They have apparently been somewhat more successful in their approach to land development in that respect than what we have in the past, and there is something to be gained from looking very closely at what they're doing.

There is a discussion as whether or not land should be sold on the fee simple basis or whether it should have some sort of restrictions or whether it should be an agriculture lease. More and more there seems to be, I think, a consensus of opinion that some sort of restrictive covenant that would keep land for agricultural purposes but still allow some kind of title. Has some advantages for a lot of the land over great leasing arrangements because that creates some other problems, financing and so on.

I think it's important to always remember in the transfer of land that it isn't going to be productive to the fellow who gains access to the land until it has had improvements on it, and some logical method of improvement to land at the time of transfer or prior to the time of transfer has some real merit for consideration. And he doesn't have to fight for 5 years before he can turn it on.

Mr. LONG. One other item comes to mind. Mr. Restad mentioned it earlier. This concerns land use and looking into the future relative to the national interest related to the D–2 lands. I know there's a number of people in the agriculture arena, at least in Alaska, that are con-

cerned that the options be kept open so that alternative uses are not eliminated, in particular, agricultural uses of D–2 lands. At least the options for future agriculture, even though they may be years away, should be kept viable and available.

Senator GRAVEL. I think it is very important for the State's agriculture task force as well as other groups to work closely with the Native as well as other communities. The Native society has never been agrarian so even those Native lands that have agricultural potential are not being thought of in terms of farming or other agricultural development.

Mr. LONG. I think the Native group recognizes this, Senator Gravel, and they know they're not going to farm land, but they also know that they have the land and they're going to have to pay taxes on it. They are going to be looking at the alternatives and they've hired some very, very astute land management people and they will be calling upon us for assistance. We have held a number of discussions in terms of services available through USDA and through the State government. We have held meetings out in the communities to provide this information through our Alaska Rural Development Council.

Senator GRAVEL. Those contacts should be broadened to the individual farmer like Mr. Nash or Mr. Bouwens. The Natives have their own enterprises they are venturing into right now, its that can-do attitude the Government can't really see in people. If we keep the Natives only interfacing with Government officials, there's the vital ingredient that is being lost. These people must expand their economic base either through consultant work or joint ventures. Really, the sky is the limit and the potential is as varied as the human imagination.

And so I'd hope that you'd use your governmental offices to bring about a diverse interface. Get the private sector involved so their views can be aired. The opportunities for joint ventures will present themselves.

Senator HUDDLESTON. Thank you, gentlemen. I understand Mayor Larson is here now. If you have any remarks you'd like to make, mayor, we'll insert those at this time.

Mayor LARSON. Senator Gravel asked me to make some remarks at our luncheon. That might be a more appropriate time.

Senator HUDDLESTON. That'll be fine. Mr. Risley of Mat-Su Borough Planning Commission.

STATEMENT OF ROBERT RISLEY, MATANUSKA-SUSITNA BOROUGH PLANNING COMMISSION, PALMER, ALASKA

Mr. RISLEY. Senator Huddleston and Senator Gravel, thanks for coming and I hope you enjoy your stay.

I have owned farmland in the valley for the past 40 years. I was raised on a farm in Kansas, spent 12 years in fruit growing in California, 2 years of which were spent at the University of California, College of Agriculture. I am presently serving on the Matanuska-Susitna Borough Planning Commission.

Agriculture in Alaska, I feel, requires more Federal assistance in the fields of soil conservation surveys and experimental tests plots in areas surrounding population centers. By that I mean all poten-

tial Federal, State, and borough agricultural lands should have test plots established by the local experimental stations to determine the type of agriculture best suited for that area. For example, certain types of hay and grain may not survive at the experimental farm located in the center of the Matanuska Valley but will survive near the mountains on the north side of the valley that has south slopes and deep snow cover. My experimental farm is located in that north valley area. Apple trees that were planted a year ago, some have survived our unusually severe winter.

In cooperation with the experimental farm over 80 varieties of grains show promise of doing real well. They sprouted and grew 6 inches in 15 days. A plot of alfalfa, planted this summer, is showing good signs of growth.

The reforestation program, through the local ASCS office, is a good example of the Federal cost sharing program that could be established for grasses and grains on private lands plus appropriations to the experimental farms for the specific purpose to establish experimental plots on Federal, State, and borough lands mentioned above.

Another definite area that the Congress should demand more input from Soil Conservation Service and Agricultural Research is in the so-called D–2 lands. The identification of potential agriculture lands should be the number one priority in determining the best uses for D–2 lands, thereby insuring we have enough land to feed the people that play in the rest of the D–2 land.

I should like to emphasize the importance of keeping in mind all aspects of agriculture in the identification process of the D–2 lands.

Alaska has millions of acres of grazing lands capable of producing red meat from cattle and sheep shipped in from the drought areas of the south 48. Meat produced from this grass is equal to any grain fed stock. It requires no finishing, just grass and salt. These grazing lands are naturally located in proposed Federal and State park areas. If these areas were put under Forest Service management, it could be managed under multiple-use concept. However, since it contains very few trees, the Forest Service may not have much interest.

I would like to propose that these mountain grazing lands be designated agricultural reserves administered by Department of Agriculture where grazing of livestock would be the primary purpose, with mining, hunting, fishing, and recreation being permitted. Such a proposal is being submitted to the State legislature on the Hatcher Pass area where our local dairy and stock men have been utilizing that grazing area for over 40 years. See exhibit A, which I have attached.*

Attached to our handout is a copy of the Borough Planning Commission's proposed bill for agriculture reserve.

Farmers have been producing since the beginning of time and now they find an uncontrollable Government agency known as OSHA looking down their necks trying to tell them they cannot farm lands that are hilly for fear they may turn a tractor over. I recommend that Congress insist that OSHA establish advisory groups with representatives from farmers and industry so that their regulations are not ridiculous. Exhibits B and C explain in more detail.*

Thank you again for this opportunity to express our views.

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*See pp. 58–61 for exhibits A, B, and C, supplied by Mr. Risley.

Senator HUDDLESTON. Thank you. I might say relating to OSHA that some of their regulations regarding farming read like a comic book, of some sort, to anybody that's ever been on a farm. The chairman of our committee has been in contact with them about that and I can assure you the Agriculture Committee is going to be very interested in what OSHA says relating to farm practices.

Mike, do you have a question?

Senator GRAVEL. I'm glad you said that. That raised my hackles too. On the agriculture reserve, I know we've got a copy of the bill you're asking for the legislature to pass. Could you just summarize very briefly what's in that bill and give us a few highlights of how you're going to handle it?

Mr. RISLEY. Yes. Actually——

Senator GRAVEL. You do the planning for the entire Matanuska Borough, right?

Mr. RISLEY. I'm on the planning commission. I'm just one of them.

Senator GRAVEL. A question I have concerns the tremendous growth that's taken place in this part of Alaska and the expansion of subdivisions. How can you control what's happening to your agricultural lands. We've got such an investment in it.

Mr. RISLEY. Right.

Senator GRAVEL. How can you prevent people who can't make their profit in farming, from making a profit in development. How do you approach the problem?

Mr. RISLEY. You can't right now at the present time under the present State law. However, the borough has an ordinance, an agriculture ordinance, whereby they are attempting to control the agricultural use of this area under borough ownership plan. They do not dispose of it if it's agricultural, and unless someone comes in with a definite plan of how he's going to develop it, he doesn't have the opportunity to bid on it because this is strictly agriculture. This is one control that the borough has done.

Senator GRAVEL. Don't you have zoning powers in the borough?

Mr. RISLEY. We do but you have to hold public hearings on proposed zoning ordinances. All borough residents are violently opposed to any type of zoning.

Well, that's what we've done as far as borough land is concerned. You can't very well do it under private ownership.

Senator GRAVEL. Why not?

Mr. RISLEY. Well, the State law prohibits you. You have nothing as yet that I know of.

Senator GRAVEL. You're a first-class borough, and a first-class borough—at least while I was in the legislature and it's been some time now—had full zoning power.

Mr. RISLEY. We can attempt to. We have to have public hearings and if you've ever been to a public hearing on zoning, you will find its almost impossible to pass a zoning ordinance of any kind.

Senator GRAVEL. No. You've got to go through a legal process.

Mr. RISLEY. That's true.

Senator GRAVEL. Yes——

Mr. RISLEY. And we've attempted that and they have done it in some areas like Denali Park. We hope we can. Right now we're growing so fast.

Senator GRAVEL. Well, you should be able to get it down to a lot 50 by 150. You can zone it for commercial use or agriculture.

Mr. RISLEY. That's been done in the cities.

Senator GRAVEL. If you're having a problem in the interface and the conflict between development and the saving of agricultural lands, you've got the legal tools to solve the problem.

Mr. RISLEY. Well, to be honest with you, we hope we'll be able to do that. We're working on it. The reason it hasn't been done is that the fact right now—I'm not trying to pass the buck or anything. I'm only saying what is actual fact, and that is the borough planning and zoning commission is also the platting board and with the volume of platting that we're having to review we don't have much time for long range planning, and that's why I feel—I've always felt that we're talking about splitting the two (planning commission and platting board) and getting down to this business of zoning that is necessary, and not only that but along the highways and keep out this junk from being thrown all over the highway or next to it and so forth, but that's down the road. We are—we are thinking about it but there's no time for it.

Senator GRAVEL. One thing you might consider is contracting with a group like the land use planning commission. Have them develop an agricultural plan, and land plans, for the area. As you point out, anyone can come in, subdivide, and you've got to accept his plan.

Mr. RISLEY. That's right.

Senator GRAVEL. If you have a prior plan with areas zoned for agricultural development, it can't be developed any other way.

Mr. RISLEY. That is true and also, like I say, we are attempting to do that and we have done it as far as borough land is concerned, borough ownership land at the present time.

Senator GRAVEL. Because there's nobody on it. Difficult problem is when you get——

Mr. RISLEY. OK. Yet it's still—we are still attempting as a borough to get the State to go along with us within—the lands within this borough, we've had a little trouble there, too. If we want to classify it as agricultural land and we felt that they should, they don't feel like they should go along with it and so these are the problems that we do have locally.

The bill is merely a—we've set up a—and you have the maps, and under that, it's very short here—

> Permissible uses. Within the area classified as a State agricultural reserve under section 20 of this chapter, grazing under lease issued by the department of natural resources is considered to be the primary use for the area, and all other uses incompatible with this primary use shall be prohibited or restricted, as provided by regulation; however, mining activities are permitted in accordance with Alaska statutes which is mining regulations, and recreational activities listed in section 050 of this chapter including hunting, fishing, and trapping are permitted in accordance with department of natural resources and department of fish and game regulations, as appropriate. Development of private property within the boundaries of the reserve shall be in accordance with applicable local ordinance and State law.

And then in this we have an advisory group set up under this—well, the board of directors—management would be under the board of directors with the director of division of agriculture, the commissioner of fish and game, the commissioner of highways, and a representative from the Matanuska-Susitna Borough Assembly or the borough planning zoning commission.

Under them they have the advisory group of the Alpine Ski Club, Cross Country Ski Club, snow machine, hang glider. You name it, we have it in there, and we get their advice and then we say, "all right, you write the regulations to control yourself."

And once they've done that, you wrote the regulations. You enforce it. There's no reason for us to have a ranger up there telling them what to do. They can do it themselves and I think they will.

This is our proposal.

Senator HUDDLESTON. Thank you very much, Mr. Risley. Mr. Allan Linn, director, Alaska Division of Agriculture, Department of Natural Resources, and Dr. Charles Logsdon, associate director, University of Alaska Agricultural Experiment Station.

Please proceed, Mr. Linn.

STATEMENT OF ALLAN LINN, DIRECTOR, ALASKA DIVISION OF AGRICULTURE, DEPARTMENT OF NATURAL RESOURCES, PALMER, ALASKA

Mr. LINN. Thank you. Senator Huddleston, Senator Gravel. First thing, I'm not a Ph. D. I'll get that clarified correctly right now. Second, I wish I had the capabilities of your commissioner from Kentucky because I wanted to take the opportunity to apologize for the weather. It's very abnormal this year.

Senator HUDDLESTON. Do you know our commissioner?

Mr. LINN. Yes, I do very well, very well. I understand he's back in education now.

Senator HUDDLESTON. Yes, he is. You're talking about Wendal Butler?

Mr. LINN. Wendal Butler, uh-hm. Since this State presently imports the great majority of its foods, it is apparent that agricultural production in Alaska is not necessary for the survival of its citizens.

This categorizes us with many of the other nations of the world, a major market for the agriculturally developed conterminous United States.

While this is all a legitimate process, it appears to be another tragic example of underutilization of the State of Alaska's resource potential. As has, or will be, pointed out to you this morning, the well identified tillable land capabilities of this State are enormous. So enormous, in fact, that we in Alaska could be providing sufficient food products to provide a high nutritional level for 100 million people, some 2½ percent of the world population.

It is possible now, and probably in the future, that Alaskan food producing capability will become a major demand resulting from a full production policy of the U.S. Government. Our tillable land area, somewhat greater than that of the State of Kentucky in farms, appears to have certain advantages over the touted tropics in disease and insect problem potentials.

The present role of the Federal Government could be most helpful in helping gain food self-sufficiency for Alaska by:

1. Recognizing that Alaska contains the last significant block of developable tillable land under the U.S. flag—nearly 4 percent of the Nation's cropland.

2. Consider the above fact when discussing the various measures at the congressional level that impact Alaskan land status conditions of the future.

3. Encourage the State to become a producer of foodstuffs large enough to achieve the necessary characteristics of economy of scale so that this production will be economically viable, health improving, and sociologically desirable.

4. Establish a military food management system keyed around the fact that year-round consumption of perishable commodities requires year-round intensive management of these items acquisition, storage, and distribution. This would improve the present military food picture greatly and assignment of Defense Personnel Supply Center personnel to operate this existing facility year round would allow local purchase of more items to the benefit of the U.S. Government and to the productive capability of the State of Alaska.

5. Encourage the USDA to participate with the States' development of agricultural production by participating in the credit and marketing needs of this development through such organizations as Farmers Home, Agricultural Marketing Service, Agriculture Research Service, et cetera, including the last one I have on the list as the Foreign Agriculture Service.

6. Recognize that food self-sufficiency in Alaska is a two-way street. The export of products surplus to Alaskan needs pays for the import of products not raised here such as oranges, and I should have used Kentucky tobacco, I guess.

Senator HUDDLESTON. I wish you had. I read someplace that you're experimenting up here with growing of Kentucky bluegrass.

Mr. LINN. We've developed our own.

Senator HUDDLESTON. You've developed your own bluegrass?

Mr. LINN. I defer to Dr. Logsdon to continue that.

Senator HUDDLESTON. Doctor, go ahead.

STATEMENT OF DR. CHARLES LOGSDON, ASSOCIATE DIRECTOR, AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ALASKA, PALMER, ALASKA

Dr. LOGSDON. Thank you, gentlemen, for the opportunity of testifying this morning.

My name is Charles Logsdon, and I am the associate director of the University of Alaska Agricultural Experiment Station. I would like to present the following statement.

Agricultural development is in the national as well as State interest. That's agricultural development in the State of Alaska. The identification by the Soil Conservation Service of 18.55 million acres of tillable lands in Alaska may in the long run be more important to the Nation than the Prudhoe Bay oil discovery.

Self-sufficiency in food production means production and marketing economies at a competitive level with the industry producing these same products in other areas. The total structure for the industry in Alaska, therefore, must be large enough and sophisticated enough to achieve scale economies.

Subsistence-type agricultural activities are more closely related to recreation and life style than to creation of a food base. An agricultural industry that will provide self-sufficiency for Alaska will also be an industry producing for export.

Alaskan agriculture suffers from an image of being a marginal production area. The recent attempts to bring marginal lands in other States into production have not been encouraging; therefore, it is assumed that Alaska's production would be equally discouraging. The fact is that much of Alaska's tillable lands are not marginal. Dryland farms producing 50-plus bushels of barley per acre are not considered marginal even in the Midwest, and that is the kind of yield we can expect here.

Alaska is undergoing massive restructuring of land ownership and use patterns, with 104 million acres designated for State ownership, 40 million acres for Native corporation ownership, 100 million acres already in Federal use categories, and 83 to 106 million acres being considered for additional special Federal land management designations. It is not entirely clear at the moment where ownership of Alaska's tillable lands will reside when this restructuring process is complete, but considerable amounts will remain in Federal ownership. We do know from the environmental impact statements on the D–2 lands that only limited resource evaluations have been made of Alaskan lands and that decisions are being made or contemplated without this basic resource inventory.

I would respectfully suggest that the following actions be considered by the Federal Government for their positive impact on Alaska's ability to contribute both to its own agricultural product needs and to the Nation's newly emerging food policy in world affairs. These are not all that can be done but these are representative, I think, of some of the things:

1. Increase funding to the Soil Conservation Service for more rapid, detailed soil surveys as a basis for resource planning.
2. Increase funding to the Agricultural Research Service especially for basic studies in soil, water, and air to establish baseline data in Alaska on air and water quality.
3. Provide for a more comprehensive, in-the-field resource inventory on Federal lands. The present land inventory responsibility of the Forest Service does not include acquisition of new data. They do acquire new data on forest lands but they have general responsibility.
4. Establish a Federal task force within the Department of Transportation to work with the Governor's group to consider extension of the Alaska Railroad to the Canadian border to join up with the Canadian railway system.
5. Through the Energy Research and Development Administration and the Economic Development Administration, support the utilization of waste heat generated by the petroleum industry for application in agriculture such as grain drying, forage pelleting, greenhouse heating, soil heating.
6. Fund the Economics Research Service and the Foreign Agricultural Service for studies on movement of Alaskan agricultural products into presently existing foreign market channels.

7. Extend Bureau of Labor Statistics Consumer Price Index to other cities in Alaska.

8. Support legislation which emphasizes multiuse management on Alaska's D–2 lands.

9. Open public domain lands to entry at the earliest possible moment.

And this last one does refer primarily to subsistence type operations because I think we do need to pay attention to this lifestyle aspect of agriculture.

Thank you very much.

Senator HUDDLESTON. We think that's pretty important, the question of agriculture as a lifestyle. It contributes greatly to the total output of the country, at least in the lower 48 States, and it's something that our committee has been very interested in maintaining—not going totally toward the big conglomerate operations of commercial farming. I don't see why it would not also be important in this young State which is really still in its development stage.

Dr. LOGSDON. But I don't think that we're going to get the competition from these smaller units without the total structure which may encompass some corporate farming. I'm not sold on this, but what I'm talking about is larger-scale farming even on a family farm basis. This is the main thing.

Senator HUDDLESTON. Right. Mr. Linn, you were the first witness to mention credit services available. Is this an important and critical thing here?

Mr. LINN. Just this morning we had a discussion that any developmental concept that involves, let's say, a feed grain base is going to represent an investment somewhere in the vicinity of $500 an acre—hopefully below that. Yes, I would say a substantial amount of dollars is involved.

Senator HUDDLESTON. I think it would be very important. I don't see how you're going to develop substantial farming, agriculture, and processing and the other things that go along with it without adequate credit available. This whole question of distribution of land is very intriguing to me. The law was passed before I was in Congress and I understand I'm going to have the opportunity one of these days to vote on some sort of a plan that you work out. I hope what I learn this week in Alaska will be helpful to me.

Mr. LINN. I hope so, too.

Senator HUDDLESTON. I can certainly understand the problem of all these competing interests of this land, but I'm principally interested in seeing that agriculture gets its proper share.

Mr. LINN. I think that there are a couple of points to be made about that. One, I think that basically agriculture complements or fits into its competitive position from a realistic point of view with other resource development concepts, and second, I think that from a numerical standpoint—it was pointed out earlier this morning it generally tends to enhance other types of wildlife resources quite a bit.

Senator HUDDLESTON. I'm very much interested, too, in Dr. Logsdon's comparing the value of agriculture potential with the value of the oil potential. I've said in numerous speeches that the U.S. agriculture capacity is to us at least what the oil is to the Mideast and if the

present trends continue, as to population and to food production capacity, somewhere down the road it's going to be the most important asset that anybody has. There's no reason I can see that Alaska can't play a very important part in that.

As other uses for this land develop that would attract people here—if it's manufacturing or whatever you have to have—your agriculture production becomes more important all the time. If you don't keep pace, that gap between what you produce here and what you need is going to get wider and wider, which means that it's going to increase the costs tremendously to feed the people who are here, which in turn means that it's going to be a damper on further development if the cost of living gets too high.

Dr. LOGSDON. I think that's the point that Mr. Linn was making that we probably are not going to starve in Alaska as long as we have oil because we can always trade oil for food, but what happens when the oil is gone?

Senator HUDDLESTON. That's a good point.

Mr. LINN. You cannot eat rupies or rubles or dollars.

Senator HUDDLESTON. That's right.

Senator GRAVEL. Has the Japanese market been explored?

Dr. LOGSDON. We've had a number of contacts. I think you'll probably hear from Mr. Woods at Fairbanks who just returned from a trip to Japan in which he discussed this very thing, and he's so enthusiastic that he's really jumping up and down about right now.

We just heard this morning from a gentleman who said that he had contacted about four or five from the major companies in Japan about the possibility of their interest in purchasing grain, for instance, and each one of them want to know where they can send a letter of credit.

Senator GRAVEL. They might even be interested in financing certain agricultural development projects. Also, we've learned that what's keeping this Nation alive today is our exports. Actually, we're deficient in oil and we wouldn't be able to afford the oils that we're presently consuming if it weren't for the foodstuffs that we're exporting. Alaska is geographically well placed for exporting to Japan. If we can find certain unique products that they would buy from us in quantity, we would then be able to go ahead and undertake some sizeable projects.

Mr. LINN. We are finding, for instance, that our grain may be more palatable in the Japanese market by virtue of production in Alaska than that that's competing with us from Northwest or the Midwest, for instance, on the basis of protein. So I feel that we do have——

Senator GRAVEL. Ours is a higher protein level or lower protein level?

Mr. LINN. Right. Higher. Much higher.

Senator GRAVEL. Then they would be willing to pay more for it than something else. Very good. Well, we'll talk to Dr. Woods and I would hope that those involved in the policy decisions here would pursue this market.

Dr. LOGSDON. There has been some question, of course, as to how much foreign investment that people in Alaska really want in Alaska.

They are invested heavily in the forest industry and perhaps the same sort of thing could be done in agriculture industry.

Senator GRAVEL. We've got all of the police power we need.

Dr. LOGSDON. One of the things, the ideas, that I've played around within constructing the intrastructure would be to designate those Federal lands, tillable lands remaining in Federal ownership for a a 25-year period to the Japanese, and I'm sure they would build the whole structure.

Senator GRAVEL. The ideal situation would be: their money, our management, our employment, and their purchase and our product.

Dr. LOGSDON. I think that's——

Senator GRAVEL. I think they've done that in Sitka where they've put up half the money for the plant. They buy the product and they've only got about two Japanese, three Japanese people in the whole community.

Senator HUDDLESTON. Well, they've done that in other countries.

Dr. LOGSDON. We had a meeting with the financial community about a year ago and their opinion was—the bankers—was that there was not enough capital in Alaska for the development effort. Now there may be with oil royalties coming into the State and there is a law on the books which commits 5 percent of the oil royalties to renewable resources development. We have hopes that this may in time provide sufficient capital to help attract the Japanese capital.

Senator GRAVEL. I'm going to Japan in either October or November. We're leading a trade mission, who would be the best person to take along to make an agriculture inventory of what the Japanese would be interested in purchasing from us.

Dr. LOGSDON. I would think perhaps Mr. Linn who's director of the State division of agriculture might be a very good one for that.

Senator GRAVEL. Well, maybe we can see if we can get a ticket for you. I'll take that up with the Government. Thank you.

Senator HUDDLESTON. Gentlemen, thank you very much.

Senator GRAVEL. I'll make one very brief announcement. We're having a luncheon right after we leave here at the Colony Room of the Frontier Cafe. Everybody who wants to come is invited.

Senator HUDDLESTON. Just one final statement. The record of this hearing will remain open for another 14 days in case any person here would like to submit any kind of written testimony or suggestions. If any of those who have already appeared would like to add more to their statement, send it to the Committee on Agriculture and Forestry, U.S. Senate, Washington, D.C. It will be included in this record.

I found this very interesting and I appreciate the fact that you're here and I thank all the witnesses who have testified.

I believe that concludes our session this morning.

Senator GRAVEL. Except to thank you, Senator Huddleston, for coming. Thank you.

Senator HUDDLESTON. Thank you very much.

[Whereupon at 12:05 p.m. the subcommittee recessed, to reconvene at 3 p.m. at the Schaible Auditorium, University of Alaska, Fairbanks, Alaska.]

AGRICULTURAL POTENTIAL IN ALASKA

TUESDAY, AUGUST 17, 1976

U.S. SENATE,
SUBCOMMITTEE ON AGRICULTURAL PRODUCTION,
MARKETING, AND STABILIZATION OF PRICES OF THE
COMMITTEE ON AGRICULTURE AND FORESTRY,
Fairbanks, Alaska.

The subcommittee met pursuant to notice at 3 p.m. in Schaible Auditorium, University of Alaska. Hon. Walter D. Huddleston (chairman of the subcommittee) presiding.

Present: Senator Huddleston.

Also present: Senator Gravel.

STATEMENT OF HON. MIKE GRAVEL, A U.S. SENATOR FROM ALASKA—Resumed

Senator GRAVEL. My name is Senator Mike Gravel.

I would like to introduce Senator Huddleston. He's here representing the U.S. Senate Agriculture Committee, and has been gracious enough to come to Alaska during the Senate recess.

In addition to Senator Huddleston, from Kentucky, and his wife, Jean, traveling with us are three other Senators, and staff. They are taking this opportunity to visit the North Slope, and Prudhoe Bay, and the community of Barrow, and will be back in Fairbanks this evening.

It's fortunate for Alaska to have this number of Senators and staff traveling in the State. I want to underscore the importance of the staff.

These staff members are in a position to counsel other Senators, which is very valuable when issues with respect to Alaska come before the Congress.

So without any further ado, I would like to introduce my good friend and colleague, U.S. Senator Dee Huddleston, who will chair these hearings. Dee.

STATEMENT OF HON. WALTER D. HUDDLESTON, A U.S. SENATOR FROM KENTUCKY—Resumed

Senator HUDDLESTON. Thank you, Senator Gravel, and to you and your staff, our appreciation for inviting us to Alaska and giving us this opportunity to observe firsthand just what is going on here in the way of agriculture; what the potentials are; and what might possibly be done in the way of Federal programs through research, market de-

velopment, or in whatever way, to assist Alaska in its agriculture development.

I've had a very enjoyable day and a half so far. We started out down in the Palmer area, and saw some of the experimental operations as well as actual farm operations. Today we've been up near Delta Junction. It's very impressive there, what's being done in developing the land and getting it prepared for production.

We believe that the potential is so great here. The potential is here, certainly, to meet the needs of the State of Alaska, and at the same time make a considerable contribution to the U.S. efforts to help supply a great deal of foodstuffs for a good part of the world.

But at any rate, our purpose is not to talk to you. We know that we're not learning anything when I'm talking. We came to hear from you, the people who are directly involved with the situation in Alaska. Everything that we learn during this week will become part of the record of these hearings. Your testimony assists us as we attempt to establish national farm policy. Next year the committee will be devising a new farm bill. These hearings will be very helpful to us.

We know that there are unique characteristics here that are not applicable to the rest of the 49 States.

So without any further ado we would like to begin with our witnesses. I'd like to point out that we are necessarily constrained on our time. Some of you, I'm sure, will have a lot more to say than time permits, so we will keep the record open for an additional 2 weeks. We will receive any further information that any person wants to submit, and it will be added to the permanent record.

We'll begin with Mr. John Carlson, who's the borough mayor of the Fairbanks North Star Borough.

Mr. Carlson.

STATEMENT OF HON. JOHN CARLSON, MAYOR, FAIRBANKS NORTH STAR BOROUGH, ALASKA

Mr. CARLSON. Senator Huddleston and Senator Gravel, it's my pleasure to officially welcome you to interior Alaska and to the Fairbanks North Star Borough. We are honored by your presence and your concern for the agriculture development.

The hearing today should point out to you our concern for the future of agriculture in this area. Concerns such as the availability of land, our gathering of information for detail—in detail, such as water and soil surveys, which enable us to identify the agricultural lands in this area.

These are planning areas in which the Federal Government can become and should get involved in, and could assist us.

I'm sure the testimony today will provide you with the information as to the actual and potential use of agriculture in our area.

It's good to have you here. And, again, we want to welcome you, and we appreciate your coming.

Senator GRAVEL. Thank you very much, mayor.

Is State Senator John Butrovich here?

STATEMENT OF HON. JOHN BUTROVICH, AN ALASKA STATE SENATOR, TANANA VALLEY, ALASKA

Mr. BUTROVICH. Mr. Chairman, Senator Gravel, I do not have any prepared testimony to offer. I didn't think it was necessary. I do think that—I'm not an expert on agriculture. I have never made a living farming in Alaska. I've lived here 66 years in the Tanana Valley, and I've spent—I'm in the middle of my eighth term in the Alaska Senate, and I think that the Federal Government and the State and Territorial government have fallen years behind in the development of basic industry in Alaska. I don't think there's any more basic industry in the world than agriculture. And I think it's being brought to our attention more every day with the shortage of the food supply all over the world, where we're trying to feed half of the world, and if half the world had what we have here in Alaska, they wouldn't need the Federal help.

I—we have a few Ma and Pa farms going, and we have a few other exceptions. And you probably—I think you probably saw one of them today, or two or three of them.

But 50 years ago in the Tanana Valley, we produced a higher percentage of agricultural products consumed per capita than we do today, 50—half a century later.

And that should give you some idea as to how much attention has been given by the Territorial and the State government to the development of agriculture. And also by the Federal Government, because I think it's in the national interest that new areas be developed to produce food. What, with every time you build a superhighway down there, and we build one up here, we take land out of production.

But I don't think we're ever going to have a real agricultural economy in Alaska until land is made available, until the Federal Government will open Federal lands, lease Federal lands on a long-term basis for no other use than agricultural purposes. And when it's determined that it isn't fit for agricultural purposes, then it should revert back to the Federal Government. It shouldn't be allowed to—people should not be allowed to get large pieces of agriculturally potential land, and then after a couple of years subdivide them and speculate with them.

But if we're ever going to have an economy, an agricultural economy, the Federal Government and the State government are going to have to do something about putting lands in the hands of people who will farm. And you don't do it successfully any more on a 160 acres. The Ma and Pa maybe, but as an industry, no, you can't operate a freezing—a freezing plant a week a year and expect it to be a viable economy. You can't have canneries and not know whether or not you're going to get any production to keep them going.

And the way that the farm industry has been mechanized in the last few years, I've been back in the Dakotas, and other States, and watched those big machines come down, and in a few swipes, they've got a field plowed, and it doesn't take too much manpower, but it takes a lot of machinery.

And I think if you'll observe in our valley here, in the Tanana Valley, as you're here, in terms of the south 48, land clearing up here is a cinch. But, nevertheless, as small as our timber is, and as easy as our terrain is to clear for agricultural purposes, most people who want to engage in farming on 160 acres can't cut it. There's no way.

But I do believe that * * * I worked on our State budgets, and at one time in Territorial days, we had an agricultural committee. That fell by the wayside when we got statehood. It got buried in the resources committee, and I can assure you I've been on that committee for at least the last 10 years, and agriculture is given less attention than anything that we take up in that committee. And I think it's a crime and sin because we can raise things up here. We can raise a lot of food. We could ship food to the south 48, it's possible. But, like I—and I hate to repeat myself—you can't do it unless you can give a person enough land so that he can farm and not have to take a job at one of the Army bases and let his wife run the farm.

And I could take a lot more time, sir, but I know there are other people who have—who know more about it than I do. And I want to thank you.

Senator HUDDLESTON. Senator, we appreciate your testimony.

Senator GRAVEL. Yes; thank you John. I would like to bring up an additional question.

Was an agricultural task force appointed at the State level to try and bring new focus on the whole agricultural situation?

Mr. BUTROVICH. I'm sure there is. And I'm sure, Senator Gravel, that they'll probably come up with a study.

But that doesn't put any food in anybody's mouth.

Yes; the Governor has such a force. And they'll come up with reams of paper.

Senator GRAVEL. Is this something that was just initiated?

Mr. BUTROVICH. Yes, sir.

Senator GRAVEL. And is it under the Department of Natural Resources?

Mr. BUTROVICH. Natural Resources, yes.

Senator GRAVEL. OK. Thank you very much.

Senator HUDDLESTON. Dr. James Drew. I'll ask each witness to identify themselves for the record.

STATEMENT OF DR. JAMES V. DREW, DIRECTOR, AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ALASKA, FAIBANKS, ALASKA

Dr. DREW. Senator Huddleston, and Senator Gravel, I am James V. Drew, director of the Alaska Agricultural Experiment Station, University of Alaska.

Today you'll hear testimony from a number of people. Some will deal with general issues with respect to ways in which the Federal Government can be of assistance in developing Alaska's agriculture.

I would like to plead for Federal support for two specific research projects that I believe are essential if Alaska is to become self-sufficient in food production. As it stands now, Alaskans obtain the largest part of their food supplies from other States and are thus required to pay

some of the highest prices for food in the United States. If certain major food items could be produced in Alaska at prices competitive with costs of food production elsewhere, the high cost of food could be reduced. The research I will describe is designed to provide solutions for specific problems that have traditionally impeded agricultural development in Alaska.

Alaska has an extensive potential land base for an expanded agriculture. Recent studies by the Soil Conservation Service, USDA, have identified 18.5 million acres of tillable land in the State. At the moment, only about 17,000 acres of this land are in production. Thus, the potential for crop production on new lands is far greater in Alaska than in any other State.

Several crops, including barely, oats, forages, potatoes, and a number of vegetable crops are well adapted to the agricultural soils and associated climatic conditions of Alaska. In fact, the yield and quality of these crops produced in Alaska equal or exceed the yields and quality of the same kinds of crops grown elsewhere. Increased production of grains and forages in Alaska, coupled with appropriate processing and storage facilities, could also provide an economical, year-round feed base for the red meat and dairy industries.

Moreover, Governor Jay Hammond of Alaska has recently identified the development of agriculture as a major State goal. Plans are underway for an expansion of proven crop acreage in the Clearwater-Big Delta area about a 100 miles southeast of Fairbanks. The Soil Conservation Service has identified more than 200,000 acres of potential agricultural land in this area.

In addition, the recently organized Alaska Farmers Cooperative is interested in expansion of agriculture and agricultural processing in the Clearwater-Big Delta area. Finally, the construction of a major pumping station for the Alaska pipeline in the area at pump station 9 provides a source of substantial quantities of waste heat that may be converted into useful energy for processing operations such as the drying of grains and forages.

Specifically, the Alaska Agricultural Experiment Station has submitted to the Economic Development Administration of the U.S. Department of Commerce a technical assistance proposal entitled, "The Feasibility of Agribusiness Development Utilizing Waste Heat From the Alaska Pipeline: A Modular Systems Approach." Waste heat available at pump station 9 will average a million Btu's per minute at a temperature of 535 degrees Fahrenheit when oil flow reaches maximum capacity. Preliminary information suggests that this heat is substantially more than would be required to dry grain, and may be sufficient, with proper conversion, to dehydrate and pellet forage. Moreover, the availability of high protein fishmeal produced as a waste product of Alaska's fishing industry provides a protein supplement for producing high quality pellets for livestock feed. The use of waste heat in these processing operations can provide, for the first time, a means of offsetting the cool and somewhat wet harvest seasons that have frustrated Alaskan producers of grain and forage in the past.

The proposed research will provide the economic and technological assessment needed in making investment decisions relative to agri-

cultural development in the Clearwater-Delta area, and in other parts of Alaska's interior. It will assess the conversion of waste heat to usable form, the use of grain and storage pellets as livestock feed, transportation to and from the processing unit, and marketing grain and pellets as an animal feed or through a feedlot operation. This study, including an assessment of the necessary marketing infrastructure, is vital if the proposed agricultural development is to succeed.

In addition, the Alaska Agricultural Experiment Station, University of Alaska, and the Alaska Energy Office, Office of the Governor, have submitted a joint proposal to the Energy Research and Development Administration for a study of a broad spectrum of waste heat applications in Alaska, including agricultural applications. The study is entitled "The Economic and Technical Feasibility of Waste Heat Utilization in Alaska: A Systems Approach." Current plans for the transportation of oil and gas as well as the generation of power within Alaska will produce vast quantities of waste heat that can be used in agribusiness, forestry, fisheries and aquaculture, industrial and commercial ventures, and domestic applications.

Our proposal focuses on a major goal of the Energy Research and Development Administration, the transformation of consumption patterns to improve energy utilization, including waste heat. The results of the study will be particularly important to Alaska in terms of identifying and developing energy saving technologies, environmental costs and benefits, and technological capabilities in waste heat utilization. Joint sponsorship with the Alaska Energy Office will facilitate informing end-users about the new technology, and encourage institutional change for implementing the use of waste heat. The study is essential if investment dollars are to be attracted to create jobs, food self-sufficiency, and a stable economy for Alaskans.

Successful completion of the research described in these proposals would benefit Alaskans in that it would provide alternatives for overcoming major economic and technological limitations that have slowed agricultural development in the past. In addition, however, the research is also significant from a national and international perspective.

Modern agriculture in the United States requires increasing amounts of fossil fuels for tractors and irrigation pumps, fertilizers, grain dryers, and other inputs that are necessary to increase food production. Alaska is now in the process of developing its agriculture and fisheries along with the development of oil and gas resources. Consequently, Alaska is in a unique position to develop advanced technology for energy conservation in food production. This technology has application in other parts of the United States and at other northern latitudes where substantial world reserves of fossil fuels occur in association with lands having undeveloped potential for food production.

A number of projections indicate that world population will increase more rapidly than world food production in the years ahead. According to a recent report from the Board on Agriculture and Renewable Resources of the National Academy of Sciences, an additional 25 million tons of grain must be provided each year to feed the current annual increment in world population. The United States

must provide additional food, not only for humanitarian reasons, but to alleviate the fear and violence that accompany hunger in food-short regions. Famine and resulting struggle could involve the United States in another world conflict.

From our own perspective as U.S. citizens, it is important that we increase food production to help meet increased world demands for food. If we do not, our food prices will continue to rise even faster than in the past 2 years. Some economists have suggested recently that the near trebling of U.S. grain prices following the Russian grain sale in 1972 was a more immediate cause of the tremendous surge of inflation in the United States in 1973 and 1974 than was OPEC's quadrupling of the price of oil. During this period, bread sold for over a dollar a loaf in Alaska at a time when our Government officials declared that such a price in the United States was unthinkable.

Finally, the United States must retain an effective position in world trade. At the moment, food produced in the United States and exported to foreign markets provides the only real hope for maintaining a balance of payments in international trade. We now buy elsewhere approximately 50 percent of the oil used in the United States, but we provide some balance by exporting about 30 percent of the food produced within our shores.

I believe it is important for the Subcommittee on Agricultural Production, Marketing, and Stabilization of Prices to know about Alaska's need to produce food, and the enormous potential of the State to contribute to total U.S. food production. Federal assistance through the Department of Commerce and the Energy Research and Development Administration for our proposed research on a systems approach for agricultural development, including energy conservation and the utilization of marine byproducts, can increase Alaska's food production and help meet international needs for food. Through the results of this economic and technological assessment, agriculture will be able to develop self-sufficiency for certain major food items. I hope we will be able to obtain Federal support for this work.

I'd like to add three additional comments with respect to some material I would like to include for the committee.* One is a publication dealing with an assessment of agriculture in Alaska, 1976 to the year 2000, published as a review of business and economic conditions by the University of Alaska.

The second is an Agricultural Experiment Station publication entitled, "Creating a Northern Agriculture," which defines parameters of agricultural potential in Alaska.

The third is a resolution, which was passed by the National Association of Conservation Districts during the meeting of that association in Hawaii on February 6, 1976. This association had approximately 4,600 members present at the Hawaii meeting. And the National Association of Conservation Districts has a total membership of more than 2 million people. The specific resolution that was passed dealt with arable lands in Alaska, and recognizes specifically the need to protect some or all of Alaska's potential arable lands, range lands and

*See p. 62 for the above-referred to material.

productive forest lands for agriculture, forestry, and other multiple-use development.

Thank you.

Senator HUDDLESTON. Thank you, Dr. Drew.

Certainly the prospect of utilizing waste heat from the pipeline is an intriguing prospect. What is the status of this research right now? What has been done beyond just the suggestion that it's possible?

Dr. DREW. Well, at the moment, we have had some research here which demonstrates that the use of waste heat, or at least the use of heat to warm soil, can have a substantial influence with respect to crop yields.

We have not had any research dealing with a specific conversion of waste heat to a form which would be satisfactory for doing things such as grain drying, and for forage pelleting.

However, the Alyeska Pipeline Co. has agreed to do the engineering design work necessary for that kind of operation, if, in fact, the Department of Commerce's Economic Development Administration approves the proposal for the feasibility study.

Senator HUDDLESTON. At what points would this heat be available, at the pumping stations, or at the——

Dr. DREW. Yes, that's correct. The pumping stations are the major sources of waste heat at the moment. The stations are powered with gas turbine engines which use a low grade fuel, but are relatively inefficient. Consequently, substantial amounts of heat are available from them.

Senator HUDDLESTON. Do you see the pipeline and the potential gas line also as offering additional prospects for some fertilizer plants here?

Dr. DREW. Of course, the oil pipeline will not have any particular implications with respect to fertilizer, but if a gas line does go through Alaska in such a manner that a portion of or all of Alaska's share of royalty gas can be extracted within Alaska, then certainly plants which would produce nitrogen fertilizer would be extremely possible. And obviously could benefit any——

Senator HUDDLESTON. That would make a substantial contribution, wouldn't it, by lowering the cost of fertilizer?

Dr. DREW. It certainly would. At the present time, the nitrogen fertilizer that's produced in the Collier plant on the Kenai Peninsula is actually less expensive and it's available to farmers in the Pacific Northwest.

Senator GRAVEL. I'd like to pursue that item a bit further.

We received testimony in Palmer stating that they weren't able to use the fertilizer coming out of the Union plant, because it's just nitrogen, and that they apparently need a different blend.

In talking today with some of the people in Delta, they made essentially the same point, that they find they can get nitrogen, but they need some kind of a mix. The new cooperative in Delta is working with an outside farmers' organization to form a proposal to utilize the State's royalty gas.

It sounds like quite an undertaking. I don't know the viability of the organization outside, but I would hope that in addition to preparing a study on the possibility of utilizing the waste heat, which is

obvious, we will work to make gas available to the interior farming community. And we should look to the economics of what that will mean. If we don't have the proper mix for the existing fertilizer requirements, I'm sure that we could design production of the needed blend into any oil company's activities in this State. It just seems preposterous to me that we have vessels coming to Alaska carrying fertilizer, and we have vessels leaving Alaska with fertilizer. And that we must buy the stuff from outside. It is just the greatest anomaly in the world.

And so if we, in the policy position, could be informed as to what that mix is, what that mix would cost, then we could begin to use our offices to pressure, on a voluntary basis, these companies to see that this is available for purchase here and if it can't be done that way, then of course it can be done through legislative means.

So, we're deficient in our capability of acting by the fact that we don't have needed expertise. Meanwhile we continue to buy from outside, the same product, slightly modified, which we ship out. I think its ridiculous. First, the fertilizer issue, I think, cries out for a great deal of technical attention right now. Second, the other area is the study concerning availability of gas and what that will mean, we'll be talking to Dr. Wood soon. I have great interest in hearing about the success of his trip. The study concerning our competing with the lower 48 in agribusiness is really most difficult. Judging from their capacity compared to our apparent capacity; it doesn't seem we can compete. From a lay person's point of view, the proof of the pudding is in the tasting, and we haven't tasted. We haven't had any real success in agriculture, and that's because we've not explored all the possibilities. We have at our doorstep a waterborne contiguous community, Japan, which imports almost all of their goods.

And I would think that that would be a natural marketplace.

What studies have been done with respect to economics? Can anybody come forward with a paper today, and say that the cost of barley is x amount at the Port of Anchorage or the Port of Seward in comparison to the cost of barley in San Francisco or Seattle? Is there any completed study available one could use in talking with possible foreign markets that enable one to say, "What are you paying for your stuff?" "This is what we can deliver it for to this point." And if we're competitive, or we're better than competitive, then I think we would have a future in agricultural export. But if we're not—if we can't even meet those rudimentary economic requirements, then we're all dreaming, and we ought to realize that.

Dr. DREW. Well, I think you're correct. And the facts of the case are that we can get scattered pieces of information, of course. We know barley prices in Seattle. We know barley prices in New Orleans, We know what is it somewhere else. We can get scattered bits and pieces of information about transportation costs. We have no integrated study, however, which puts all these things together in a single system, and shows us just what has to be done with respect to looking at transportation costs, looking at possible trade advantages that can be worked out through agreements with a country like Japan and the United States, looking at various kinds of assistance that Government can provide in terms of transportation, tax structures, and so on. And

these are all part of working out a total system to really make a decision as to whether or not agriculture can be successful. I think we have enough advantages here now with respect to the fact that Alaska is an energy rich State. Modern agriculture, to be competitive today, is highly energy intensive. There's absolutely no reason why we can't take advantage of the energy resources that are present here in Alaska in terms of fossil fuels and fertilizers, to make use of the soils and land that we have to end up with an agriculture situation that will compete with other places.

Senator GRAVEL. Do you counsel with this task force that's recently been appointed by the Governor? Do you have any contact with them?

Dr. DREW. Yes; I am a member of the task force.

Senator GRAVEL. Well, let me just suggest that while you are studying various possibilities, bear in mind, one of the ingredients that may change is competition. I think we're in a new era of possibility with respect to agriculture because of the blessing of our energy resources. But unless global economics are considered, which is what concerns us, in pulling forth this information on heat, it isn't going to be terribly relevant to an economic decision to be made by some entrepreneur that may bring this to some fruition. It will just be another Government study that will have academic value but won't have any economic value because nobody will be able to translate the findings in a broad base economic sense.

I need somebody to do some pretty fundamental economics. Then if we're off the target by x number of dollars in competitive position, then we start focusing what is available locally. When those studies come into being, you know if you've got a contribution positive or negative.

But unless you start with very rudimentary economic or commercial data, these studies of things are just going to be more studies on the shelf.

Dr. DREW. And I think that's the significant thing about the two studies which I've outlined in my presentation. Neither of those studies are primarily technologically oriented. Both studies are aimed specifically at determining the economic feasibility for large scale agricultural production associated in this case with the application of waste heat.

One cannot complete that study without all the other things, including the marketing, the intrastructure necessary for transportation, complete working out of these—all of these——

Senator GRAVEL. So that would be part of that definition of the study?

Dr. DREW. That's correct.

Senator GRAVEL. Good. I didn't understand that.

Senator HUDDLESTON. Do you have any concern about the availability of land for farming purposes that the Senator talked about?

Dr. DREW. I think everyone in Alaska——

Senator HUDDLESTON. Do you have enough land dedicated to agriculture?

Dr. DREW. I think everyone in Alaska has concern on this issue. Part of the problem is that Alaska is big. And the identification of the lands that are specifically suitable for agriculture is not an easy task.

And it's not an inexpensive task. It's one that requires a substantial amount of effort. And people who are placed in the position of making decisions about just which lands ought to be preserved for agriculture are somewhat stymied by the fact that we really don't have the detailed inventory information available to us yet that shows where that land is. After all, if our total amount of land which is estimated to be suitable for cultivation now is as large as the State of Kentucky, you can see that we have some way to go to complete the detailed inventory.

Senator HUDDLESTON. I believe that the Federal-State Land Use Planning Commission has been working on that project. And they're now at the present time taking inventory of the land.

Dr. DREW. That's true. Part of the problem that that Commission faces is the fact that they do not have resources available to do actual inventory. They're doing assessments on the basis of the current data base which is available to them. And in many cases, that's not sufficient.

Senator HUDDLESTON. Of course, if you have a viable agricultural economy where the profit potential was reasonably good, you would undoubtedly see a lot of the land being devoted to agriculture which might otherwise be devoted to some other purpose.

Dr. DREW. That's true. And I think it's incumbent on us all to try to develop the sort of demonstration of that economic viability in order to see things begin to happen. I think that once that does happen, the State, itself, owns sufficient areas of land which could be made available to farmers, exclusive of the land which may come under Federal review and management.

In addition, the Native corporations in Alaska have a substantial amount of land, which could be economically viable for agricultural purposes. And I think we would see agriculture developing there. We have a way to go.

Senator HUDDLESTON. Do you have any further questions?

Senator GRAVEL. No; thank you.

Senator HUDDLESTON. Thank you very much, Dr. Drew.

Senator GRAVEL. Thank you, Doctor, very much. I wish you success on your endeavors.

Senator HUDDLESTON. We're very honored to have the president of the University of Alaska appear, Dr. Robert Hiatt.

Senator GRAVEL. Let me just say before Dr. Hiatt starts that he's the person that had the wisdom of seeing the great benefit of Alaska. He came from Hawaii to Alaska.

STATEMENT OF DR. ROBERT W. HIATT, PRESIDENT, UNIVERSITY OF ALASKA, FAIRBANKS, ALASKA

Dr. HIATT. There's some people who would doubt the wisdom of the move.

Well, Senator Huddleston, and Senator Gravel, let me take this opportunity before I provide my testimony to issue an official welcome to this parent campus of our University of Alaska system, which now contains some 10 campuses around the State.

I was asked to provide testimony with respect to the Federal support needed for agriculture in Alaska, and indeed that's what I am intending to do. There are many other people here who are agricul-

tural experts, and I've just followed one, who can give you many more of the details of the technology of agriculture.

I am extremely pleased to have this opportunity to discuss the potential role of the Federal Government in assisting the State of Alaska in its efforts toward food self-sufficiency.

Alaskans today import about 95 percent of the food they consume. The significance of this virtually complete dependence on food shipped from elsewhere is evident to all Alaskans each time they pay the weekly grocery bill. Perhaps you saw the implications as you examined prices in restaurant menus during your visit here to the northland.

It's not surprising, therefore, that interest in developing Alaska's agriculture is increasing both within the State, and to a certain extent, outside the State. In the last session of the Alaska State legislature, for example, 32 bills related to agriculture were introduced. In addition, Governor Jay Hammond recently announced a positive State policy for rehabilitating Alaska's fishing industry and for developing agriculture.

And the committee that you just spoke about is one of the initial steps in implementing that policy.

Nevertheless, our agricultural situation in Alaska was summed up in the 1976 Yearbook of Agriculture, published by the U.S. Department of Agriculture as follows:

> There are serious limitations, as well as strong potentials, for agricultural development in our largest State.

As Alaska moves toward implementing agricultural development, Federal assistance is essential in overcoming the serious limitations that have hampered Alaskan agriculture in the past. Our strong potentials will be realized only if agriculture in Alaska is permitted to develop so it can compete with the massive, efficient production of other States. When this development occurs, food will be available at prices commensurate with food costs in other States.

The Federal Government can be of substantial assistance as Alaska struggles with the difficult task of developing this agriculture. At the same time, Alaska must meet the needs of an expanding population and the extensive development of energy resources for the rest of the Nation. Increased Federal assistance for agricultural development in Alaska is needed in the areas of resource inventories, improved transportation, economic analyses, and financial assistance to farmers.

I'd like to first talk about resource inventories. Traditionally, there's been a strong Federal role in developing major inventories of renewable resources from other States. The Soil Conservation Service, for example, has provided major support for extensive soil surveys throughout the lower 48. These surveys have been used by State agencies and the private sector to plan, improve, and expand the agricultural program. At the present time, Alaska is attempting to plan the use of enormous areas of land with a bare minimum of information about the distribution and the behavior of Alaska's soils for agriculture, forestry, rangeland, or other uses. Soil inventories are essential if Alaska's potential agriculture land is to be identified and protected from encroachment and preemption for noncompatible

uses. Federal support for the soil survey program of the Soil Conservation Service in Alaska should be markedly expanded. Moreover, the supporting program of research in the soil, water, and air sciences by the Agricultural Research Service should be substantially increased.

The Forest Service has provided surveys of timber resources and rangeland vegetation on public and private lands throughout the United States. In Alaska, vast areas of forest and rangeland occur in existing or proposed national forests and in the private ownership of Native corporations. The need for timber and rangeland inventories in these areas is enormous if management plans mandated by Congress are to be based on factual information. Federal support for forest and rangeland inventories and research in Alaska should be substantially increased.

The Bureau of Land Management has completed detailed inventories of rangeland in the Western States to provide a resource base for managing grazing leases. Alaska has some 10 million acres of rangeland suitable for domestic livestock, and some hundred million acres for reindeer grazing. Nevertheless, there is virtually a complete lack of detailed inventories of Alaskan rangeland for assessing the carrying capacity of the rangeland. The Bureau of Land Management should be funded to substantially increase range inventories and research.

Next, improved transportation. Agricultural development requires adequate transportation. Studies have been completed to extend the Alaska Railroad to Tanana, to Delta Junction, and to the Canadian border. Conceivably, the railroad could be linked with the Canadian Railroad to provide rail transportation from Alaska to the Midwestern United States.

The existing Alaska Railroad will provide rail transportation for proposed agricultural development near Nenana. Expansion of agricultural development in the vicinity of Delta Junction would be facilitated by extension of the railroad to Delta Junction. In both cases, reasonable backhaul rates on the federally owned Alaska Railroad would be of substantial benefit to agricultural development of these areas.

In addition, primary and secondary highways are essential if adequate transportation is to be provided for agriculture. The increased Federal assistance in highway construction would help to promote agricultural development in Alaska. However, adequate soil and vegetation inventories are essential for planning the system of highways and roads to minimize the effect on the environment and to maintain the esthetic values of the landscape.

Next, economic analyses. In order to move toward food self-sufficiency, Alaska must develop agricultural production that is large and efficient enough to compete with food production elsewhere. The development is impossible without a detailed analysis of market conditions both within Alaska and in export markets. The Economic Research Service of the U.S. Department of Agriculture should be funded to provide a major contribution to the analysis of export markets for Alaska.

The agribusiness complex in the United States processes, packages, and transports more agricultural products than anywhere else in the world. Fitting a developing agriculture in Alaska into the system

requires economic assessments and analyses that go far beyond the assessments that were necessary as agriculture developed in the other States. Large organizations such as petroleum companies or major governmental agencies have correspondingly large staffs to provide economic analyses for major developmental programs. However, individual farmers and businessmen interested in developing agriculture in Alaska have no staffs to prepare this kind of assessment.

Consequently, the Alaska Agricultural Experiment Station of this university prepared a research proposal to develop the economic analyses necessary to plan large-scale agricultural development. First, the proposal planned to aggregate individual crop and livestock system data, including capital, labor, and transportation requirements.

Next, the alternatives of farm size, land tenure, taxation, and subsidy policies were to be analyzed relative to crop and livestock systems. Finally, an objective summary assessment of development strategies was to be developed considering both benefits and costs of the projected agricultural enterprises.

The proposal was reviewed by the Agricultural Research Service, the Economic Research Service, the Economic Development Administration, and the National Science Foundation. These agencies declared that the proposal was sound, but concluded that it did not fit within their current programs and priorities for funding. Specifically, they stated that the proposal did not meet regional or national needs.

Of course, it's difficult for Alaska to meet the needs of another geographic or climatic region when Alaska is not contiguous with any other State or region in the United States. In light of the world food shortages and the need for U.S. food exports in the balance of payments, however, it would seem that Alaska's potential for food production is important in terms of national needs. In fact, support for the assessment of large-scale agriculture in Alaska is probably more critical to national needs than the substantial support given to research or increasing food production in areas where yields are already pushing maximum limits.

Increased Federal assistance for the University of Alaska to develop the economic assessments necessary for correct decisions on agricultural development would go a long way toward making Alaska self-sufficient in food production.

And, finally, financial assistance to farmers. Federal assistance has been traditionally provided to farmers in other States for financing agricultural enterprises. The Farmers Home Administration, for example, is a Federal agency that could provide financial assistance to farmers for developing new lands in Alaska. Under present guidelines, however, the funding arrangements permitted by the Farmers Home Administration are too low to meet the needs for developing new land.

Meeting financial requirements for developing extensive areas of new agricultural land is a problem that has not been faced by the Farmers Home Administration in recent years in other States. Consequently, funding guidelines are adjusted to agricultural land already in production in areas with a fully developed agricultural infrastructure. A revision of these guidelines for Alaska could make financing available for agricultural development in Alaska.

In summary, the development of new lands for agriculture in Alaska is neither easy nor inexpensive. In modern agriculture food is produced through a complex system of technology, including soil management, transportation systems, power, fertilizers, machinery, processing, storage facilities, financing, marketing and farm management skills. As a university president, I am fully aware of the funding constraints we all face in our respective areas of responsibility. Nevertheless, Alaska's increasing population cannot walk through the wilderness and find over the next hill a fully developed agriculture ready to supply a bountiful harvest of crops and livestock at low cost.

To become food self-sufficient in Alaska, we must develop our strong agricultural potentials. Increased Federal assistance can provide a major thrust toward this goal.

Thank you very much.

Senator HUDDLESTON. Thank you, Dr. Hiatt for a very fine statement.

I might say that the Senate Agriculture Committee has taken cognizance of the need for inventorying our land throughout the entire United States. And we have voted a bill out of the Senate, which is now in the House Agriculture Committee, that will require the Agriculture Department to do just that. And to present to the Congress a plan for the utilization of our land, indicating what its best use is, indicating how we're going to protect it, develop it, and utilize it.

Hopefully, that'll pass, and that could be very helpful to the problem that you've indicated here.

I think you've stated very correctly and adequately the uniqueness of the situation here that just simply doesn't lend itself to the kind of programs that are developed in the lower 48. And that's the kind of thing we really need to remedy. It certainly would not be a unique endeavor on the part of the Federal Government since we are right now, as you know, spending a great deal of money and effort to help the so-called Third World countries develop their food production capacity in order to help meet the needs of the world which is projected to be in a shortage position somewhere all the time.

It doesn't seem to me that it's unwise policy to develop the production capacity of our own States I think this ought to be our first objective.

Dr. HIATT. In this regard. Senator, when I used to be in Hawaii, we frequently said it would be much better if we were a foreign country in terms of getting the Federal Government to provide assistance.

And Alaska, I find, is no exception.

Senator HUDDLESTON. I'm sure that's true. You mentioned that with some additional funding, the university could do more in your economic research. Could you elaborate on that some? Also mention other areas in which the university might be equipped to provide the necessary expertise and research that would help find a solution to these problems, and help develop solutions.

Dr. HIATT. You may have been made aware of the fact that as a land grant university, we really didn't start with an agricultural program. Agricultural research in Alaska was actually a Federal program in earlier years and became a university program not so very long ago.

Since I've been here—only 3 years—and I know that Senator Gravel knows this, because every once in awhile I write a letter to him about it, there's been a continual diminution of the Federal support program to agriculuture here. In other words, the number of people the USDA has here and the amount of money that they're spending here are gradually lessening. Not so long ago, the USDA was about to curtail the only position that maintains any kind of agricultural marketing inventory in the State. These individuals were Federal employees attached to the U.S. Department of Agriculture, but posted here with the university.

As I say, this program has been continually going downhill, and we feel that, rather than going downhill, we ought to be trying to go up, because, as I have mentioned, this really is the only place within the United States where new agricultural potential is possible.

Senator HUDDLESTON. I might say I tried to add $100 million to the agricultural appropriation for research during the debate on the current appropriations. I was not successful.

Dr. HIATT. Well, I realize that we all have problems this way, but there has been a substantial amount of economic work done here by the agricultural experiment station. Senator Gravel just made a very good statement about the need for a great deal more economic research being done. Unless you know what your inventory is and what your economic possibilities are, you don't go very far in any business. And——

Senator GRAVEL. Dr. Hiatt, I want to say I was very impressed that you had already requested funds to do exactly what I was suggesting, and were turned down. Your statement that certain agencies maintained that your proposal did not meet regional or national needs, really strikes a responsive chord in me. And I think that this hearing is going to help dispel thoughts that Alaska needs are not regionally and nationally significant. The new ingredient of energy has altered the entire dynamics of that situation and now we've got to get the Nation, on a priority basis, to take a fresh look at the situation, because it's a new card game. I think there is archaic thinking happening at the national level. Your statement ties it very well together.

I would ask for no more than what you've already tried to do. And I think that this is certainly our responsibility on a Federal level, to try to change the existing climate.

Dr. HIATT. This is why we appreciate the type of visit that you're making now, because it's quite easy—I've been in the Federal Government and I know how it is to turn off proposals when you don't have money. You use whatever excuses seem best at the time, but the point is that Alaska's not just another State. I think this is a very important take-home point, and you might be able to convince your colleagues of this. I don't really consider it a State, but rather it's a developing nation in many ways. I believe we have to treat it with the same parameters of consideration as we do many of the Third World countries into which we are, in effect, pouring a good deal of money.

So, the State at the moment, I think, is doing what it can in the support of its agriculture. It probably could do more, but we are constrained by other requirements in the State at this time, and par-

ticularly with the current development offshore, which really won't bring much money into the State but, instead, a lot of responsibility. We need more assistance now in areas of renewable resources such as agriculture, which are the newly developing potential areas of wealth and work. You know, of course, that energy resources which are already pretty well known and will be extracted shortly.

I really have great faith in the future of agriculture in Alaska. It's not the frozen north that so many people believe it to be. And there are strains of plants that have been developed by the agricultural experiment station which grow beautifully here, and the yields are as great or greater than for most places in the lower 48.

Senator HUDDLESTON. One thing, Doctor, that we've been struck with is—we've talked to practicing farmers in the Palmer area and in Delta Junction, also—that we're almost faced with a kind of a "which came first, chicken or egg" situation. We can't really get agricultural production going until there's a market, but we can't develop markets until we have production.

Do you see any way that the Federal Government could help in the establishment of processing plants that would give an immediate use for the product of the farmers?

Dr. HIATT. I'm afraid I can't really speak very intelligently on that. We've had a number of cases presented and I have talked with people who wanted to establish processing plants or other kinds of packaging operations in Alaska and the problem basically was a steady source of supply of materials. And with an assured source of supply of food materials I don't think they need much special help. I mean to say that they can go to Alaska and finance themselves once they're assured of farm products. But our big problem is really getting enough land in production, that is, sustained production, to make the process go. I think Senator Butrovich put it very well—that Alaska is not a place for the stump farmer to make it. Nobody on 160 acres is going to make much of a living in Alaska in agriculture. In my view, it's a country that's going to take vast sums of money and gigantic agricultural enterprises.

That's why, gentlemen, that this concept of utilizing waste heat, putting more grain into production, and the utilization of fishmeal to pelletize high protein, high energy animal food looks like a worthwhile major type of undertaking that, if properly studied out and financed, can do a great deal for agriculture as well as the fisheries industry.

Senator GRAVEL. Thank you very much, Doctor.

Senator HUDDLESTON. Thank you, Dr. Hiatt. I appreciate your coming, and allowing us to use these wonderful facilities.

Dr. William Wood.

STATEMENT OF DR. WILLIAM R. WOOD, EXECUTIVE VICE PRESIDENT, FAIRBANKS INDUSTRIAL DEVELOPMENT CORP., FAIRBANKS, ALASKA

Dr. WOOD. Senator Huddleston, Senator Gravel, I am William Wood, president emeritus of the University of Alaska, and for the past 3 years the nonpaid executive vice president of the Fairbanks

Industrial Development Corp., which has some 126 member firms of the business, professional, industrial types, and represents about 10,000 full-time year-round nongovernment jobs in District 20 of the State of Alaska.

What I'm going to say will be partly redundant; I need to use a broad brush before I can get into one or two specifics that I think you might be interested in hearing.

In a sense Alaska is a "sleeper" as far as agriculture is concerned. It has more to contribute to the world's food supply system than partial or even total self-sufficiency. Let me outline just one feature of Alaska's potential role in the world's food supply scenario. Let us look, for example, of the need for cereal grain in Japan's northern island, Hokkaido, for the ports of Hokkaido are nearest to the ports of Alaska.

First, Alaska has according to a recent U.S. Soil Conservation analysis, 18.551 million acres of tillable soils, that's 7.5 hectares. Through years of USDA and University of Alaska experimentation, it has been demonstrated that high quality cereal grains can be produced successfully on these Alaskan soils. High quality and good yield, as others have pointed out. Good yield barley, for example. Incidentally, it's believed that the 18.5 million acres of tillable soils in Alaska, about twice the size of Iowa's farmlands, comprise the largest area of new lands suitable for growing a cereal grain in any country of the world today. Vast acreages of Alaska grazing lands are in addition to this.

Second, there is a need in a hungry world, growing more hungry year by year, for all of the cereal grain that could possibly be produced in Alaska. The world population was 3 billion in 1960, and 4 billion in 1975, just 15 years later. The present rate of growth in world population is 75 million annually, anticipated to increase to 100 million annually by the end of the present century. Of the 75 million newcomers to the planet Earth each year, about 15 million are estimated to be middle class, such as most of us in North America. Each of us consumes annually about three-quarters of a metric ton of cereal grain. Sixty million newcomers are in the poor developing countries where cereal grain consumption is only about one-quarter of a metric ton per person.

Combine these two for an annual need for an additional 26¼ million metric tons of cereal grain. For each and every year an additional 26½ million metric tons! This is an inescapable fact of life. A portion of this food, it seems to me, must come from Alaska. And there is a market for what Alaska could produce. I have mentioned Hokkaido. Just recently I spent 16 days in Japan and Korea, asking the question, "if Alaska could produce certain agricultural products, would you be interested in buying? What quantities might interest you? In dry grain or in pellet form?" I found out in talking with the Governor of Hokkaido, personally, in a one-to-one situation for about 30 minutes, and later in conferring for more than 2 hours with some 15 ministers and technical experts, that there is a genuine interest in whatever Alaska can produce. Then I mentioned that we could produce some 500,000 bushels of barley, of good quality, by next September, the year 1977. A member of the group checked statistics, and commented:

"Dr. Wood, we are very interested, yet that amount represents slightly less than 1 percent of the barley which we import this year for animal feed to the island of Hokkaido alone."

So I suggested that we might be able, with the strong support of the Alaska State government, to open up some of our new lands, perhaps 50,000 acres in the next 3 years. That would provide on their present level of imports, about 5 percent of the barley consumed in Hokkaido. If we can go beyond that in another 3 years of a 6-year development plan, we could produce, perhaps, 5 million bushels of barley, or about 10 percent of their present level of consumption.

But what I found out later complicates this picture a good deal. I don't need to dwell on the fact that we're fully unready to deliver or to sign a contract on a 6-year basis of this sort. But we can get there. Then I learned a bit about the impact of our 200-mile fishing regulation. I mention this, not that I am not in favor of this regulation, but only to point out that there is a dimension to it which ties in to Alaska's obligation to make a contribution to the world's food supply through agriculture. Japan has been taking from the Bering Sea, which is one of the half dozen of the great fisheries in the world, some 2½ million metric tons annually of pollack.

As you so well know, Japan has an extraordinarily sophisticated modern fishing fleet and techniques for fishing. The fishing industry has provided very cheap food for the population of Japan. The Bering Sea catch, I am told, constitutes roughly 14 to 17 percent of the protein which the Japanese consume annually.

There is no way that this amount of protein can be replaced by a wild harvest of the seas. It isn't there. There is a potential, however, aquaculture. And, again, it's been pointed out to me that one of the few major possibilities for large-scale aquaculture is in that same great food stream that provides a welling up of the nutrients from the bottom of the sea along the coast of Alaska, its continental shelf adding the Aleutian Chain, and in the Bering Sea. And this is a place where aquaculture could not only replace the wild harvest, that is almost at its maximum exploitation potential now, but it could add a great deal to the total resource to be derived from the oceans.

When we talk about research for Alaska, we must not overlook the potential of "fish farming," if you please, farming of the seas. Alaska is one of the prime prospects for this.

There is market for what we can produce in Alaska in terms of the cereal grain. I see no reason why we should hesitate to attempt to supply that market. I came back reassured that we wouldn't be planting in vain those many acres around Delta, or Nenana, or Fairbanks, or North Pole, or the Upper Susitana, or the Upper Yukon, or the Kuskokwin. We wouldn't be planting in vain. There is a market.

The task, now, is to clear the land, break it, plant it, fertilize it, harvest the crop, clean and dry that crop, get it to tidewater, and onboard an oceangoing vessel for export. In that process we shall take care also of the self-sufficiency issue, of feeding, at least in part, those who choose to live in Alaska. I doubt that it's possible to achieve self-sufficiency in food for Alaska, except as a companion to, or perhaps even as a byproduct of very large-scale production for export to the nations of the rim of the Pacific.

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I do not see that we are in any way competitive in this attempt with other major growing areas of North America, United States, and Canada. We would simply be supplementary to their very best effort which indeed has been spectacular over the years. No other place in the world has even begun to match that success in agricultural production. We would be supplementary. Our contribution would be relatively small, perhaps, yet we do have the largest new lands area available in the world. These lands are suitable for growing cereal grains.

I'm confident we can put into place the necessary infrastructure that is required to make this successful. People interested in food production must have access to Alaska lands. At the present time, of the 365 million acres in Alaska, there is something less than 1 million acres in private ownership. The rest is in Federal and State hands, including a little bit in the hands of the University of Alaska. There are 40 million acres or so coming into the hands of private Native corporations, but we must have access to those lands that are suitable for agriculture, and have them dedicated for agricultural purposes. I could say something similar about the forests of the interior Alaska. I remind myself, when I look at the entangled situation of the lands of Alaska, that a national park may provide food for the souls of a few, but leaves empty the bellies of the many. May this reality weigh heavily upon those who, at the Federal level, and at the State level, will make the ultimate decision of what lands are to be reserved in Alaska for the production of foodstuff needed in a world that becomes increasingly hungry year after year.

These three things, I think, must always be before us as we push ahead on developing agriculture in Alaska, particularly cereal grain growing, which is a rifle shot on just one thing. Many other things are possible. To be successful production has to be in large volume, primarily for export. Our local market isn't big enough to sustain a successful agriculture under today's conditions.

Second, the product must be of high quality. Whatever it is that Alaska produces must have the best of quality control mechanisms built into the process.

And, third, Alaska must demonstate the ability to sustain a high volume and a high quality yield.

Now, what can Government do? The State has an enormous task facing it. Although I am a strong advocate of free enterprise, I realize that to develop a sound agriculture in Alaska, the State must play a major role in making the lands available and putting up the capital for clearing and breaking. In addition, the State has a role to play in establishing sound processing and marketing arrangements. Perhaps we are faced with the necessity of having some type of an Alaska trading company, for I cannot see that the commodity trading companies of the lower 48 taking much interest in the small scale beginning that we should have in cereal grain production in Alaska.

There is a role that the Federal Government can play. One, please help in making Federal lands suitable for agriculture available for agricultural production, and don't, if you can avoid it, lock it up in national parks, wilderness areas, and the like. We need those, but they are not the farmlands that should be identified, and, in my judgment, withdrawn first.

Now, the second thing that the Federal Government could do is avoid in every way possible any further piling on of regulations. I look at the 64,000 pages of regulations in the Federal Register now under which we all live in this land of the free and the home of the brave, and I wonder how we can continue to support the burden. So, no more regulations. Policies, yes. Regulations, no. Just establish the conditions that constitute opportunity for successful enterprise.

The third thing the Federal Government ought to take an interest in is helping the State of Alaska develop promptly adequate port facilities and bulk storage and load capabilities. This we have to have. It is doubtful that the State can carry this burden alone, and I'm sure that at this particular stage, free enterprise is not going to. Later on they'll pay for it, but not in the beginning. They'll pay for it through new taxes, new jobs.

We have in Alaska the need then for cooperation with Government, both at the Federal and at the State level. But I hope that you'll think through what the forms of the cooperation are to be. Give us no more band-aid "cures", little loans for an individual to go broke before he gets started. Do the significant things that will make it possible for us little people to work hard and earn a living from agriculture in Alaska.

Not only do we have land, we have the water for irrigation. Mexico now has a total of 2½ million acres in irrigation. We could irrigate our entire 18.5 million acres. We have the water. We have the source for the fertilizer, not only do we have the natural gas in abundance, if we ever get a right to process it in our State, but we also have the limestone deposits and the phosphate deposits totally undeveloped. We could make any form of fertilizer that our marginally cool soils demand. We can make it here.

I think that this is probably all that I have to offer. I'm reminded that in 1970, I believe it was, maybe I'm off a few years, Japan considered itself 82 percent self-sufficient in food. In 1976, it is 40 percent self-sufficient in food. It is searching the world for more food for its people. This is just one country and it is fairly highly developed. Japan is searching the world for a source of additional food. Alaska is its nearest neighbor that has the potential to supply a portion, a small portion, of that need.

Senator Huddleston, Senator Gravel, I hope that we get on with the job rather than studying it to death. Let us not concern ourselves more with regulation and tax income that could be derived from the effort than from the production of the food that is needed in the world.

Thank you very much.

Senator HUDDLESTON. Thank you, Dr. Wood. I think you detailed very well where the assistance is needed, and can be helpful.

I might ask one question, I know Senator Gravel's very much interested in this aspect. In your contacts with the officials in Japan, were you given any indication as to what the next step ought to be from this end?

Dr. WOOD. Yes; I think that we have got to organize. The farm cooperative down in Delta is a beginning in the right direction. There's no question in my mind that cooperative could produce by next September in the Big Delta area a half million bushels of grain. But getting it from there to tidewater, getting it stored and dried, and

loaded on board an oceangoing vessel, and still be competitive with whatever the world market range may be, is beyond the present capability of the local cooperative. We've got proximity going for us, and we've got big lands going for us, but all the little detail in between is an Alaskan task that has to be accomplished by Alaskans. For the port and port facilities, however, we need help from Uncle Sam.

Senator HUDDLESTON. But your impression was that if this could be accomplished, the market would be there?

Dr. WOOD. Yes, Hokkaido, for example, would like to have a long-range assurance that we can live up to a commitment, but I think it quite possible they would sign a contract for this 6-year spread. I'm talking about growing into a production of roughly 5 million bushels of grain, or 50,000 metric tons by 1982 or 1983.

Senator GRAVEL. How many acres would it take for us to do that?

Dr. WOOD. I think about 100,000 acres. Now, let me add one other thing. A group from the university was over in Peace River, an area much like interior Alaska. I'm told that the Canadian farmers are clearing and planting 300,000 to 400,000 acres a year in the Peace River Valley. We've been toying around here with a huge project of 50,000. Well, we have to begin somewhere. This is the first little step. I hope the Governor and the State Committee on Agriculture and Forestry Committee act promptly to encourage the project.

Senator GRAVEL. Thank you very much.

Senator HUDDLESTON. Thank you very much, Dr. Wood.

Dr. James Matthews.

STATEMENT OF DR. JAMES W. MATTHEWS, DIRECTOR, COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ALASKA, FAIRBANKS, ALASKA*

Dr. MATTHEWS. Mr. Chairman, Senator Gravel, it's a real privilege to be here as Director of Cooperative Extension Service. My name is James W. Matthews. I'm Director of the University's Cooperative Extension programs. And I'm going to try and eliminate from my discussion some of the points that were made earlier by some of the speakers. There's a little bit of overlap, but I—I do want to address the concept of self-sufficiency as many of the former speakers have. And I'll do it in this fashion that I also think that agriculture and food production in Alaska is on the verge of potential change and development. But I think it will occur if it is not based on—primarily on a philosophy of self-sufficiency, but looks at a much broader scope.

This philosophy of self-sufficiency has been in existence since World War II, and during the last 30 years, it really hasn't accomplished much in the way of agricultural development. And as many of the earlier speakers have indicated, today we're in a much different ballgame.

It appears quite unrealistic to believe that given advances in military technology, transportation systems, over the past two decades that self-sufficiency is a valid concept for defense purposes. It appears even more unrealistic as one views Alaska's accelerating entrance into many areas of economic endeavor, that—such as the oil and

*See p. 111 for the prepared statement to Dr. Matthews.

mineral, the fishing, and marine resources, the forestry, and many areas of large economic activity that are not self-sufficient, they're very much involved in the national and international scene. And I think we should look at the same pattern of organization for agriculture. At first glance we say that self-sufficiency is step one, national and international involvement are steps two and three.

But I think that it would be much more realistic to look at a scheme, a scope of development to a point where specialization and volume can really occur, and where we can then in the process be competitive with other areas of the country that are agricultural producers. I believe we'd make much more rapid progress if research, and education, and capital development were geared toward, as has been said so many times, large scale development. I think if we don't we're going to continue to be subject to increasing specialization and efficiency achievements in other areas of the country.

I grew up in the State of North Dakota. I was back there recently. Mr. Butrovich mentioned the large machinery. One of my cousins took a large tractor and a cultivator and cultivated 40 acres in 35 minutes. You know, it's that scale of activity that we're competing against. And I stress again, Alaskan farmers have proven many times that they can produce grain, livestock, potatoes, a very broad range of cool weather vegetables. We have a large but untapped capability in berry production and ornamental planting, specialty items that are very high value crops. But we have not yet reached the scope that I think we should reach in trying to compete in a world system.

Alaskan farmers, too, have always had to face large challenges in their efforts to establish farm enterprises. The initial capital outlay, the operating cash outlay are substantial in our State. They're much larger than you'd anticipate, I think, than beginning in any part of the country. They usually are derived from off-farm income, either from savings or loans or other employment as a farmer attempts to wrest from the wilderness a successful farm enterprise. This is done in a condition where the basic data on lands, soils, forests, ranges, water, and climatological conditions is either lacking, or it's so broadly generalized that it's inadequate for management decisions in modern farm enterprises.

And I would stress again that the—I think the Federal resources could be wisely used if they were directed in Alaska toward filling the gaps and accelerating the focus, particularly on soil capability assessments, studying ground water supplies, and recharging capabilities for irrigable agriculture as well as community needs. We have a large volume of water. We don't know exactly how it's located, or what its rechargeable capabilities are in the relationships to our agricultural lands. And I think that the soil and snow survey systems that are so important to agriculture are just as important for community development in this State. Most of our agricultural land is located along the river systems. Most of our communities are also. There's a significant interrelationship here, and a need for data for both kinds of development.

I've been in Alaska 20 years. Twenty years ago, we perceived about 3 to 4 million acres as being suitable for agricultural purposes. Back in 1974, a major study indicated 15 million acres.

Today we say 18. The soil hasn't changed; it's our ability to see it and to perceive its utility. So, I think as studies become more intensive, Alaska has more potential even than we can see at this point in time.

Another area that is of high concern is that there have been very limited assessments of the interrelationships of commercial forest activity and intensive agriculture. Most of the farmland that's potentially usable is here in the interior. Most of the forest land is here in the interior also. There's a great deal of intermingling of such lands, and overlapping of such lands, and both kinds of development have to come along together, I believe.

Another area that we have very little specific research is in the climatological area. In a subarctic environment of generally cool air temperatures, and certainly cool soil temperatures, the timing of fertilizer application and pesticide control material is extremely important. And we need much more precise data than we have at this point to make those kinds of management decisions that are so extremely critical to good farming operations. Dr. Wood and others talked about the vast areas of rangeland; again, very little research has been done on the ranges. We have vast areas in the State that are populated primarily by big game animals. No real significant research has been done on the indigenous species, and their potential for domestication or commercialized food production needs, except for very limited work with reindeer and musk ox.

You've heard many times, I'm sure, about the social and economic changes Alaska's going through. Over the past decade, we've organized 50 new second class cities. And I don't think there's an area in the world that's organized as many cities or as many government entities that are new. The experience of developing these is new to the people involved, and they have very limited economic basis from which to proceed. Certainly agriculture could, in many of these areas, make a successful contribution to stability in relation to such community development. Forty-four million acres of land is now in transition to Alaska Natives. For the first time, there'll be a significant amount of land in private ownership in the State. Today it's less than 1 percent. And that's a very unusual condition in our society. Eighty million acres go to one of the four national systems for Federal management. And, again, there's quite a range of administrative variance in how these lands can be used. The Forest Service does have quite a broad multiple use regulatory program that would permit other types of activity. It appears even their regulations would have to be modified unique to Alaska to allow intensive agriculture, although current policies make broad provisions for range use and limited homesite activity.

In all these cases, the transition to private ownership, the transition to Federal ownership, there hasn't really been much assessment of the impact of such action on future agricultural development. You could argue on the one hand that this a State responsibility, but I think on the other hand that—the scope of acreages involved, the intermix with Federal management activity, and State priority of State land use development is such that it really calls for an increasingly large Federal presence in Alaska to help provide the basic resource basis of information to make good decisions.

I think one of the great concerns Alaskans have, and certainly I as an individual as well as a professional advocate, is that many decisions will be made outside of the State that will affect us forever in the future. And these decisions may often be made on inadequate information basis. That's why, I think, we all plea so urgently for expansion of resource analyses, particularly at the natural resource level, the climatic level, and interrelationships that exist between intensive agriculture, range agriculture, and forest management activity.

I would say again, I think that this concept of self-sufficiency is important. It can be approached, I think, better by taking a much broader look at agricultural development than arguing for self-sufficiency as a primary goal.

Our role in extension is one of delivering information out to people, and helping to solve practical problems, and working very much in enterprise development such as agriculture is involved in. But we're often hampered by the lack of good basic data and broad data to work with the entrepreneur. I think our efforts could substantially increase with modest resource expansion if we had better data basis to work from. I think that the country as a whole has a real stake in the development of Alaska. The Federal Government is already organized with national systems to survey soils, and to study water resources, to survey ranges as has been indicated again and again here today. I think a larger presence of these agencies in Alaska is extremely important at this time.

Finally, I would indicate that with the environmental protection regulations coming along, many of these are going to pose major problems to Alaskan agricultural producers. Just to dramatize the uniqueness of this north country's natural environment, I might indicate that most baseline studies that would accurately identify the amounts of nitrates, and particulate matter in river systems have yet to be made. Most agricultural development of the future is projected near or closely adjacent to our rivers and streams. The challenge of establishing baselines is large. That condition is magnified by the general knowledge that Alaskan river systems contain a very high degree of largely glacial material. They also drain vast bog areas, both conditions that lend to problem conditions if the baseline studies are not there prior to development.

I think this situation, as one example, reflects again the need for the Federal presence, the larger research data generating program that goes beyond the resources alone.

And I would argue also that those kind of regulations pull us into the national scene in a regulatory sense. Consequently we would also argue, then, we should also be more involved on the national scene in a developmental sense.

I would call attention to two publications that I think your committee would find useful in studying the Alaska scene. The first one is "Alaska's Agricultural Potential",* which is a broadly based study by the Alaska Rural Development Council, and involves some 11 agencies, State and Federal agencies, and reflects a pretty good picture, not only of lands, but forests, soils, waters, and climate characteristics. Ever since this study was made in 1974, there's been an indication of more land that is potential for agricultural developmental purposes.

*Retained in committee files.

The other one is "Alaska's National Interest Lands",* a University of Alaska Extension publication. It's a summary of the current congressional proposals that deal with the D–2 land disposals, and it brings together in one point all the various proposals, and helps give some overview, I think, to members of your committee that are not as familiar as Senator Gravel is with the problems in Alaska.

Senator GRAVEL. Make sure those are placed in their packets.

Dr. MATTHEWS. Yes.

Senator HUDDLESTON. Very good. I'll see that they are part of the record in the committee. I had an opportunity to read them during the flight out, and they're very helpful.

Dr. MATTHEWS. Yes. One other one I'll just call your attention to, it's an argument for broader extension role in forestry. Your committee on Agriculture and Forestry has given much support to this process. It's more important, we think, in Alaska than in almost any area of the country, and it's—it goes back to my earlier statement on the many interrelationships we have between agriculture and forestry, and the fact that now 40 million acres are going into private ownership introducing a very highly motivated new kind of clientele.

Senator HUDDLESTON. Thank you very much, Dr. Matthews. And I wholeheartedly support this concept of reaching beyond a goal of just self-sufficiency. I think when you're talking about a current population of something under 400,000, and even if there aren't dramatic increases in the population, which I suspect there will be, I still don't think that comes close to the potential that you have here for agriculture production. Alaska ought to take its place in the effort to supply the world food needs as well as their own. And besides, competing a little bit down in the lower 48, I think it could help us lower our prices.

Dr. MATTHEWS. Yes. I think it certainly would.

Senator HUDDLESTON. We have virtually no reserve of grain anywhere in the world. Protracted weather conditions could throw us into absolute turmoil. Our agriculture department officials are on pins and needles all the time that sales to Russia and China are going to be too great, and we're going to have a big uproar of irate citizens because the grain prices go up in this country. We're in a very precarious situation, as I see it, and certainly it's in our interest, and by "our", I mean the whole United States, to develop our own production capacity to its fullest extent. There's not much more land in the lower 48. We're planting fence row by fence row. And what new land has been brought in has been way below production standards compared to the rest, because it's land that obviously was not too good, or it would have been in production a long time ago.

There are just too many reasons that we need to make a special effort, as I see it, to develop this great potential up here.

Dr. MATTHEWS. Thank you. And I would say, too, I did include a few statistics on cropland in other States just for comparative purposes, but Alaska has more potential farmland than Japan is currently using.

Senator HUDDLESTON. In its entire country?

Dr. MATTHEWS. Yes.

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*Retained in committee files.

Senator GRAVEL. The only thing, Doctor, we'll have to forego the inspection unfortunately because the time just evaporated on us, and we have another commitment after this.

But I think the time is well spent here in the testimony. We did inspect very thoroughly Delta and, of course, the facilities at Palmer.

Dr. MATTHEWS. Yes. I'm sure Dr. Drew will be disappointed, but I think you can see some of the big cabbage right outside the door here that's reflective——

Senator HUDDLESTON. Yes; I saw that. It should make a lot of sauerkraut.

Mr. Smetzer is our next witness. Jerry Smetzer.

STATEMENT OF JERRY SMETZER, EXECUTIVE DIRECTOR, FAIRBANKS TOWN AND VILLAGE ASSOCIATION, FAIRBANKS, ALASKA

Mr. SMETZER. Thank you, Senator Gravel, Senator Huddleston, I'd like to thank you very much for coming to Fairbanks. It's always a welcome opportunity for us to give you some reasons to argue strongly for Alaskan interests in the U.S. Senate.

I've been listening to the comments. I have no written testimony, and I will promise to be brief. I'm Jerry Smetzer, executive director of the Fairbanks Town and Village Association. We're a nonprofit regional development corporation. We serve the economic development interests of interior Alaska. We're financed primarily by the Federal Economic Development Administration and the Fairbanks North Star Borough.

We're primarily interested this year in transportation development in the interior, but we increasingly find that if we're very successful at that, we may still have a problem of not having anything to transport for export. Agriculture is very important to us, and we very much support the interest of those people who have spoken here before. We very much want to see further development of the Big Delta area. And, specifically, I'd like to call your attention once again to Dr. Drew's proposal for the heat utilization study, at pump station No. 9 at Big Delta and the marketing study of grains from the Big Delta area. We believe that if the technology is there, and I understand it is, and if the market factors are there, that that particular process may have even more applications in the lumber industry. For drying spruce, for example, that could come out of the interior forests. And I know that you have a copy of a USDA publication on the interior's forests on your desk, and I encourage you to read that very closely.

One of the biggest problems in developing commercial grade spruce has been the problem of economically drying the stuff, and cutting it to construction dimensions. I think this heat utilization process may measurably enhance that—that process and make it economical, and give us the rudiments, as I mentioned, of a dimension spruce industry here.

Beyond that, I think—I would call attention to the EDA's presence in Alaska, as represented by us, and by some other programs that the EDA has going here, and it does provide the possibility of immediate

Federal impact in the development of agriculture, Dr. Drew's proposal being one example. We think some of the other projects related to agriculture, the transportation of agricultural products. The mechanism is here. The administrative capability is here. I think if the United States would choose to emphasize Alaskan agriculture quickly, that I think that we can find plenty of areas for you to get involved in.

With that, I'll just say thank you, again.

Senator HUDDLESTON. I just want to say, I was already interested before I came, but what I've seen and heard has persuaded me that we need to very quickly assess all of the potential Federal programs, those that are now in effect, in the country, to see what their application is to the unique characteristics that exist up here.

I'm persuaded that we're going to find that many of them will need some adaptation, perhaps a little change in the law in order to make it applicable here. I'm sure Senator Gravel and his staff would be interested in also exploring those possibilities, and seeing just where we might be able to offer such changes as may be necessary to make those programs beneficial to the particular situation that exists here. I think therein probably lies the best hope of getting some immediate action and some immediate development.

Mr. SMETZER. I think Senator Butrovich's comments are very important. I disagree with the Senator in thinking that all studies are merely paper, but I think he is right in suggesting there must be some direct and immediate infrastructure development. There must be some money made available for capital improvements for the system of either growing, or delivering, or processing the crop.

Senator HUDDLESTON. One thing that just occurred to me, part of the great storage capacity that exists in the lower 48 is there because of former agriculture programs—the loan programs—which the Government paid the farmer for storage costs, which gave him the opportunity to construct, on his property, a large storage capacity.

Well, those programs are not in effect now. They're not going to help Alaska, and that's one of the means that you have, if you're going to produce 500,000 acres of wheat, and have it ready to ship to Japan, there'll be a period of storage. And if you are going to be a consistent producer, or seller, then you're going to have to store it perhaps from year to year to make sure that in case of bad weather, you still have some on hand.

So those programs which benefited so greatly the States down below have had virtually no beneficial impact up here.

Mr. SMETZER. We have had farmers and farms in the interior, but we don't have a tradition of agriculture here, a tradition of farming, and consequently we haven't had people trying to put together this infrastructure, and we've got to start really from ground zero, and try and bring it up to production capacity in a relatively short period of time.

Senator HUDDLESTON. The present programs, as I understand them, mean virtually nothing up here, the target price, offers very little assistance, if any at all.

Senator GRAVEL. Thank you very much, Jerry.

Mr. SMETZER. Thank you.

Senator HUDDLESTON. Thank you, Mr. Smetzer.

Is Ray Morgan still here?

Mr. MORGAN. My comments are just written, and I've already given them to you.*

Senator HUDDLESTON. Oh, very fine. I just wanted to make sure. You being an old Kentucky boy. I didn't want to overlook you.

That concludes, then, our list of witnesses, and I would point out again that our record will stay open for some 14 days for any of those who may have already testified and want to add a few additional thoughts, or for those who might want to submit testimony to us. You can send such written testimony to the Committee on Agriculture, U.S. Senate, Washington, D.C., and we'll be glad to add it to our record.

If there's nothing else, we'll conclude this hearing.

Senator GRAVEL. Thank you.

[Whereupon at 5:05 p.m., the subcommittee adjourned, subject to call of the Chair.]

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*See p. 114 for the prepared statement of Mr. Morgan.

ADDITIONAL ARTICLES, STATEMENTS, AND MATERIAL

STATEMENT OF WEYMETH E. LONG, STATE CONSERVATIONIST, SOIL CONSERVATION SERVICE, U.S. DEPARTMENT OF AGRICULTURE, ANCHORAGE, ALASKA

I am Weymeth E. Long, State Conservationist for the Soil Conservation Service headquartered in Anchorage, Alaska, and serving the State of Alaska. Recognizing the time limitations and the need to hear a number of knowledgeable people relative to Alaska's potential for agriculture, I would like to limit my discussions primarily to those program activities for which our agency is primarily responsible. These would be the soil surveys, the identification of potential soils for agricultural use, and the technical assistance needed for the proper development of these areas containing suitable soils for agricultural purposes.

In 1968 we initiated an exploratory soil survey to encompass the entire State of Alaska. We completed the field surveys in 1974, and it is scheduled for printing in 1978. This survey while made in the field was conducted at a very low intensity, or it is a broad brush type survey. However, I must stress that it is based on actual soil investigations in the field. We established basic survey units of about 10,000 acres and surveyed these in detail. These units then served as the base from which we expanded to our broader generalized survey.

The soils with agricultural potential that we identified from the Exploratory Soil Survey are tabulated on page 21 of the attached report entitled, "Alaska's Agricultural Potential", and are located on the map at the end of chapter 3 of this report. Chapter 3 describes these soils. It should be brought to your attention that the 15.5 million acres identified are areas with large blocks of potential tillable soils. If we include smaller blocks of less than 25 percent suited for agriculture, the potential agricultural lands will be approximately 20 million acres.

In layman's terms the agricultural soils in Alaska are generally silt loams to sandy loams. Many are underlain by gravel or sands. These soils vary in depth and most of them are subject to erosion, both by water and wind. Therefore, in terms of the program for the future to assist in the proper development of these agricultural lands, it will be necessary to have much more detailed soil surveys prior to development to clearly identify those soils needing special attention. It will also be necessary to provide proper technical assistance for planning the development of these lands and in the management of these soils. The technical information we need to refine and apply will include proper clearing, establishment of shelter belts and windbreaks, proper use of stubble, fertilizers, irrigation facilities and related management assistance, etc., to measures controlling or eliminating runoff waters to assure we do not create any erosion or pollution of adjoining lands and streams. Because of Alaska's conditions, direct application of techniques and knowledge from other states is not generally acceptable, but must be adapted or modified to assure similar success.

I recognize that other able participants may discuss the productive capacity of these soils, but to assure that this is not overlooked, I have attached an extract from the Agricultural Experiment Station's publication, Agroborealis, Volume 8, No. 1, January, 1976, page 10, listing the yields of various vegetables that can be produced in Alaska in comparison with the national average for these vegetables.

In addition to the lands suitable for conventional farming, there are vast acreages, more than 18 million acres, well adapted to grazing sheep and cattle. Tundra range suitable for grazing reindeer amounts to 220 million acres. The utilization of these resources will also require soils and other technical inputs to achieve proper development.

It is our observation that the lands can produce significant yields of adapted varieties of small grains, forage, vegetables, and red meat. However, it is very important that we develop only those lands suitable for production and that

the development be done properly. This is an opportunity to plan and do the job right. To assure that the development is carried out properly, I believe, Mr. Chairman, our agency if afforded the opportunity, can help meet these challenges and render the technical services, both in soil surveys and other technical fields, to do this job properly.

TABLE 1.—SELECTED VARIETIES AND YIELDS OF VEGETABLE CROPS GROWN AT VARIOUS SPACINGS AT FAIRBANKS ALASKA

Crop and variety	Row spacing	1974 Alaska yield (pounds per acre)	1974 U.S. National average (pounds [5] per acre)
Cabbage			21,800
Alaska 6467 (late)	4 ft by 1.25 ft	69,604	
Tastie (early)	do	34,253	
Hybrid 15 (medium)	do	[2][3] 44,303	
Do	4 ft by 1 ft	[2][4] 39,202	
Do	4 ft by 0.67 ft	[2][5] 39,985	
Broccoli			7,700
Green Duke	4 ft by 1.25 ft	17,338	
Gem	do	18,767	
Cauliflower			8,700
Super Junior	3 ft by 1.25 ft	22,671	
Whitehorse	do	16,031	
Self Blanche	do	22,812	
Snow Crown	do	17,025	
Lettuce			22,700
Minilake	2 ft by 1 ft	26,016	
Snapbeans			4,720
Provider (3 pickings)	3 ft by approximately 2 in	19,213	
Provider (1 picking)	do	11,789	
Eagle (2 pickings)	do	18,086	
Green peas (shelled)			2,380
Sparkle	Drilled	8,443	
Frosty	do	5,884	
Green Arrow	do	5,934	
Carrots			26,000
Nantes Special Long	1.5 ft by approximately 1 in	53,648	
Spartan Fancy	do	42,752	
Spartan Bonus	do	49,336	
Cucumbers			9,380
Triple Purpose (seeded, without plastic)	5 ft by 2 ft	0	
Triple Purpose (seeded, grown with plastic).[6]	do	9,303	
Triple Purpose (transplants, grown with plastic).	do.[6]	57,182	
Summer squash			
Zucchini Elite (seeded, without plastic)	5 ft by 3 ft	67,737	
Zucchini Elite (seeded, grown with plastic).	do.[6]	112,744	
Zucchini Elite (transplants, grown with plastic).	do.[6]	76,870	
Winter squash (all grown from transplants with plastic).			
Boston Marrow	8 ft by 8 ft	55,680	
Faribo Hybrid R	8 ft by 6 ft	37,243	
Gold Nugget	6 ft by 3 ft	45,011	

[1] U.S. Department of Agriculture. "Agricultural Statistics 1974."
[2] Hybrid 15 variety of cabbage produced smaller, more marketable heads when grown at the closer spacings without sacrificing much in total yield.
[3] 5 lb per head.
[4] 3.7 lb per head.
[5] 2.4 lb per head.
[6] Clear polyethylene plastic sheeting was used to improve soil temperatures. This frequently gave greatly improved yields.

[The following exhibits were supplied by Mr. Risley and referred to on p. 18.]

EXHIBIT A

SENATE BILL, IN THE LEGISLATURE OF THE STATE OF ALASKA, TENTH LEGISLATURE, FIRST SESSION

A BILL For an Act entitled: "An Act establishing the Talkeetna Mountains State Agricultural Reserve."

Be it enacted by the Legislature of the State of Alaska:

SECTION 1. AS 41 is amended by adding a new chapter to read:

CHAPTER 23. TALKEETNA MOUNTAINS STATE AGRICULTURAL RESERVE

SEC. 41.23.010. DECLARATION OF PURPOSE. The Purpose of secs. 10–60 of this chapter is to restrict state-owned land and water described in secs. 10–60 of this chapter as a state agricultural reserve.

SEC. 41.23.020. DESIGNATED STATE LAND AND WATER RESTRICTED TO USE AS A STATE AGRICULTURAL RESERVE. The following state-owned land and water is designated as the Talkeetna Mountains State Agricultural Reserve and is subject to the uses specified in sec. 30 of this chapter: Beginning at the SE corner of Section 34, T 20 N, R 4 E, SM; thence west twelve miles along section lines to the NW corner Section 2, T 19 N, R 2 E, SM; thence south one mile to the SW corner Section 2; thence west three miles to the NW corner of Section 8; thence south one mile to the SW corner Section 8, T 19 N, R 2 E, SM; thence west two miles to the NW corner of Section 13, T 19 N, R 1 E, SM; thence south one mile to the SW corner of Section 13; thence west seven miles to the NW corner of Section 23, T 19 N, R 1 W, SM; thence south one mile to the SW corner of Section 23; thence west four miles to the SW corner of Section 19; thence north five miles to the NW corner of Section 31, T 20 N, R 1 W, SM; thence west two miles to the SW corner of Section 26, T 20 N, R 2 W, SM; thence north twenty miles to the NW corner of Section 23, T 23 N, R 2 W, SM; thence east 30 miles to the NE corner of Section 22, T 23 N, R 4 E, SM; thence south twenty-one miles to the point of beginning, containing 430,080 acres.

SEC. 41.23.030. PERMISSIBLE USES. Within the area classified as a state agricultural reserve under sec. 20 of this chapter, grazing under lease issued by the department is considered to be the primary use for the area, and all other uses incompatible with this primary use shall be prohibited or restricted, as provided by regulation; however, mining activities are permitted in accordance with AS 38.05.135–38.05.280, and recreational activities listed in Sec. .050 of this chapter, including hunting, fishing and trapping, are permitted in accordance with Department of Natural Resources and Department of Fish and Game regulations, as appropriate. Development of private property within the boundaries of the reserve shall be in accordance with applicable local ordinance and state law.

SEC. 41.23.040. MANAGEMENT RESPONSIBILITY. Land and water specified in sec. 20 of this chapter are assigned to the Department of Natural Resources, division of agriculture, for control through a board of directors composed of the following persons or their designees:

(1) the director of the division of agriculture;
(2) the commissioner of fish and game;
(3) the commissioner of highways;
(4) a representative from the Matanuska-Susitna Borough assembly, or the borough planning and zoning commission.

SEC. 41.23.050. ADVISORY COMMITTEE. The board of directors shall obtain assistance in controlling and administering the uses within the agricultural reserve by considering the recommendations of an advisory committee made up of one representative from each of the following active organizations:

(1) an alpine ski club;
(2) a cross-country ski club;
(3) a snow machine club;
(4) a hang glider club;
(5) a local stock grazing association;
(6) a mountaineering club;
(7) a mining association;
(8) a sportsman association; and
(9) a dog musher association.

SEC. 41.23.060. REGULATIONS. (a) Regulations shall be developed by the Board of Directors and adopted by the Department of Natural Resources, except as provided in sec. 30 of this chapter, to implement secs. 10–60 of this chapter, including but not limited to

(1) specification and control of the permissible uses within the reserve in conformity with sec. 30 of this chapter;
(2) the imposition of reasonable use fees to cover maintenance costs; and
(3) a plan to attract and recruit volunteer labor for work within the reserve.

EXHIBIT B

[From Lancaster Farming, Saturday, July 24, 1976]

EDITORIAL COMMENTS

(By Dieter Krieg, Editor)

GOOD IDEA CARRIED TOO FAR

One of the ever increasing problems in the world today is education, and the foolish assumption by both employer and employee alike that a few years of college are automatic passports to wisdom and worthy achievements. In the field of agriculture, we have teachers who never experienced a working life on the farm; efficiency experts who are acquainted only with theory rather than practicality; and safety advocates who work out of plush offices. In reference to the latter, I'd like to invite readers to turn to page 27 to read Congressman Edwin Eshleman's view on OSHA. It provides a good example of how those making the rules for agriculture are nothing more than a bunch of simpletons.

These neat and tidy little men who live pampered lives obviously have no conception of how intelligent farmers are. There's no question that their ridiculous rules and proposals are nothing but insults to farmers. Or is there a farmer out there who doesn't know he can get cut by protruding nails. Or that he can slip on wet manure? Some officials in Washington think farmers have to be told about such common sense items. It's time that kind of hogwash gets put to a stop. How about farmer cooperatives and any other farmer organizations joining together to take a trip to Washington to let the "educated" nincompoops know they're wasting a lot of time and money. Or at least send your Congressman a letter, If that's too much trouble, then write "Amen" and your "John Hancock" across this editorial and mail it to Washington.

As Eshleman notes in his article, safety regulations are needed. Very much so. But the least the government officials could do is to allow farmers to have a bigger voice in what is to become law. Then we'd have something.

An amendment to a labor appropriations bill, which is scheduled to go into a conference committee at the Capitol on Monday, will exempt farms with less than 10 employees from some OSHA regulations. However, even if that goes through, it's only going to be a temporary breather.

According to informed sources, the bill—as it now reads—would only exempt farmers from Oct. 1 of this year until Sept. 30 of next year. That, in my opinion, is not enough.

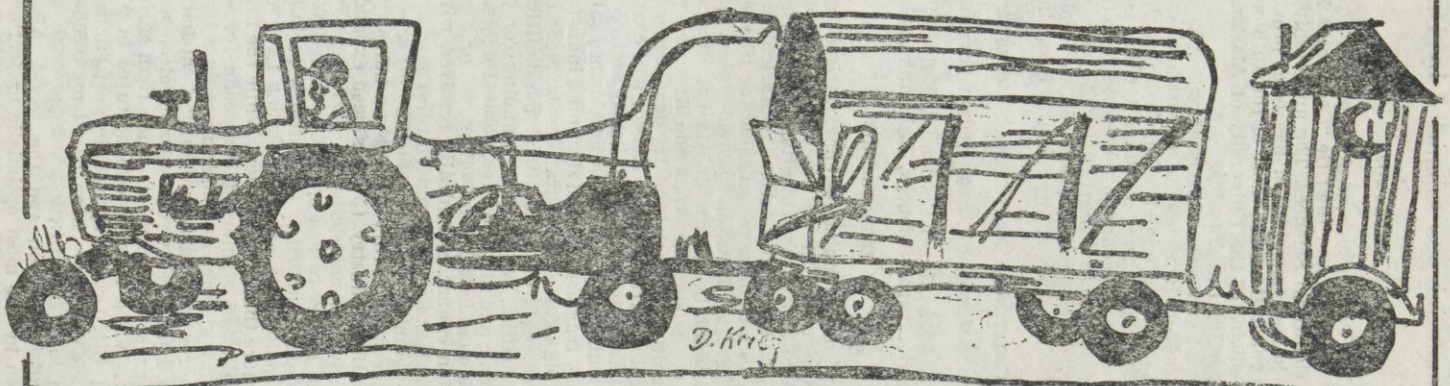
No one is trying to deny that farm safety is needed. In fact, I've had a few close calls of my own, some of which are brought out in this week's "Life on the Farm" series. But the fact remains that no amount of regulation is going to eliminate injuries and accidents. To some extent they will certainly lessen them, but a good thing can be carried too far. And OSHA laws are being carried too far when they are insulting rather than helpful or educational.

It's been pointed out many times before by numerous persons that one of the bigger problems we're facing is regulation and so-called education by people who have never had a real and direct connection with the basics involved in production and work. Such statisticians and specialists like to think they have the answers, but often don't. Theory doesn't always apply. Practicality does—because it is more flexible and fits into any situation. It's time the practicality of farmers is heard, not just in farm safety, but in efficiency, productivity, education, and law enforcement.

EXHIBIT C

EDITORIAL COMMENTS

By DIETER KRIEG



According to the Occupational Safety and Health Act (OSHA), farmers must provide toilet facilities within a five minute walk for their employees. Well, some farmers have fields so big or so far out in the boondocks, that a five-minute walk wouldn't be adequate. So, pictured above is a possible solution to the problem.

[The following material was submitted by Dr. James Drew and referred to on p. 33.]

FOREWORD

This report, "Defining Parameters of Agricultural Potential in Alaska," is one of a series, being published under the title "Creating a Northern Agriculture," by the Institute of Agricultural Sciences. The authorship is strictly that of Dr. Wayne E. Burton. Technical consultation has been provided by Dr. Minnie E. Wells. The content and conclusions are those of the author and do not necessarily reflect the views and policies of the University of Alaska, the Institute of Agricultural Sciences, or other Institute faculty.

The objectives of these reports is to direct attention to opportunities for development of a northern agriculture, and to opportunities forgone if agriculture continues to be ignored in Alaska's land use and control planning process.

This series of reports rests squarely on the belief that substantial development of a northern agriculture would contribute materially to the economic and social well-being of Alaska's peoples, particularly after the boom of the petroleum industry is gone. Moreover, development of agriculture could provide the largest source of employment for Alaskans of any resource based industry.

CREATING A NORTHERN AGRICULTURE

III. DEFINING PARAMETERS OF AGRICULTURAL POTENTIAL IN ALASKA

(By Wayne E. Burton, Agricultural Economist, University of Alaska, Institute of Agricultural Sciences, Fairbanks, Alaska)

INTRODUCTION

Alaska's current land-use planning is characterized by a particular void in providing for future agricultural development. One reason for this void in planning has been a profound lack in identification of production possibilities in most areas of the State. While the report, "Alaska's Agricultural Potential (4)," generally identified some 16 million acres suitable for tillage, and millions of acres suitable for livestock grazing, it did not provide other than a cursory review of product types which might be grown in Alaska. Further, it did not identify probable locations where particular crops and livestock would be produced, nor possible scope and magnitude of such industry development.

Public apathy regarding agriculture in Alaska will continue until such time as potential production parameters are established and recognized. Present negativistic images of agricultural possibilities in Alaska continue to be rationalized in terms of a miniscule, fragmented, and declining industry that now exists. Any extensive attempt to plan for agricultural development in Alaska will not only suffer innocuous assessments of agricultural possibilities but will be in competition, if not open conflict, with public planning for parks, wildlife refuges, ecological reserves, scenic and historic sites, public forests, petroleum and mineral provinces, and those lands identified for other real or conceived public uses (9). Moreover, this situation cannot be ethically resolved without informed and objective assessment of Alaska's latent agricultural production possibilities.

The present public planning for renewable and other resource-based industries in Alaska does not reflect the reality of long-run industry development possibilities. The fish and shellfish industry (5) has been expanded to near capacity in most areas, with returns to domestic fishermen being less than $100 million and the wholesale value of processed fish being less than $200 million in most years. The Alaska forest products industry (5), after a period of very rapid growth, has stabilized at an employment level of less than 1,200 workers and a wholesale product value of not more than $100 million. While the fisheries industry appears to have little probability of significant expansion for domestic fishermen, the forest products industry appears at some future date to have the probability of doubling in size before reaching sustained harvest capacity.

Other resource-based industries such as recreation and minerals (excluding petroleum) receive a great deal more attention than agriculture in present land-use planning (9, 10). While tourism expenditures in Alaska are estimated to approach $50 million (5), typical optimistic projections have little probability of being realized since they have been based on trends established in a brief period of very rapid industry growth when personal disposable incomes were very high throughout the nation and the world. Also, Alaska's $50 million mineral industry, even by the most optimistic projections, is not anticipated to substantially expand during the foreseeable future (5, 9, 11). Even though tour-

ism and mining are both labor intensive, and highly seasonal, neither is anticipated to provide significant net additions to permanent employment in a relevant planning period.

In contrast, the agricultural industry appears to have definite possibilities for expanding from the present 600 workers, and a farm product value of $5.5 million (2), to more than 55,000 workers and a farm product value in excess of $4.0 billion per year, if serious attention is directed to its development. Expansion possibilities have been identified from the following considerations.

SUPPLY OF AGRICULTURAL LAND

Alaska's agricultural lands are not yet fully identified. Estimates of latent agricultural lands, in various regions of the state, (Figure 1.) hinge on data available from the U.S. Department of Agriculture—Soil Conservation Service (SCS) and the Joint Federal-State Land Use Planning Commission for Alaska. While the available data (Table 1) are of exploratory grade, in most instances, they do reflect some 30 years of soils identification work within the state (4).

The first comprehensive investigation of soils in Alaska was made in 1946, and published in 1951. Detailed surveys have been made in the Tanana Valley, the Cook Inlet-Susitna Lowland, Kodiak Island, and a number of small areas elsewhere in the state. The statewide Exploratory Soil Survey of Alaska was initiated in 1967 by the SCS and was completed in 1973. The resulting mapping (4) shows only those areas with significant portions of the soils classed as suitable for farm tillage. Some areas considered marginally suitable for tillage, with present crops and states of technology, have been deleted. Small areas, and those with lesser portions of tillable lands, have not been identified.

Even though extensive acreages of latent agricultural lands have been identified in several regions of the state, only small acreages can be classed as mature agricultural soils. Most of the latent agricultural land has not been cleared, and is morphologically immature when initially prepared for tillage. Since the soils maturation process in this northern environment is not well understood, optimal tillage systems have not yet been identified. Other critical data such as fertilizer response and conservation measures are not available for most areas of the state. However, agricultural land-use projections have been based on classification data, more than seventy years of observation and experience in many areas, and many years of research in numerous locations.

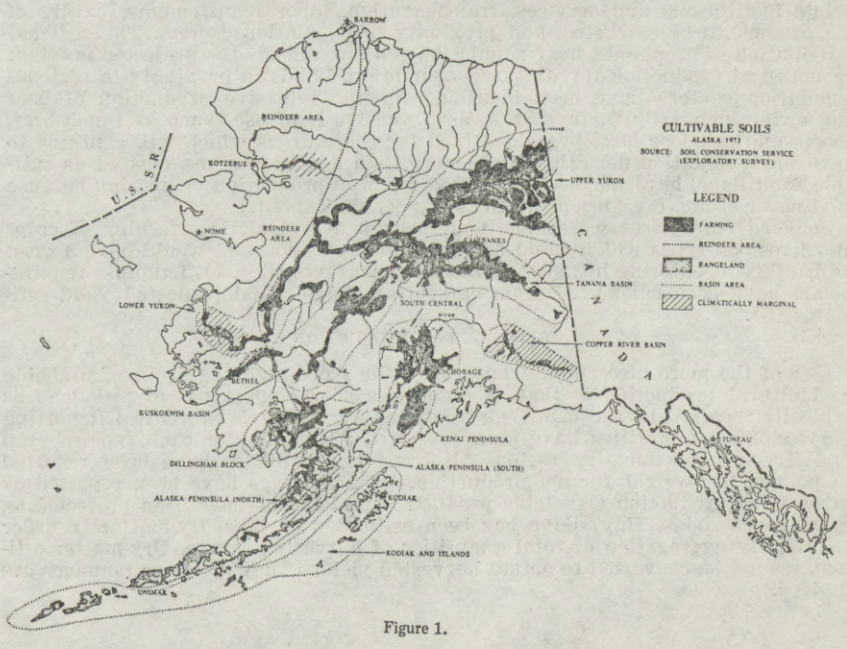


Figure 1.

Agricultural Regions of Alaska

TABLE 1.—ESTIMATED AGRICULTURAL LANDS AVAILABLE IN ALASKA FOR CROPS INCLUDED IN THE STUDY

[In thousands of acres]

Region	Class 1 (group A)	Class 2 (group A)	Class 3 (group B)	Class 4 (group B)	Class 5 (group C)	Class 6 (group C)	Range	Total
Upper Yukon Basin	1,626	1,571	1,625	724	----	----	(1)	5,546
Lower Yukon Basin	----	233	----	1,372	75	232	(1)	1,912
Tanana Basin	311	1,915	----	610	480	----	(1)	3,316
South Central	1,247	----	----	116	----	409	1,134	2,907
Kenai Peninsula	545	----	----	----	----	237	210	992
Alaska Peninsula, south	----	----	----	----	----	----	2,233	2,233
Dillingham Block	----	883	----	138	102	----	2,096	3,219
Alaska Peninsula, north	----	----	----	----	345	674	1,263	2,182
Kuskokwim Basin	----	406	355	355	189	426	(1)	1,731
Copper River Basin	153	----	----	14	15	104	(1)	286
Kodiak and islands	----	----	(2)	(2)	(2)	(2)	1,200	1,200
Reindeer grazing areas	----	----	----	----	----	----	100,000	[3] 100,000
Total	3,882	5,008	1,980	3,329	1,206	2,082	108,036	125,524

[1] No grazing lands were identified or included in calculations because of possible conflict with wildlife or other environmental factors.
[2] Not applicable.
[3] Estimates include only traditional reindeer grazing areas.

Source: USDA—SCS field notes adjusted by Federal-State Land Use Planning Commission work group.

USE OF AGRICULTURAL LANDS

Since not more than one-eighth of one percent of potential tillable lands are presently being farmed, the following estimates of latent agricultural land use are necessarily projective in nature. The estimating process has been based on identification of possible enterprises, present and probable yields, future production systems, and identified land use requirements. Initial production estimates were calculated for those products needed for Alaska consumption (7). Subsequent estimates have been calculated for a fully developed agriculture on all identified agricultural lands within the state (8).

Land use estimates (Table 2) reflect the results of assessments regarding enterprise adaptation to climate and availability of suitable land, probable public institutions and services, transportation, labor requirements, nature of the product to be marketed, and proximity to population centers. The regional distribution of croplands, near population centers, reflects the projected needs of agricultural production for Alaska consumption. Lands in proximity to regional population centers have been identified for the intensive production of beef and swine, primarily for export. Least intensive land uses such as ranch beef, sheep, and reindeer have been identified for those areas which will continue to have low population densities. Also, more than 6 million acres, classed as suitable for tillage, have not been identified for crop production or grazing because of climatic or non-farm use projections (Appendix Table 1.)

Selected enterprises were identified through a systematic screening of crops and livestock types which could be produced in Alaska, and would have a good probability of entering intrastate and export markets (3, 4, 7). Land-use requirements have been calculated from enterprise budgets and projected yield estimates (8).

AGRICULTURAL PRODUCTION

One of the more discernible measures of the scope and magnitude of probable agricultural production is that of quantities of various types of products, as typically reported by the U.S. Department of Agriculture's Statistical Reporting Service. Such quantities have been projected (Table 3) for each type of crop and livestock product, by region. All livestock quantities have been reported in pounds live-weight for net production. Milk and eggs have been reported as gross farm production of salable product. Cereal grains have been projected as gross farm yields. Hay/silage has been estimated as tons dry-matter in order to simplify aggregation of total quantities of harvested forage. Dry-matter estimates must be converted to actual harvested yields if hay or silage tonnages are desired.

TABLE 2.—ESTIMATED USES OF IDENTIFIED AGRICULTURAL LANDS BY REGION

[In thousands of acres]

Region	Cereal grains	Hay/ silage	Pasture	Vege-tables and fruits	Other [1]	Range	Total
Upper Yukon Basin	1,863	1,002	548	----------	2,133	----------	5,546
Lower Yukon Basin	445	473	259	----------	735	----------	1,912
Tanana Basin	1,041	615	314	3	1,343	----------	3,316
Kenai Peninsula [2 3]	6	19	34	----------	37	896	992
Alaska Peninsula, south	----------	----------	----------	----------	----------	2,233	2,233
Dillingham Block [3]	233	262	197	----------	431	2,096	3,219
Alaska Peninsula, north [2]	----------	43	75	----------	73	1,991	2,182
Kuskokwim Basin	403	428	234	----------	666	----------	1,731
Copper River Basin [2]	2	6	10	----------	10	258	286
Kodiak and islands	----------	----------	----------	----------	----------	1,200	1,200
Reindeer grazing areas	----------	----------	----------	----------	----------	100,000	100,000
South Central	448	345	188	3	789	1,134	2,907
Total	4,441	3,193	1,859	6	6,217	109,808	125,524

[1] Lands in farms not tilled, lands used in enterprises not identified, and identified agricultural lands not in farms.
[2] Lands classified as tillable have been allocated to "range" use, due to climactic limitations and assumed competing land uses.
[3] Some "nontillable" lands classed as range.

Livestock and Poultry Numbers

A second discernible measure of the scope and magnitude of possible agricultural production is that of livestock numbers. Such have been projected (Table 4) for both annual farm and ranch inventories and for annual slaughter. Slaughter numbers reflect the anticipated number of animals that could be harvested each year. Poultry numbers represent the number of laying hens that would be needed to produce eggs for a projected 820,000 Alaskans (year 2000).

Farm Value of Agricultural Production

The most critical, and the most difficult, parameter to establish regarding Alaska's agricultural potential is that of annual value of farm production. Such a projection has been made (Table 5), using standardized planning data from the U.S. Water Resource Council (14). Future farm prices will undoubtedly deviate substantially from 1973 data, but such projections will provide one perspective of the possible scope and magnitude of a fully developed agriculture in Alaska. Calculated values reflect only prices received by farmers at the first point of sale.

OTHER RESOURCES USED IN AGRICULTURAL PRODUCTION

Land use and agricultural production treats only one part of the latent farming industry picture. Many other Alaska resources make up another aspect. Certain factor inputs such as labor, fertilizer, petroleum fuels, and electricity, which could be provided from within Alaska, constitute industry development possibilities of significant magnitude, in addition to the farming sector.

Labor

A fully developed farming industry, in Alaska, would require more than 55,000 man-years of labor on farms, including some 8,000 trained and qualified management personnel. This estimate (Table 6) has been calculated from the U.S. average labor requirements for identified enterprises (1). The number of jobs would undoubtedly exceed man-years of labor since some portion would be seasonal in nature. The farming sector alone would provide more employment than fisheries, forestry, tourism, and mineral industries combined. The agricultural processing, marketing, transportation, energy, input, and service industries would probably employ as many people as the farming sector.

TABLE 3.—ESTIMATED LATENT AGRICULTURAL PRODUCTION, BY REGION [1]

[In millions]

Region	Beef pounds (live weight)	Pork pounds (live weight)	Lamb and mutton (live weight)	Reindeer pounds (live weight)	Milk pounds	Eggs dozen	Vegetables and fruits (pounds)	Cereal grains (hundredweight	Hay silage (tons-D.M.)
Upper Yukon Basin	873	1,833					S	67.2	4.1
Lower Yukon Basin	412						S	16.0	1.9
Tanana Basin	503	935			300	6.7	73.8	37.6	2.5
South Central	265	316			150	6.7	73.8	16.2	1.4
Kenai Peninsula	26	(2)	(2)		(3)	(3)	(3)	.3	.08
Alaska Peninsula, South	32						(2)		
Dillingham Block	250				(3)	(2)	(2)	8.4	1.07
Alaska Peninsula, North	58			(3)			(2)		1.8
Kuskokwim Basin	373				(2)	(2)	(2)	14.5	1.8
Copper River Basin	8						(2)	.07	.02
Kodiak and islands	13	(2)	1.5	(3)	(2)		(2)		
Reindeer areas				26.4			(2)		
Total	2,813	3,134	1.5	26.4	450	13.4	147.6	160.27	13.05

[1] Estimated latent agricultural production calculated from regional data found appendix table I.
[2] Subsistence.
[3] Undetermined.

TABLE 4.—ESTIMATED LIVESTOCK AND POULTRY NUMBERS TO ACCOMPLISH LATENT AGRICULTURAL PRODUCTION POSSIBILITIES IN ALASKA, BY REGION [1]

[In thousands]

Region	Cattle in herd	Swine in herd	Sheep in herd	Reindeer in herd	Dairy cattle in herd	Poultry in flock	Cattle slaughter	Swine slaughter	Sheep slaughter	Reindeer slaughter
Upper Yukon	1,673	4,602					767	8,261		
Lower Yukon	789						362			
Tanana Basin	958	2,284			33	325	441	4,101		
South Central	521	772			17	325	253	1,387		
Kenai Peninsula	58						25			
Alaska Peninsula, south	71						30			
Dillingham Block	497						223			
Alaska Peninsula, north	129						55			
Kuskokwim Basin	715						328			
Copper River Basin	23						7			
Kodiak and islands	40		35				12		14	
Reindeer areas				400						80
Total	5,474	7,658	35	400	50	650	2,503	13,749	14	80

[1] Calculated from appendix table I, (8).

TABLE 5.—ESTIMATED ANNUAL VALUE OF CROP PRODUCTION ON LATENT AGRICULTURAL LANDS, BY REGION [1]

[In millions of dollars]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruit	Cereal grains	Hay and silage	Total
Upper Yukon Basin	373.64	723.07						403.20	201.34	1,701.25
Lower Yukon Basin	176.34							96.00	93.18	365.52
Tanana Basin	215.28	359.04			21.39	3.48	4.02	221.90	122.72	947.83
South Central	113.42	121.34			10.70	3.48	4.02	95.64	68.64	417.24
Kenai Peninsula	11.13							1.08	3.74	16.67
Alaska Peninsula, south	13.70									13.70
Dillingham Block	107.00							50.40	52.42	209.82
Alaska Peninusla, north	24.82								8.74	33.56
Kuskokwim Basin	159.64							87.00	88.19	334.83
Copper River Basin	3.42							.42	.83	4.67
Kodiak and islands	5.56		0.53							6.09
Reindeer area				14.08						14.08
Total	1,203.95	1,203.45	.53	14.08	32.09	6.96	8.04	956.36	639.80	4,065.26

[1] Price data—U.S. Water Resource Council, Agricultural Price Standards, Guideline 2 (14), and USDA Agricultural Statistics—1974 (1).

Fertilizer

A fully developed agricultural industry, in Alaska, would require some 2.9 million tons of fertilizer. This estimate (Table 7) does not include that used for greenhouses, nurseries, public and private landscaping, revegetation projects, or recreation facility uses. A major portion could be produced from available phosphate and petroleum resources found in Alaska. Present nitrogen fertilizer production at Nikishka fully demonstrates the technical and economic feasibility of Alaska production. Large deposits of phosphates, suitable for fertilizer use, have been identified in the southern Brooks Range (10). These two fertilizer ingredients, nitrogen and phosphorus, constitute a major portion of the critical fertilizer requirements for development of an Alaskan agricultural industry.

Petroleum Fuels

An Alaskan agricultural industry, as previously described, would require about 439 billion Btu's of energy for farm production alone. This would probably be provided by 83.309 million gallons of diesel fuel (Table 8), 125.363 million gallons of gasoline (Table 9), and 41.718 million gallons of L-P gas (Table 10) along with 455 million kilowatt-hours of electricity (Table 11). Such quantities of petroleum fuels, excluding that used in generating electricity, would require more than 7 million barrels of crude oil per year to refine those needed for farm use.

Energy requirements for the farm production sector make up only a small portion of that used in the agricultural food industry. Percentages used in the various sectors, as identified for the United States, are: farm production 22 percent, farm family living 12 percent, food processing 28 percent, marketing and distribution 18 percent, and the selected input industries 20 percent (not including feed stock used in fertilizer production) (12).

The farm family living sector would require some 231.24 billion Btu's of energy which would probably come from the following: gasoline 32.4 percent, diesel and distillate 21.5 percent, L-P and natural gas 26.5 percent, electricity 15.7 percent, and coal 4.9 percent.

The food processing industry, generated by a fully developed Alaskan agricultural industry, would require about 537 billion Btu's of energy, and this would be provided from gasoline 0.6 percent, distillate and fuel oil 10.7 percent, L-P and natural gas 48.4 percent, electricity 30 percent, coal 9.9 percent, and other 0.4 percent, if it followed the present U.S. pattern.

The marketing and distribution sector, including both transport of food products to consumers and transport of production inputs to farms, would require at least 347 billion Btu's of energy and could require as much as 500 billion Btu's of energy. Some 91 percent would come from diesel fuels and about 9 percent would come from gasoline.

Input manufacturing would require some 385 billion Btu's of energy, and the energy sources would probably be broken down in the following manner: L-P and natural gas 82.9 percent, electricity 12.4 percent, distillate and fuel oil 2.8 percent, coal 1.1 percent, and gasoline 0.1 percent (if it followed the present U.S. pattern).

A cursory perusal of the crude petroleum requirements, resulting from a fully developed Alaskan agriculture, would indicate: farm production 7 million barrels, other sectors of the agricultural food industry 24 million barrels, fertilizer and petroleum fuels production 15 to 20 million barrels, and the equivalent of 18 million barrels for household preparation of food products (6, 12).

TABLE 6.—ESTIMATED MAN-YEARS OF LABOR REQUIRED TO ACCOMPLISH LATENT AGRICULTURAL PRODUCTION IN ALASKA, BY REGION [1]

[Man-years [2]]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruits	Regional total
Upper Yukon Basin	10,761	11,410						22,171
Lower Yukon Basin	5,080							5,080
Tenana Basin	6,164	5,665			1,174	161	55	13,219
South Central	3,302	1,915			588	161	55	6,021
Kenai Peninsula	300							300
Alaska Peninsula, south	265							265
Dillingham Block	3,018							3,018
Alaska Peninsula, north	649							649
Kuskokwin Basin	4,598							4,598
Copper River Basin	91							91
Kodiak and islands	107		20					127
Reindeer grazing areas				300				300
Product enterprise								
Total	34,335	18,990	20	300	1,762	322	110	55,839

[1] Acreage and production data from regional tables found in app. 1 (8).
[2] Calculated from Agricultural Statistics—1973, tables 651 and 652, p. 449.

TABLE 7.—ESTIMATED CROP FERTILIZER REQUIREMENTS FOR LATENT AGRICULTURAL LANDS, BY REGION [1]

[In thousands of tons]

Region	Cereal grains	Hay/ silage	Pasture	Vegetables and fruits	Other [2]	Range	Total
Upper Yukon Basin	186.3	165.5	576.0		U		927.8
Lower Yukon Basin	13.8	88.1	306.7		U		408.6
Tanana Basin	105.1	125.7	384.0	2.2	U		617.0
South Central	42.9	82.3	196.8	2.2	U		324.2
Kenai Peninsula	1.1	7.4	12.9		U		21.4
Alaska Peninsula, south							
Dillingham Block	11.1	57.6	165.5				234.2
Alaska Peninsula, north		14.8	25.8		U		40.6
Kuskokwim Basin	10.1	66.0	229.8				305.9
Copper River Basin	.3	2.	3.6				5.9
Kodiak and islands							
Reindeer grazing areas							
Total	370.7	609.4	1,901.1	4.4	U		2,885.7

[1] Estimates derived from published and unpublished data, judgements of professional agriculturalists, and information provided from research in progress.
[2] Data not available on enterprises which have not been treated in this research effort.

TABLE 8.—ESTIMATED DIESEL FUEL USE FOR LATENT AGRICULTURAL PRODUCTION (ON FARM), BY REGION [1]

[In thousands of gallons]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruits	Regional totals
Upper Yukon Basin	22,064	8,140						30,204
Lower Yukon Basin	10,413							10,413
Tanana Basin	12,634	4,041			727	26	23	17,451
South Central	7,244	1,366			363	26	23	9,022
Kenai Peninsula	524							524
Alaska Peninsula, south	(2)							(2)
Dillingham Block	5,074							5,074
Alaska Peninsula, north	1,040							1,040
Kuskokwim Basin	9,430							9,430
Copper River Basin	151							151
Kodiak and islands	(2)		(2)					(2)
Reindeer area	(2)			(2)				(2)
Total	68,574	13,547			1,090	52	46	83,309

[1] Diesel fuel use—U.S. Senate Committee on Agriculture and Forestry, The U.S. Food and Fiber Sector: Energy Use and Outlook, September 1974; Btu data from The Yearbook of Agriculture—1960: Power to Produce (includes all farm use).
[2] Not available.

TABLE 9.—ESTIMATED GASOLINE FUEL USE FOR LATENT AGRICULTURAL PRODUCTION (ON FARM), BY REGION [1]

[In thousands of gallons]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruits	Regional totals
Upper Yukon Basin	33,201	12,249						45,450
Lower Yukon Basin	15,670							15,670
Tanana Basin	19,012	6,081			1,094	38	35	26,260
South Central	10,900	2,056			547	38	35	13,576
Kenai Peninsula	789							789
Alaska Peninsula, south	(2)							(2)
Dillingham Block	7,635							7,635
Alaska Peninsula, north	1,565							1,565
Kuskokwim Basin	14,191							14,191
Copper River Basin	227							227
Kodiak and islands	(2)		(2)					(2)
Reindeer grazing area	(2)			(2)				(2)
Total	103,190	20,386			1,641	76	70	125,363

[1] Gasoline fuel use—U.S. Senate Committee on Agriculture and Forestry, The U.S. Food and Fiber Section: Energy Use and Outlook, September 1974; Btu data from The Year Book of Agriculture 1960—Power to Produce (includes all farm use).
[2] Not available.

TABLE 10.—ESTIMATED L-P GAS USE FOR LATENT AGRICULTURAL PRODUCTION (ON FARM), BY REGION [1]

[In thousands of gallons]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruits	Regional totals
Upper Yukon Basin	11,048	4,076						15,124
Lower Yukon Basin	5,214							5,214
Tanana Basin	6,326	2,024			364	13	12	8,739
South Central	3,627	684			182	13	12	4,518
Kenai Peninsula	263							263
Alaska Peninsula, south	(2)							(2)
Dillingham Block	2,541							2,541
Alaska Peninsula, north	521							521
Kuskokwim Basin	4,722							4,722
Copper River Basin	76							76
Kodiak and islands	(2)		(2)					(2)
Reindeer area	(2)			(2)				(2)
Total	34,338	6,784			546	26	24	41,718

[1] L-P gas use—U.S. Senate Committee on Agriculture and Forestry, The U.S. Food and Fiber Sector: Energy Use and Outlook, September 1974; Btu data from The Year Book of Agriculture—1960: Power to Produce (includes all farm use).
[2] Not available.

TABLE 11.—ESTIMATED ELECTRICITY USE FOR LATENT AGRICULTURAL PRODUCTION (ON FARM), BY REGION [1]

[In million kilowatt hours]

Region	Beef	Pork	Lamb and mutton	Reindeer	Milk	Eggs	Vegetables and fruits	Regional totals
Upper Yukon Basin	120.7	44.5						165.2
Lower Yukon Basin	56.9							56.9
Tanana Basin	69.1	22.1			4	0.1	0.1	95.4
South Central	39.6	7.5			2	1	.1	49.3
Kenai Peninsula	2.9							2.9
Alaska Peninsula, south	(2)							(2)
Dillingham Block	27.8							27.8
Alaska Peninsula, north	5.7							5.7
Kuskokwim Basin	51.6							51.6
Copper River Basin	.8							.8
Kodiak and islands	(2)		(2)					(2)
Reindeer area				(2)				(2)
Total	375.1	74.10			6	.2	.2	455.6

[1] Kilowatt hours use—U.S. Senate Committee on Agriculture and Forestry, The U.S. Food and Fiber Sector: Energy Use and Outlook, September 1974, (includes all farm use).
[2] Not available.

Electricity

Farm use of electricity, as previously noted, would require more than 455 million kilowatt-hours *per annum*, based on typical use patterns in the United States today, This estimate does not include that which would be used by farm families (790 mil. kw.-hr.), in agricultural food processing (3,550 mil. kw.-hr.), or in input manufacturing (1,045 mil. kw.-hr.). Identified petroleum reserves, coal deposits, geothermal and wind sources, and hydroelectric possibilities within Alaska constitute more than ample energy sources for added generating capacity needed in developing Alaska's latent agricultural industry.

Estimated Farm Production Expenses

There is little basis for accurately projecting farm production input costs, at this time, other than as a percentage of projected farm sales comparable to that reported for the rest of the country (1). The following estimates are for a fully developed Alaskan agriculture, as previously identified, using data from AGRICULTURAL STATISTICS—1973.

Estimated farm production expenses

Feed purchased	$556, 311, 000
Livestock purchased	414, 338, 000
Seed	66, 556, 000
Fertilizer and lime	161, 836, 000
Repair and operation of capital items	336, 293, 000
Depreciation, etc	487, 739, 000
Hired labor	255, 313, 000
Taxes on farm property	201, 226, 000
Interest on farm mortgage debt	126, 144, 000
Net rent	88, 802, 000
Miscellaneous	361, 075, 000
Total	3, 055, 633, 000

The above estimates provide some perspective of the relative scale of various farm production expenditures, and consequently some perspective of the scope and magnitude of possible farm service and supply industries. It must be noted, however, that the combination of farm production expenses in Alaska might be quite different than found in the 1974 AGRICULTURAL STATISTICS, which has been used as a base for calculating the reported estimates even though costs as a percentage of sales might be quite comparable.

Farm Machinery and Equipment

While it is not expected that Alaska's agriculture would be large enough to support a farm machinery and equipment manufacturing industry, it would provide opportunity for a substantial sales and service industry. A partial list of the projected annual sales of farm machinery is as follows:

Tractors	1, 875
Plows	470
Field cultivators	140
Power sprayers	370
Side delivery rakes	150
Pickup hay balers	220
Field forage harvesters	190
Combines	200
Manure spreaders	280
Power grinders and crushers	50
Silo unloaders	160

At 1973 (stateside) prices the estimated annual sales would approach 40 million dollars, and this does not include possible sales of several million dollars of irrigation equipment each year.

CAPITAL INVESTMENT IN FARM PRODUCTION SECTOR

As noted previously, estimates of this type are inevitably subjective, and must be approached with caution. However, the ratio of farm sales to farm assets, derived from 1973 nation-wide data, would indicate a capital investment of more than $1,800 an acre for a fully developed mature farming industry in Alaska. This would indicate a need for capital investment of at least $2,500 per acre to bring large blocks of latent agricultural lands into production, for land acquisition, clearing, soil development tillage and fertility additions, construction of buildings and facilities, purchase of machinery and equipment, and initial operating capital. Estimated capitalization for a fully developed farm production sector, by region, (Table 12) would indicate some $23.9 billion in farm assets—at 1973 prices.

DISTRIBUTION OF LATENT AGRICULTURAL PRODUCTION

The scope of this report does not allow treatment of transportation, processing, and distribution sectors of Alaska's latent agricultural industry, but general estimated of intrastate and export commodity uses (Table 13) do provide some perspective of the scope and magnitude of those sectors. It should be noted that export products include beef, pork, reindeer products, milk and wool. As noted previously, this report does not include ornamental, environmental, and horticultural crops which could be exported when production is developed for those crops.

TABLE 12.—ESTIMATED CAPITALIZATION FOR ALASKA'S LATENT FARMING REGIONS[1]

Region	Value as a mature industry (millions)	Value per acre (tillable)	Value per acre (range)	Value of new development (millions)
Upper Yukon Basin	$10,007	$2,346	----------	$12,409
Lower Yukon Basin	2,150	1,461	----------	2,666
Tanana Basin	5,575	2,260	----------	6,913
South central	2,454	2,460	$30.00	3,043
Kenai Peninsula	98	939	30.00	122
Alaska Peninsula, south	81	----------	36.00	100
Dillingham Block	1,234	1,354	30.00	1,530
Alaska Peninsula, north	198	933	30.00	246
Kuskokwim Basin	1,970	1,480	----------	2,443
Copper River Basin	28	877	30.00	35
Kodiak and Islands	36	----------	30.00	45
Reindeer grazing areas	83	----------	.83	103
Total	23,914	----------	----------	29,655

[1] Asset values calculated from estimated sales and acres in farms and range, and reflect values of all components of a going farming concern (1973 prices).

TABLE 13.—ESTIMATED DISTRIBUTION OF LATENT AGRICULTURAL PRODUCTION FROM IDENTIFIED LANDS IN ALASKA

Product	For Alaska consumption[1]	For export	Total production
Beef (million pounds dressed weight)	[2] 95.5	1,557.1	1,652.6
Pork (million pounds dressed weight)	51.7	2,298.8	2,350.5
Lamb and mutton (million pounds dressed weight)	.8	----------	.8
Reindeer (million pounds dressed weight)	[3] .8	12.4	13.2
Milk (million pounds)	200.0	250.0	450.0
Eggs (million dozen)	13.4	----------	13.4
Wool (million pounds)	----------	.4	.4
Reindeer skins (thousands)	10.0	70.0	80.0
Reindeer antlers (thousand pounds)	----------	1,000.0	1,000.0
Barley (thousand tons)	8,014.0	----------	8,014.0
Oats (thousand tons)	27.8	----------	27.8
Hay/silage—D.M. (thousand tons)	13,050.0	----------	13,050.0
Vegetables and potatoes (thousand tons)	79.3	----------	79.3
Fruits and berries (thousand tons)	1.4	----------	1.4

[1] Estimated consumption for 820,000 population (year 2000), "Alaska's Agriculture, An Analysis of Development Problems," University of Alaska, ISEGR Report No. 30, table XXXIX, p. 162.
[2] Adjusted to 1970 U.S. consumption average for beef and veal. Does not include consumption due to tourism and part-year worker population.
[3] Estimated trend increase in consumption.

SUMMARY AND CONCLUSIONS

Alaska's agricultural development planning has suffered neglect, apathy, and innocuous assessments because of the recalcitrance of public agencies and institutions to objectively and comprehensively identify parameters of latent agricultural possibilities in Alaska. This situation has resulted from negativistic images created by a miniscule, fragmented, and declining agricultural "industry", unreal assessments of other resource based industry potentials, and profound voids in agricultural industry planning data. The situation has been further complicated by the overly aggressive pursuit of environmental "objectives" and public planning for parks, wildlife refuges, ecological reserves, scenic and historic sites, public forests, and petroleum and mineral provinces, without due consideration to the future social and economic well-being of the Native people and other residents of Alaska.

This report should provide one perspective of the scope and magnitude of latent agricultural production potential in Alaska. It further identifies some 17.5 million acres of tillable lands, by region. While climatic limitations, geographic locations, and competing land uses introduce uncertainties in projecting future agricultural uses, production estimates have been made for 9.5 million acres of tillable soils, 9.8 million acres of domestic livestock range, and 100 million acres of reindeer grazing. Particular care has been exercised in deleting possible crop and grazing lands where severe climatic or competing land uses were recognized.

Projected agricultural land uses have been identified in several ways. Field crop uses have been identified for 4.5 million acres of cereal grains, 3.2 million acres of hay and silage, 1.9 million acres of cultivated pasture, and 6,000 acres of fruits and vegetables. Livestock uses have been identified for 5.5 million cattle, 7.7 million hogs, 35,000 sheep, 400,000 reindeer, 50,000 dairy cattle, and 650,000 poultry. Less extensive land-using crops, i.e. greenhouse, nursery, grass seed, environmental, and recreation, have not been identified.

An annual value of agricultural production, at the first point of sale, has been identified as being in excess of 4 billion dollars. This projection has been based on estimates of sales of 1.7 billion pounds of beef, 2.4 billion pounds of pork, 800,000 pounds of lamb and mutton, 13.2 million pounds of reindeer meat, 450 million pounds of milk, 13.4 million dozen eggs, 400,000 pounds of wool, 80,000 reindeer skins, 1 million pounds of (velvet) reindeer antlers, 8.0 million tons of barley, 27,800 tons of oats, 13.0 million tons (dry matter) of hay and silage, 79,300 tons of vegetables including potatoes, and 1,400 tons of fruits and berries.

A second component of Alaska's potential agricultural industry, which has not previously been identified, is that of factor inputs used in farm production. A fully developed farming industry would require more than 55,000 man-years of labor, petroleum fuels from more than 7 million barrels of crude oil, 2.9 million tons of fertilizers, 455 million kilowatt hours of electricity, and in excess of 40 million dollars of new machinery and equipment each year. Farm production expenses have been estimated at 3.0 billion dollars, which provides additional perspective regarding the probable scope and magnitude of potential farm support industries.

The capital investment (asset value) per acre of agricultural production, excluding extensive rangeland, has been projected as being $1,800, and about $2,500 per acre for bringing new lands into production. These estimates include all investments in land, buildings and facilities, machinery and equipment, livestock, etc. A projected value of a fully developed mature farming industry in Alaska would indicate constant farm assets of more than $23.9 billion (at 1973 prices). Moreover, such estimates would indicate initial farming industry development costs of some $30 billion.

The time element of full agricultural development in Alaska has not been addressed in this report since the intent has been only to provide definitive parameters for the development planning process. The data provided should allow planning assessments of production possibilities within each region of latent agricultural lands. It should also allow ethical assessments of Alaska's agricultural production possibilities in comparison with other resource based industries and conflicting public land uses, if public goals are to fully address the future social and economic well-being of Alaska's present and future peoples.

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APPENDIX

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION

Region	Present standards [1]	Projected standards [2]
Upper Yukon River Basin (above Tanana):		
Agricultural lands (acres):		
Class 1 [3]	1,626,000	(4)
Class 2	1,571,000	(4)
Class 3	1,625,000	(4)
Class 4	724,000	(4)
Tillable acres	5,546,000	----------
Nontillable	0	----------
Total acres	5,546,000	----------

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards [1]	Projected standards [2]
Upper Yukon River Basin (above Tanaka)—Continued		
Estimated production:		
Beef (intensive farm system):		
Net product (live weight) (million pounds)	473	873
Cattle in herd (head)	906,268	1,672,668
Slaughter (head)	415,374	766,642
Crop acres required:		
Barley	958,621	943,416
Hay/silage	1,067,448	1,001,889
Pasture	467,009	548,072
Other	1,558,115	1,557,816
Total acres	4,051,193	4,051,193
Pork (controlled environment system) (live weight):		
Net product (live weight) (million pounds)	944	1,883
Hogs in herd (at one time)	2,305,814	4,602,180
Slaughter (during year)	4,138,960	8,260,960
Crop acres required:		
Barley	919,881	919,881
Other	574,926	574,926
Total acres	1,494,807	1,494,807
Lower Yukon River Basin (below Tanana):		
Agricultural lands (acres):		
Class 2 [3]	233,000	(4)
Class 4	1,372,000	(4)
Class 5	75,000	(4)
Class 6	232,000	(4)
Tillable acres	1,912,000	----
Nontillable	0	----
Total acres	1,912,000	----
Estimated production:		
Beef (intensive farm system):		
Net product (live weight) (million pounds)	223.3123	411.8914
Cattle in herd (head)	427,866	789,184
Slaughter (head)	196,106	361,711
Crop acres required:		
Barley	452,431	445,255
Hay/silage	503,793	472,851
Pasture	220,409	258,668
Other	735,367	735,226
Total acres	1,912,000	1,912,000
Tanana River Basin:		
Agricultural lands (acres):		
Class 1 [3]	311,000	(4)
Class 2	1,915,000	(4)
Class 4	610,000	(4)
Class 5	480,000	(4)
Tillable acres	3,316,000	----
Nontillable	0	----
Total acres	3,316,000	----
Estimated production:		
Milk (controlled environment system):		
Net product (million pounds)	300	300
Cattle in herd (head)	45,035	33,470
Beef (from cull slaughter) (million pounds)	3.8	2.8
Crop acres required:		
Barley	53,052	28,295
Oats	17,021	12,860
Hay/silage	80,704	41,005
Other	94,236	51,225
Total acres	245,013	133,385
Beef (intensive farm system):		
Net product (live weight) (million pounds)	271	500
Cattle in herd (head)	519,123	957,503
Cattle slaughter (head)	237,932	438,857

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards [1]	Projected standards [2]
Tanaka River Basin—Continued		
Estimated production—Continued		
Beef (intensive farm system)—Continued		
Crop acres required:		
Barley	548,926	540,220
Hay/silage	611,243	573,702
Pasture	267,419	313,837
Other	892,208	892,037
Total acres	2,319,796	2,319,796
Pork (controlled environment system):		
Net product (live weight) (million pounds)	464	935
Hogs in herd (at 1 time) (head)	1,133,552	2,284,205
Hog slaughter (head)	2,035,104	4,100,910
Crop acres required:		
Barley	452,116	456,683
Other	282,573	285,427
Total acres	734,689	742,110
Eggs (controlled environment system):		
Net product (eggs) (million dozen)	6.7	6.7
Poultry in flock	325,000	325,000
Tillable acres required:		
Barley	5,417	2,889
Other	3,386	1,806
Total acres	8,803	4,695
Vegetables and berries (field production systems):		
Vegetable and potatoes (tons)	36,206	32,206
Berries (tons)	693	693
Tillable acres required:		
Potatoes	2,550	1,433
Cabbage	112	35
Carrots	194	84
Celery	90	59
Lettuce	1,185	503
Peas	255	204
Other vegetables	101	101
Subtotal	4,487	2,418
Strawberries	190	142
Other berries	62	36
Subtotal	252	178
Tilled acres	4,789	2,596
Other	2,962	1,792
Total acres	7,701	4,388
South central (not including the Kenai Peninsula):		
Lands (acres):		
Class 1 [3]	1,247,000	----------
Class 4	116,000	----------
Class 6	409,000	----------
Tillable acres	1,773,000	----------
Nontillable (range)	1,134,000	----------
Total acres	2,907,000	----------
Estimated production:		
Milk (controlled environment systems):		
Net product (million pounds)	150	150
Cattle in herd (head)	22,517	16,735
Beef (from cull slaughter) (million pounds)	1.9	1.4
Crop acres required:		
Barley	26,526	14,148
Oats	8,510	6,430
Hay/silage	40,351	20,402
Other	47,117	25,613
Total acres	122,504	66,593
Beef (range livestock system): [5]		
Net product (live weight) (million pounds)	33	33
Cattle in herd (head)	73,491	73,491
Cattle slaughter (head)	31,185	31,185

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards [1]	Projected standards [2]
South central (not including the Kenai Peninsula)—Continued		
Estimated production—Continued		
Beef (range livestock system) [5]—Continued		
Crop acres required:		
Barley	15,038	8,019
Hay/silage	48,296	24,432
Pasture	85,050	42,522
Other	92,440	46,858
Tillable acres	240,824	121,831
Nontillable (range)	1,134,000	1,134,000
Total acres	1,374,824	1,255,831
Beef (intensive farm system): [6]		
Net product (live weight) (million pounds)	117	234
Cattle in herd (head)	224,903	447,903
Cattle slaughter (head)	103,061	220,913
Crop acres required:		
Barley	237,815	252,705
Hay/silage	264,813	268,368
Pasture	115,855	146,808
Other	386,537	417,279
Tillable acres	1,005,020	1,085,160
Nontillable (range)	0	0
Total acres	1,005,020	1,085,160
Pork (confrolled environment systems):		
Net product (live weight) (million pounds)	154	316
Hogs in herd (at one time) (head)	375,498	772,302
Hogs slaughter (during year) (head)	674,114	1,386,540
Crop acres required:		
Barley	149,827	154,394
Other	93,642	96,496
Tillable acres	243,469	250,890
Nontillable	0	0
Total acres	243,469	250,890
Eggs (controlled environment system):		
Net product (eggs) (million dozen)	6.7	6.7
Poultry in flock	325,000	325,000
Tillable acres required:		
Barley	5,417	2,889
Other	3,386	1,806
Total acres	8,803	4,695
Vegetables and berries (field production systems):		
Vegetable and potatoes (tons)	36,206	36,206
Berries (tons)	693	693
Tillable acres required:		
Potatoes	2,550	1,433
Cabbage	112	35
Carrots	194	84
Celery	90	59
Lettuce	1,185	503
Peas	255	204
Other vegetables	101	101
Subtotal	4,487	2,418
Strawberries	190	142
Other berries	62	36
Subtotal	252	178
Tilled acres	4,789	2,596
Other	2,962	1,792
Total acres	7,701	4,388
Intrastate shipment (to supply feed requirements of Alaska Peninsula; south-side beef; and Kodiak and Islands district, beef and sheep):		
Crop acres required:		
Barley	21,588	11,787
Hay/silage	67,249	34,835
Other	55,541	29,138
Total acres	144,378	75,760

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards [1]	Projected standards [2]
Kenai Peninsula:		
Lands (acres):		
Class 1 [3]	545,000	([6])
Class 6	237,000	([6])
Tillable acres	782,000	
Nontillable (1/4 of 840,000)	210,000	
Total acres	992,000	
Estimated production:		
Beef (range livestock system): [5]		
Net product (live weight) (million pounds)	24	26
Cattle in herd (head)	53,020	58,055
Cattle slaughter (head)	22,498	24,635
Crop acres required:		
Barley	10,848	6,335
Hay/silage	34,841	19,301
Pasture	61,354	33,591
Other	66,902	37,017
Tillable acres	173,945	96,244
Nontilled (range)	† 818,053	895,754
Total acres	991,988	991,998
Alaska Peninsula (south side):		
Lands (acres):		
Range	2,233,000	([8])
Tillable acres	0	([8])
Nontillable (range)	2,233,000	([8])
Total acres	2,233,000	
Production estimate:		
Beef (extensive range livestock system):		
Net product (live weight) (million pounds)	31	32
Cattle in herd (head)	69,037	71,264
Cattle slaughter (head)	29,295	30,240
Crop acres required:		
Barley	([9])	([9])
Hay/silage	([9])	([9])
Other	([9])	([9])
Tillable acres	0	0
Nontillable (range)	2,233,000	2,233,000
Total acres	2,233,000	2,233,000
Dillingham Block:		
Lands (acres):		
Class 2 [3]	883,000	
Class 4	138,000	
Class 5	102,000	
Tillable acres	1,123,000	
Nontillable (range)	1,617,000	
Nontillable (¼ of 1,915,000)	478,750	
Total acres	3,218,750	
Production estimate:		
Beef (range livestock system): [5]		
Net product (live weight) (million pounds)	61	61
Cattle in herd (head)	135,829	135,829
Cattle slaughter (head)	57,638	57,638
Crop acres required:		
Barley	27,791	14,822
Hay/silage	89,257	45,157
Pasture	157,181	78,591
Other	171,393	68,606
Tillable acres	455,622	225,176
Nontillable (range)	2,095,750	2,095,750
Total acres	2,541,372	2,320,926
Beef (intensive farm system): [10]		
Net product (live weight) (million pounds)	73	188
Cattle in herd (head)	140,511	361,136
Cattle slaughter (head)	64,389	165,489

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards [1]	Projected standards [2]
Dillingham Block—Continued		
Production estimate—Continued		
Beef (intensive farm system) [10]—Continued		
Crop acres required:		
Barley	148,579	203,751
Hay/silage	165,446	216,380
Pasture	72,383	118,368
Other	241,495	336,444
Tillable acres	627,903	874,943
Nontilled (range)	0	0
Total acres	627,903	874,943
Interstate shipment (to supply feed requirements of Alaska Peninsula, north side):		
Crop acres required:		
Barley	24,293	14,080
Other	15,183	8,800
Total acres	39,476	22,880
Alaska Peninsula (north side):		
Lands (acres):		
Class 5 [3]	345,000	----
Class 6	674,000	----
Tillable acres	1,019,000	----
Nontillable (range)	1,163,000	----
Total acres	2,182,000	----
Beef (range livestock system):		
Net product (live weight) (million pounds)	53.3	58
Cattle in herd (head)	118,732	129,038
Cattle slaughter (head)	50,382	54,756
Crop acres required:		
Barley (see Dillingham Block)	----	----
Hay/silage	78,022	42,899
Pasture	137,396	74,661
Other	134,636	73,475
Tilled acres	350,054	191,035
Nontilled (range)	[7] 1,831,943	1,990,962
Total acres	2,818,997	2,818,997
Kuskokwim River Basin:		
Lands (acres):		
Class 2 [3]	406,000	([11])
Class 3	355,000	([11])
Class 4	355,000	([11])
Class 5	189,500	([11])
Class 6	426,000	([11])
Tillable acres	1,731,500	----
Nontillable (range)	0	----
Total acres	1,731,500	----
Estimated production:		
Beef (intensive farm system):		
Net product (live weight) (million pounds)	202	373
Cattle in herd (head)	387,474	714,682
Cattle slaughter (head)	177,559	327,500
Crop acres required:		
Barley	409,719	403,221
Hay/silage	456,232	428,212
Pasture	199,602	234,249
Other	665,946	665,818
Tillable acres	1,731,499	1,731,500
Nontillable (range)	0	0
Total acres	1,731,499	1,731,500

See footnotes at end of table.

APPENDIX TABLE 1.—ESTIMATED LATENT AGRICULTURAL LAND USE AND PRODUCTION, BY REGION—Continued

Region	Present standards[1]	Projected standards[2]
Copper River Basin:		
Lands (acres):		
Class 1[3]	153,000	----------
Class 4	14,000	----------
Class 5	15,000	----------
Class 6	104,000	----------
Tillable acres	286,000	----------
Nontillable	0	----------
Total acres	286,000	----------
Estimated production:		
Beef (range livestock system):		
Net product (live weight) (million pounds)	7.0	8.0
Cattle in herd	21,251	23,268
Cattle slaughter (head)	6,507	7,125
Crop acres required:		
Barley	3,128	1,826
Hay/silage	10,045	5,565
Pasture	17,689	9,684
Other	19,288	10,672
Tilled acres	50,150	27,747
Nontillable (range)	235,850	258,250
Total acres	286,000	285,997
Kodiak and Island ranges (traditional ranch areas):		
Lands (acres):		
Range	1,200,000	----------
Tilled acres	0	----------
Nontillable (range)	1,200,000	----------
Total acres	1,200,000	----------
Estimated production:		
Beef (extensive range livestock system):		
Net product (live weight) (million pounds)	13	13
Cattle in herd (head)	40,248	40,248
Cattle slaughter (head)	12,324	12,324
Crop acres required:		
Barley	(9)	(9)
Hay/silage	(9)	(9)
Other	(9)	(9)
Tillable acres	0	0
Nontillable (range)	919,630	920,689
Total acres	919,630	920,689
Lamb and mutton (range system):		
Net product (live weight) (million pounds)	1.5	1.5
Wool (pounds)	388,000	388,000
Sheep in flock	35,288	34,288
Slaughter	13,636	13,636
Crop acres required:		
Barley	(9)	(9)
Hay/silage	(9)	(9)
Other	(9)	(9)
Range	280,370	279,311
Total acres	280,370	279,311

[1] Present standards are a composite of statistical data (1970) and judgments of professional agriculturists, table XL; p. 165, (7).
[2] Projected standards assume committed public resources and dedicated public research and service inputs. These standards were projected for year 2000, but could be attained at a much earlier date, table XLIII, p. 168, (7).
[3] Refers to S.C.S. map classes in "Alaska's Agricultural Potentials," Alaska Rural Development Council, Publication No. 1, pp. 20–21, (4).
[4] No grazing lands were identified or included because of possible conflict with wildlife and other environmental factors.
[5] Extent of range livestock system determined by available identified range lands.
[6] The range livestock system of beef production was selected to minimize possible conflict with wildlife and recreation.
[7] Lands classed tillable have been allocated "range" due to climate and use conflicts.
[8] The range livestock system for beef was selected to minimize conflict with wildlife, and minimize predation.
[9] Refer to south central for farm production.
[10] Determined by available tillable lands.
[11] No grazing lands were identified or included because of possible conflict with wildlife and reindeer.

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AGRICULTURE IN ALASKA: 1976–2000 AD

INTRODUCTION

Sharply rising food prices and the possibility of food shortages have increasingly focused national attention on existing sources of food production and potential new areas of production in the United States. This subject is especially relevant to Alaskans who receive the largest part of their food supply by transport from the other states, and as a result pay some of the highest prices in the United States.

Just where Alaska fits into the picture as a food producer is yet undetermined. Clearly, agriculture in Alaska is small; however, it has potential for significant increases in production which could benefit Alaska, the rest of the United States, and the world.

To provide a clearer view of Alaska agriculture, its present capabilities and future possibilities, this issue of the *Review* looks at agricultural development in Alaska, analyzes past changes, and discusses future prospects for several types of agricultural production in Alaska.

HISTORICAL DEVELOPMENT

Our knowledge of Alaska's agricultural past begins with some of the first Russian settlers who transported cattle and goats from Siberia to Kodiak Island in the latter part of the eighteenth century.[1,2] These early settlers also grew such vegetables as potatoes, cabbages, radishes, and lettuce, although with limited success because of a wet climate.

After U.S. purchase of the territory in 1867, there was little agricultural activity beyond the food that the small white populace grew for their own tables. In fact, until the first territorial governor's report in 1884, U.S. officials had been led to believe through erroneous reports that the Alaska climate effectively ruled out agriculture. Such thinking changed during the next few years, however, and by the late 1890s, the U.S. Government had established agricultural experiment stations at Sitka, Kenai, and Kodiak to conduct research toward adapting certain grains, vegetables, fruits, and livestock to Alaska conditions.[3]

The gold discovery near Nome in 1900 brought thousands of prospective miners to that area, and this new market gave a boost to a fledgling experiment in Alaska animal husbandry—reindeer. Reindeer were first imported by the U.S. Government from Siberia in the early 1890s to be used as a subsistence resource for the Natives. But when the gold rush created the nearby market, Natives and others began to sell reindeer meat to the miners. After the gold rush population subsided, reindeer in Alaska continued to increase, being used both for local subsistence and commercially for local as well as import markets in the United States. Reindeer herds increased steadily until they peaked in 1932 at approximately 640,000 animals. After that, for a variety of economic and other reasons, their numbers were allowed to decrease precipitously. Total numbers in 1968 were estimated at only 30,000 head.[4]

The 1902 discovery of gold in the north Tanana Valley led to development there of a significant market for agricultural products. A small agricultural industry developed in response to the growing numbers of gold seekers, and local farmers produced grains, vegetables, livestock, and poultry products. However, as gold production diminished and the boom population decreased, agricultural activity also decreased.[5]

A depression-inspired experiment in the mid-1930s renewed agricultural interest in Alaska when the U.S. Government transplanted a group of impoverished

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[1] However, some researchers believe that southeastern Natives may have cultivated tobacco in aboriginal times. See F. Laguna, *Under Mount St. Elias: The History and Culture of the Yakutat Tlingits* (Washington, D.C.: Smithsonian Institution Press, 1972), p. 410.

[2] Alford Jake Barron, "History of Agriculture in Alaska" (Thesis, University of Oklahoma, 1939), Chapter 2.

[3] *Ibid.*, Chapter 1.

[4] Dean F. Olson, *Alaska Reindeer Herdsmen*, Institute of Social, Economic and Government Research Report No. 18 (Fairbanks: University of Alaska, 1969), pp. 8–16.

[5] Population in the area, including Fairbanks, grew eo 10,541 persons by 1910. By 1920, however, declining gold production had caused the population to dwindle to 2,182. James W. Sullivan, "Fairbanks: An Economic Profile," *Alaska Review of Business and Economic Conditions*, 7 (January 1970) :1.

farmers from the mid-western United States to the Matanuska Valley to develop agricultural production in that region.[6] This experiment was a success to the extent that today, this valley produces the largest volume of agricultural products in the state.

During the late 1940s, the U.S. Department of Agriculture (USDA), in response to U.S. military concern for the vulnerability of Alaska's food supply, increased its efforts to make the territory less dependent on the other states. The USDA increased its agricultural research, expanding ongoing programs and introducing new ones. In addition, the military increased its purchases of locally grown products. As a result, partly of this and partly because of a growing population, Alaska agriculture grew steadily from that time until the early 1960s. By the sixties, however, because of an improving transportation network between Alaska and the lower U.S., Alaska's small scale, inefficient agriculture simply could not compete with the massive, cheaper, output of its lower U.S. counterpart. Thus, agriculture in Alaska stagnated during the 1960s (Table 1).

TABLE 1.—SUMMARY OF ALASKA CROP AND LIVESTOCK SALES, 1960–74

Year	Crops	Livestock	Total
1974	$1,987,000	$3,654,000	$5,641,000
1973	1,980,000	3,318,000	5,298,000
1972	1,343,000	3,040,000	4,383,000
1971	963,000	2,871,000	3,834,000
1970	903,000	3,112,000	4,015,000
1969	624,000	2,948,000	3,572,000
1968	1,031,000	3,060,000	4,091,000
1967	920,000	3,197,000	4,117,000
1966	1,025,000	3,299,000	4,324,000
1965	989,000	3,255,000	4,244,000
1964	1,332,000	3,025,000	4,357,000
1963	865,000	3,148,000	4,013,000
1962	1,139,000	3,265,000	4,404,000
1961	1,090,000	3,315,000	4,405,000
1960	1,020,000	3,116,000	4,136,000

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

IMPORTANCE OF AGRICULTURE IN ALASKA

If large-scale agricultural development in Alaska were feasible, it could provide food products for a world market. In addition, it could provide employment and economic development for Alaskans. World population and incomes are rising, with a corresponding increase in demand for food. Greater food production is facilitated by increased efficiency of production and development of new agricultural lands. There are only a few places left on earth with large areas of undeveloped land, and Alaska is one of these.

Another factor to consider in measuring the importance of Alaska agriculture is, even if it were only developed to provide for markets within the state, such development would provide employment opportunities and create secondary economic growth in rural areas. A developed, large-scale agriculture, if feasible, could provide Alaska consumers with a limited range of price-competitive food products. Another advantage would be the social benefits resulting from an attractive rural lifestyle enjoyed directly by farm families and vicariously by urban residents. There are, of course, some negative aspects to consider. The character of certain wild land areas would distinctly change. Development would affect habitat for wild game and fish to the extent that whole areas might become unsuitable for certain species. Stream and ground water pollution might increase due to use of agricultural chemicals and large concentrations of people.

Thus, we must ask several questions in considering agricultural developments in Alaska:

[6] Evangeline Atwood, *We Shall Be Remembered* (Anchorage: Alaska Methodist Press, 1966).

What is the present state of agriculture in Alaska? (What base have we to build on?)

What, if any, types of future agricultural enterprises have been identified as feasible for Alaska?

What is the potential for statewide and export markets?

What would be the regional economic impact of such developments?

What would be the social benefits of agricultural development; for example, the farm lifestyle?

What would be the social costs of agricultural development—that is, pollution potential and impact on wild lands and wildlife.

The first four questions are explored in the remaining sections of this *Review*. Although the questions on social benefits and costs will need to be considered in depth, they are outside the scope of this article.

PRESENT SITUATION

Major agricultural production areas in Alaska are shown in Figure 1.

LIVESTOCK AND POULTRY PRODUCTS

Milk Production.—Milk is the largest component of reported agricultural sales in Alaska (Table 2).

TABLE 2.—SALES OF ALASKA LIVESTOCK AND CROPS, 1974

Product	Sales	Percent
Milk	$2,449,000	43
Eggs	499,000	9
Potatoes	760,000	13
Hay	754,000	13
Beef	322,000	6
Lettuce	232,000	4
Reindeer [1]	150,000	3
Other vegetables	129,000	2
Pork	77,000	1
Barley and oats	104,000	2
Wool	98,000	2
Poultry meat	10,000	(2)
Silage	8,000	(2)
Mutton	49,000	1
Total	$5,641,000	100

[1] Excludes antlers, hides, and other byproducts (worth $60,000 in 1974).
[2] Less than 1 percent.

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

However, much of what is consumed in the state in imported.

According to 1972 data, fresh milk sales from Alaska producers accounted for approximately 33 percent of the total fluid milk consumed in Alaska.[7] Another 33 percent (including all the fresh milk consumed in Southeastern Alaska) was shipped in fresh. Recombined milk accounted for the remaining 33 percent of the fluid milk market. It is shipped in as a dry powder and butterfat/cream, reconstituted in Alaska, packaged much like fresh milk and sold as a competing product.[8]

Alaska's dairy industry has been undergoing a readjustment period since the 1960s. Milk sales and production remained relatively constant in the Matanuska Valley for the entire period 1960–1974 (Table 3), while they declined rapidly

[7] Except for some ice cream items, all other dairy products, including fresh milk, are shipped into Alaska, largely from Washington State.

[8] Wayne C. Thomas and Peter C. Lin, "Economic Factors in Alaska Milk Marketing," *Agroborealis*, 4 (1972) : 21–22. The milk data were taken from this article and updated.

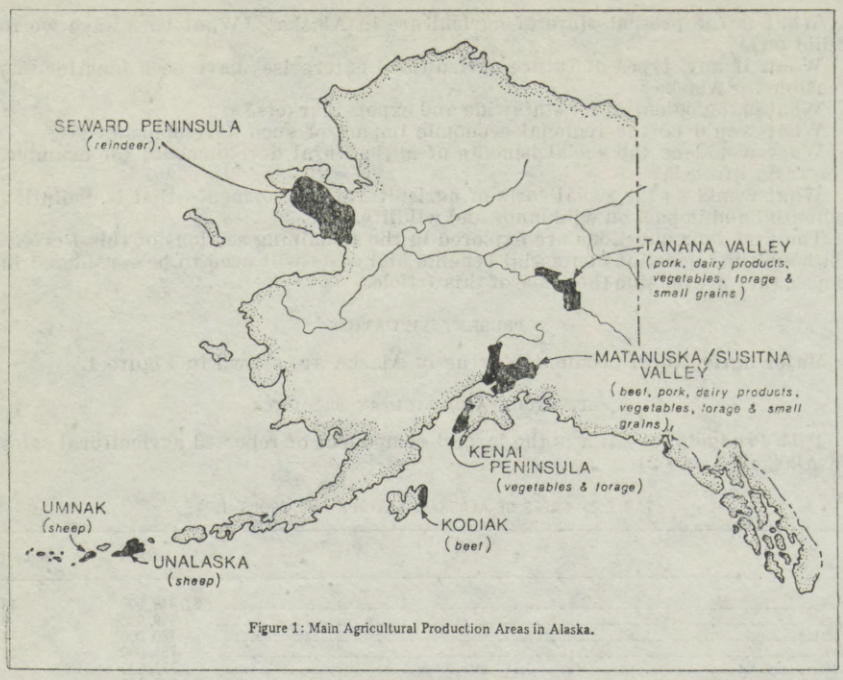

Figure 1: Main Agricultural Production Areas in Alaska.

in all other regions of the state. A number of factors were responsible for the reduction. The cost of milk production is relatively high in Alaska due to insufficient farm size, rising land costs, and economically more attractive alternative uses of labor and capital in the other sectors of the Alaska economy.

Beef Cattle.—Cattle for slaughter came from two major sources in Alaska. One source is the Matanuska Valley dairy farms where bull calves and cull cows make up 31 percent of total beef marketings. The other source is ranches on Kodiak Island, which represents the largest beef breed production area, with 48 percent of beef sales.[9] Most of the cattle slaughtered for beef in Alaska are marketed by the individual producers and sold privately as beef for frozen food lockers. At times, a small percentage goes into manufactured beef where the carcasses are ground for hamburger and other processed meats. Some cuts of Alaska beef are intermittently sold at retail in mainland Alaska on a supply-available basis.

Alaska produces less than 2 percent of the beef marketed within the state.[10] Total sales of Alaska beef in 1974 amounted to slightly less than 500,000 pounds (Table 4). As shown in Table 4, Alaska beef production for the period 1960–1974 has fallen from its highest production level in 1967. Part of reduced beef production in Alaska was due to unsettled Native land claims. Until land titles become less clouded, existing beef producers, especially those operating on leased federal lands, are probably reluctant to make the major capital investments necessary to maintain or increase production.

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[9] Alaska Livestock and Crop Reporting Service, *Alaska Agricultural Statistics*, various issues.

[10] Christopher Stephens, Wayne Thomas, and Virginia Burke, *Supplying Alaska's Red Meat and Poultry Markets*, Institute of Agricultural Sciences Bulletin 41 (Fairbanks: University of Alaska, May 1975), p. 23.

TABLE 3.—QUANTITY SOLD, VALUE OF SALES, AND PRICE RECEIVED FOR MILK PRODUCED IN ALASKA, 1960–74

Year	Tanana Valley		Matanuska Valley		Kenai Peninsula		Southeast		Totals		
	Quantity (lbs × 10^3)[1]	Sales (× 10^3)	Quantity (lbs × 10^3)	Sales (× 10^3)	Quantity (lbs × 10^3)	Sales (× 10^3)	Quantity (lbs × 10^3)	Sales (× 10^3)	Quantity (lbs × 10^3)	Sales (× 10^3)	Price/cwt.[2]
1974	645	$92	16,555	$2,357					17,200	$2,449	$14.24
1973	650	85	16,650	2,022					17,300	2,107	12.18
1972	800	135	16,100	1,828					16,900	1,963	11.62
1971	830	91	15,570	1,747					16,500	1,838	11.21
1970	950	141	16,850	1,853					17,800	1,994	11.20
1969	625	95	16,250	1,751	115	$14	10	$2	17,000	1,862	10.95
1968	470	65	16,400	1,726	120	14	10	2	17,000	1,807	10.63
1967	969	115	16,496	1,736	125	14	10	2	17,600	1,867	10.61
1966	1,700	168	16,430	1,684	120	21	50	8	18,300	1,881	10.28
1965	1,850	215	16,345	1,593	647	59	858	87	19,700	1,954	9.92
1964	1,520	184	18,280	1,720	640	60	1,060	103	21,500	2,067	9.61
1963	2,160	294	17,940	1,783	674	71	1,326	136	21,900	2,284	10.43
1962	2,420	323	17,760	1,817	460	51	1,360	149	22,000	2,340	10.64
1961	2,430	340	17,700	1,975	240	25	1,430	164	21,800	2,504	11.49
1960	2,170	308	15,504	1,763	221	25	1,505	181	19,400	2,277	11.74

[1] 10^3=1,000.
[2] Cwt=hundredweight.

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

TABLE 4.—QUANTITY SOLD, VALUE OF SALES, AND PRICE RECEIVED FOR VARIOUS MEAT PRODUCTS PRODUCED IN ALASKA, 1960–74

Year	Beef and veal			Pork			Lamb and mutton			Reindeer		
	Quantity sold D.W. [1] (lbs × 10^3) [2]	Sales (× 10^3)	Price/cwt D.W.	Quantity sold D.W. (lbs × 10^3)	Sales (× 10^3)	Price/cwt D.W.	Quantity sold D.W. (lbs × 10^3)	Sales (× 10^3)	Price/cwt D.W.	Quantity sold D.W. (lbs × 10^3)	Sales (× 10^3)	Price/cwt D.W.
1974	466	$322	$69.10	136	$77	$56.62	102	$49	$48.04	220	$150	$68.18
1973	420	309	73.57	110	71	64.55	20	9	45.00	261	144	55.17
1972	483	278	57.56	124	79	63.71	20	9	45.00	239	121	50.63
1971	494	273	55.26	138	88	63.77	21	10	47.61	365	188	51.51
1970	681	355	52.13	123	75	60.98	33	17	51.53	479	241	50.31
1969	719	359	49.93	142	64	45.07	17	9	52.94	442	219	47.82
1968	692	292	42.20	191	83	43.46	19	11	57.89	608	260	42.76
1967	857	350	40.84	140	64	45.71	28	12	42.86	517	188	36.36
1966	854	350	40.98	145	77	53.10	34	14	41.18	546	190	34.80
1965	694	279	40.20	198	98	45.96	21	9	42.86	522	200	38.31
1964	624	249	39.58	128	51	39.84	16	8	50.00	504	195	38.69
1963	505	209	41.39	64	24	37.50	15	8	53.33	394	138	35.03
1962	507	237	46.75	121	51	42.15	14	8	57.14	372	139	37.37
1961	251	116	46.22	166	67	40.36	13	7	53.84	364	136	37.36
1960	305	122	40.00	145	59	40.69	9	5	55.55	330	132	40.00

[1] D.W.=Dress weighf.
[2] 10^3=1.000.

Source: Alaska Crop and Livesfock Reporting Service, Palmer, Alaska.

Hogs.—In 1972, over 6,000,000 pounds of cured and uncured pork (42,000 carcasses) were shipped to Southcentral Alaska.[11] In the same year, less than 800 carcasses were produced in the state. Alaska pork, unlike Alaska beef, can move into any existing market, because it is similar in all respects to shipped-in pork products. However, local pork production can only expand significantly if the higher costs of production in Alaska are no greater than cost of pork in the lower 48 states plus transportation to Alaska. A 1971 study indicates that a production cost range of $28.66 to $36.25 per hundredweight (dressed weight) can be achieved in Alaska with good-to-average management.[12]

Since 1965, Alaska farm-level pork prices have not dropped below $37.50 per hundredweight (dressed weight). Thus, increased pork production, if managed properly, should be profitable in Alaska.

Pork production through 1974 remained below that of 1965 (Table 4). In 1974, several pork producers in the Matanuska and Tanana valleys went out of business, both because of a lack of local feed and a lack of the processing facilities and other supporting services.

Sheep and Wool.—Alaska sheep production occurs almost exclusively on the eastern portion of the Aleutian Islands. The production process is dissimilar to what is generally found in the western range areas of the lower states, because lamb production for meat is not the primary income generator. All lambs, both wethers and ewes, are kept for wool production. Only as the animals grow older and their wool production declines are they sold for mutton, generally to individual buyers (Table 4).

In 1974, a signficant increase in mutton production occurred in the Aleutian Islands after a new slaughter house went into operation on Umnak Island. This mutton was sold to institutional buyers from the lower United States.

The wool is also sold to markets in the lower states. Production of wool in Alaska has diminished in recent years, largely because of reduced national wool prices. In 1973 and 1974, the price received locally for wool increased fourfold over 1971 (Table 5), but production of wool in Alaska has continued to decline.

Eggs and Poultry.—Egg markets in Alaska have fluctuated periodically since statehood. The current production level is greater than that of 1960, but less than that of 1965–1968 (Table 6). The farm price received for eggs showed little response to inflation; it was only seven cents per dozen higher in 1974 than in 1960.

Egg production is carried on by a few large operators. There are presently two commercial-size egg producers in Alaska and both are importing most of their feed A locally developed feed base would reduce feed supply problems.

Poultry meat production in Alaska is primarily a byproduct of egg production, providing a means of getting rid of older birds.

Reindeer.—By federal law, reindeer in Alaska are entirely owned and managed by Native herders. Most of the animals are located on the Seward Peninsula and Nunivak Island. Roundup and slaughter generally occur in the fall of the year. Most slaughter animals are marketed and consumed in Nome and in Native villages in northwest Alaska. Only a limited amount of reindeer meat on a supply available basis is marketed in Anchorage or Fairbanks. In addition, a small portion is shipped outside the state for use in the exotic meat trade.

The price received by reindeer herders has nearly doubled over that of the low year 1966, while production has fallen to its lowest level in the fifteen years of data reported in Table 4.

Herd management over vast areas in the arctic and subarctic north is difficult at best. Disease and predator problems along with range management and supply problems hinder herd management. The Native lifestyle, to a degree, prevents reindeer production from achieving market potentials.[13] In addition, federal and state laws controlling methods of slaughter also hinder market growth in urban Alaska.

CROPS

Hay and Silage.—Hay and silage are forage crops produced to feed livestock. Dairy cows and horses constitute the primary markets for Alaska hay. This crop is so important that milk production in the Matanuska Valley has to some degree fluctuated according to hay productivity. A reduction in milk produc-

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[11] *Ibid.*

[12] Wayne Burton, *Alaska Agriculture*, Institute of Social, Economic and Government Research Report No. 30 (Fairbanks: University of Alaska, 1971), p. 181. These cost figures have increased through 1975, as has the price for hogs.

[13] D. Olson, *Alaska Reindeer Herdsman*, Chapter 8.

tion in 1971 can be partially explained by the smaller hay crop that year. In 1972, 1973, and 1974, the Matanuska Valley, in response to favorable climatic and economic conditions, produced the largest hay crops in its history.[14]

In 1974, hay produced in Alaska was worth approximately $2,000,000. Of this, 39 percent or $754,000 came from off-farm sales to Alaska horse owners (Table 7). Pleasure and work horses in Alaska in 1971 numbered nearly 3,000 head.[15] Although data are not available, the number of horses would appear to be increasing in Alaska in conjunction with the population growth. If this is true, the demand by horse owners for roughage should continue to be strong, thereby increasing demand for hay.

TABLE 5.—PRODUCTION, VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA WOOL, 1960–74

Year	Number of sheep shorn	Wool production (pounds)	Sales	Price per pound
1974	11,000	110,000	$98,000	$0.89
1973	11,000	129,000	115,000	.89
1972	13,000	145,000	55,000	.38
1971	16,000	225,000	43,000	.19
1970	21,000	239,000	72,000	.30
1969	23,000	269,000	94,000	.35
1968	23,000	264,000	92,000	.35
1967	21,000	246,000	98,000	.40
1966	19,000	215,000	123,000	.57
1965	18,000	209,000	111,000	.53
1964	16,000	189,000	115,000	.61
1963	14,000	167,000	97,000	.58
1962	12,000	146,000	72,000	.49
1961	12,000	128,000	51,000	.40
1960	11,000	125,000	50,000	.40

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska

TABLE 6.—PRODUCTION AND VALUE OF SALES FOR ALASKA EGGS AND POULTRY MEAT, 1960–74

Year	Eggs sold (dozen)	Sales (dozen)	Farm price per dozen	Poultry meat sales
1974	525,000	$499,000	$0.95	$10,000
1973	575,000	546,000	.95	17,000
1972	576,000	518,000	.90	17,000
1971	492,000	418,000	.85	13,000
1970	408,000	341,000	.84	17,000
1969	425,000	328,000	.77	13,000
1968	617,000	496,000	.80	19,000
1967	750,000	592,000	.79	26,000
1966	842,000	648,000	.77	16,000
1965	758,000	584,000	.77	20,000
1964	408,000	328,000	.80	14,000
1963	458,000	369,000	.81	19,000
1962	493,000	400,000	.81	18,000
1961	526,000	410,000	.80	24,000
1960	518,000	454,000	.88	17,000

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

The other important forage crop, silage, can be produced from the same crop, grass or grain, as can hay. Determination of which harvest method to use depends on market, weather, crop, and storage conditions, as well as on feed and labor requirements of individual farms. In 1974, over 98 percent of the silage produced was used on the producing farms (Table 8).

Barley and Oats.—Barley is used for cattle, hog, chicken, and horse feed. More barley was sold in 1973 than any year since 1960 (Table 9). However, in 1974, one large farming operation switched from barley to straw production

[14] However, Alaska milk sales did not follow the upward trend of hay production for the period 1972–74.
[15] *Alaska Agricultural Statistics,* various issues.

(for pipeline construction), and the quantity of barley produced in the state decreased dramatically. This feed base instability has a detrimental effect on livestock production in Alaska.

Oats is the other feed grain grown commercially in Alaska. Oats production dropped from around 1,000 acres annually in the early 1960's to 500 acres in 1974 (Table 10). This crop is used for horse and dairy feed.

Potatoes.—The Matanuska Valley accounts for 87 percent of the potatoes harvested in the state. The remainder comes from the Tanana Valley, with a small portion also produced on the Kenai Peninsula. Potato production in Alaska is highly mechanized with hired labor needed only for harvesting. After harvest, potatoes can be stored by the producer until the next harvest period. This allows for a more continuous market supply and helps to prevent short-term market gluts which drive down the farm price.

Potato acreage fell to near its lowest level in 1974 (for period 1960–1974), while price received was more than double that of 1967 (Table 11).

Alaska-grown potatoes are commonly found in food stores throughout the state. However, a lack of potato-processing facilities in Alaska has limited the product to only the fresh market.

Several attempts, yet unsuccessful, have been made to develop frozen-food processing facilities in the Matanuska Valley. Until this occurs, both civilian and military markets will continue to look outside the state for frozen and dry-processed potatoes.

TABLE 7.—PRODUCTION, VALUE OF SALES, AND SALE PRICE RECEIVED FOR ALASKA HAY, 1960–74

Year	Harvested acres	Yield per acre (tons)	Quantity produced (tons)	Production value	Quantity sold (tons)	Sales	Price per ton
1974	12,600	1.19	15,000	$1,950,000	5,800	$754,000	$130.00
1973	11,600	1.28	14,800	1,332,000	4,400	396,000	90.00
1972	10,900	1.33	14,500	1,160,000	4,200	336,000	80.00
1971	7,000	1.03	7,200	576,000	1,500	120,000	80.00
1970	8,000	1.17	9,400	705,000	1,700	128,000	75.29
1969	8,100	.95	7,700	539,000	1,600	112,000	70.00
1968	7,900	1.25	9,900	545,000	2,200	121,000	55.00
1967	8,700	1.51	13,100	721,000	1,800	99,000	55.00
1966	8,200	1.38	11,300	655,000	3,200	186,000	58.12
1965	6,900	1.28	8,800	528,000	2,200	132,000	60.00
1964	8,300	1.30	10,800	626,000	1,800	104,000	57.78
1963	7,600	1.25	9,500	551,000	1,000	58,000	58.00
1962	7,800	1.37	10,700	674,000	3,200	202,000	63.12
1961	7,400	1.34	9,900	653,000	3,100	205,000	66.13
1960	6,900	1.52	10,500	772,000	1,300	96,000	73.85

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

TABLE 8.—PRODUCTION, VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA SILAGE, 1960–74

Year	Harvested acres	Yield per acre (tons)	Quantity produced (tons)	Production value	Quantity sold (tons)	Sales	Price per ton
1974	2,800	4.46	12,500	$500,000	200	$8,000	$40.00
1973	2,900	4.41	12,800	320,000	700	18,000	25.71
1972	3,800	5.08	19,300	367,000	500	10,000	20.00
1971	4,200	4.64	19,500	351,000	200	4,000	20.00
1970	2,900	4.69	13,600	245,000	800	14,000	17.50
1969	3,000	3.40	10,200	184,000	700	13,000	18.57
1968	3,500	5.26	18,400	276,000	400	6,000	15.00
1967	3,800	5.13	19,500	312,000	500	8,000	16.00
1966	3,900	4.69	18,300	329,000	200	4,000	20.00
1965	4,300	5.05	21,700	412,000	500	10,000	20.00
1964	5,600	5.21	29,200	540,000	1,500	28,000	18.67
1963	6,600	4.86	32,100	594,000	1,600	30,000	18.75
1962	6,500	4.03	26,200	498,000	900	17,000	18.89
1961	4,700	4.70	22,100	464,000	800	17,000	21.25
1960	4,400	4.59	20,200	411,000	80	1,600	20.00

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

TABLE 9.—PRODUCTION, VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA BARLEY (PRODUCED FOR GRAIN), 1960–74

Year	Harvested acres	Quantity produced (cwt) [1]	Production value	Quantity sold (cwt)	Sales	Price/cwt.
1974	1,000	13,400	$116,000	7,400	$64,000	$8.65
1973	3,100	48,400	363,000	39,700	298,000	7.51
1972	2,800	24,900	101,000	13,200	54,000	4.09
1971	3,100	21,600	83,000	6,300	24,000	3.81
1970	1,500	22,300	88,000	6,800	27,000	3.97
1969	1,200	14,400	53,000	4,500	16,000	3.56
1968	1,900	27,400	117,000	12,000	51,000	4.25
1967	1,800	36,300	144,000	16,000	63,000	3.94
1966	1,600	34,600	140,000	22,100	90,000	4.07
1965	1,600	32,300	131,000	14,800	60,000	4.05
1964	1,900	35,600	144,000	19,600	80,000	4.08
1963	2,200	31,700	135,000	18,000	77,000	4.28
1962	2,200	40,100	176,000	18,000	79,000	4.39
1961	2,000	35,000	172,000	21,400	105,000	4.91
1960	2,300	42,000	192,000	16,800	77,000	4.58

[1] Cwt=hundredweight.

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

TABLE 10.—PRODUCTION VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA OATS (PRODUCED FOR GRAIN) 1960–74

Year	Harvested acres	Quantity produced (cwt) [1]	Production value	Quantity sold (cwt)	Sales	Price/cwt.
1974	500	5,900	$50,000	4,700	$40,000	$8.51
1973	600	8,100	58,000	5,600	40,000	7.14
1972	500	4,800	21,000	3,400	15,000	4.41
1971	200	3,800	17,000	2,300	10,000	4.35
1970	500	7,200	29,000	2,500	10,000	4.00
1969	500	4,800	17,000	2,700	10,000	3.70
1968	900	15,000	68,000	10,000	46,000	4.60
1967	600	14,800	62,000	10,300	44,000	4.27
1966	400	10,200	42,000	6,800	28,000	4.12
1965	600	13,400	57,000	5,800	24,000	4.14
1964	500	12,000	53,000	6,600	29,000	4.39
1963	1,000	14,400	65,000	8,400	38,000	4.52
1962	1,100	21,500	97,000	7,900	36,000	4.56
1961	900	14,700	71,000	3,200	16,000	5.00
1960	1,400	25,500	120,000	8,400	39,000	4.64

[1] Cwt=hundredweight.

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

TABLE 11.—HARVESTED ACRES, QUANTITY SOLD, VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA POTATOES, 1960–74

Year	Harvested acres	Quantity sold (cwt) [1]	Sales	Price/cwt
1974	570	72,400	$760,000	$10.50
1973	500	82,500	949,000	11.50
1972	550	69,300	658,000	9.49
1971	630	71,700	502,000	7.00
1970	610	72,800	480,000	6.59
1969	620	56,100	297,000	5.29
1968	620	94,400	538,000	5.70
1967	690	108,000	502,000	4.65
1966	710	93,700	520,000	5.55
1965	780	100,100	578,000	5.77
1964	730	120,000	889,000	7.41
1963	760	107,400	467,000	4.35
1962	730	120,000	576,000	4.80
1961	770	103,400	651,000	6.30
1960	730	96,000	614,000	6.40

[1] Cwt=hundredweight.

Source: Alaska Crop and Livestock Repor

VEGETABLES

Lettuce.—In 1974, lettuce had the largest dollar sales of any year since Alaska statehood. Lettuce acreage peaked in 1968 and has not since attained these levels (Table 12). A serious problem of perishability limits field production of lettuce for the Alaska market. Only one field crop of lettuce is possible during Alaska's short growing season. This is harvested between July and September, and the crop cannot be stored for any length of time. This means the market season is short and market glut problems are always a possibility.

Field Vegetable Crops.—Field production of carrots, cabbage, radishes, celery, and broccoli amounted to 90 acres in 1974, a reduction of 115 acres from 1968 (Table 13). The decline has resulted from extensive labor and management problems and the high requirements for capital investment.

Controlled Environment Agriculture.—Tomatoes and ornamentals are produced in Alaska on a limited basis. Production takes place in greenhouses on the Kenai Peninsula, in Southcentral Alaska, and in the Tanana Valley. Since these greenhouses can operate for longer periods (up to year-round), and the production process is faster than for field-grown varieties, crops can be marketed at different times during the year. Greenhouse production, as compared to field production, requires higher input costs and results in increased production per square foot of growing space.

TABLE 12.—HARVESTED ACRES, QUANTITY SOLD, VALUE OF SALES, AND PRICE RECEIVED FOR ALASKA LETTUCE, 1960–74

Year	Harvested acres	Quantity sold (pounds)	Sales	Price/cwt[1]
1974	65	860,000	$232,000	$26.98
1973	65	600,000	142,000	23.67
1972	60	580,000	143,000	24.66
1971	75	930,000	223,000	23.98
1970	60	770,000	157,000	20.39
1969	60	510,000	62,000	12.16
1968	80	910,000	115,000	12.64
1967	60	720,000	100,000	13.89
1966	60	600,000	93,000	15.50
1965	50	620,000	95,000	15.32
1964	50	690,000	95,000	13.77
1963	60	790,000	72,000	9.11
1962	50	780,000	111,000	14.23
1961	50	670,000	85,000	12.69
1960	50	610,000	77,000	12.62

[1] Cwt=hundredweight.

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

Controlled environment agricultural production can go beyond greenhouse production in that all the light is artificially supplied and greater control is exerted on the growth process.[16] Experimentally, this method has shown substantially increased yields over greenhouse and field production.

Practical applications of controlled environment production are now being attempted in several locations around the world, including Alaska's Kenai Peninsula. Should the Alaska venture prove economically successful, the quantity and quality of local produce available to the Alaska consumer should increase markedly.

Feasibility Studies

REGIONS

The basis for agricultural feasibility and development is land[17] (see Appendix). In March 1974, a group of studies was published under the title of "Alaska's Agricultural Potential,"[18] which included a report by the Soil Conservation

[16] Donald Dinkel, et al., "Controlled Environment Agriculture," *Agroborealis* 5 (1973): 6–8.

[17] Greenhouse and associated methods are excluded from this analysis, because these types of production do not require extensive quantities of land.

[18] Alaska Rural Development Council, *Alaska's Agricultural Potential,* Publication No. 1 (1974), p. 19–20.

Service, U.S. Department of Agriculture. This report stated that over 15,000,000 acres in Alaska were suitable for cultivated agricultural production (this figure has since been increased to over 17,000,000 acres). To achieve a better understanding of where these soils are located, an enclosed map (Figure 2) and Table 14 contain regional districts[19] as recognized by the Federal-State Land-Use Planning Commission for Alaska.[20]

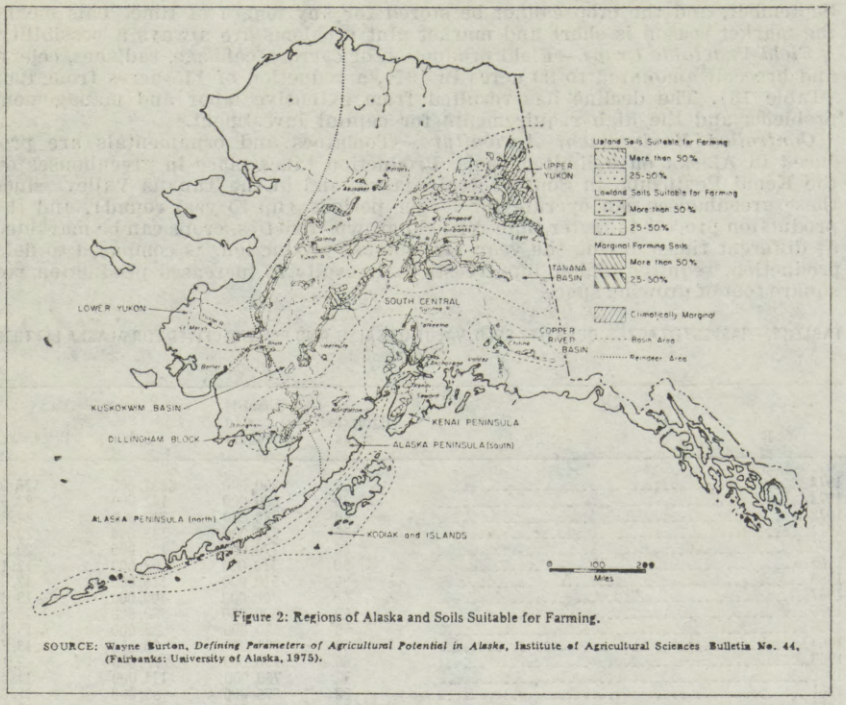

Figure 2: Regions of Alaska and Soils Suitable for Farming.

SOURCE: Wayne Burton, *Defining Parameters of Agricultural Potential in Alaska*, Institute of Agricultural Sciences Bulletin No. 44, (Fairbanks: University of Alaska, 1975).

TABLE 13.—HARVESTED ACRES AND VALUE OF SALES FOR ALASKA CARROTS, CABBAGE, RADISHES, CELERY, 1960–74

Year	Harvested acres	Sales
1974	90	$129,000
1973	100	119,000
1972	110	127,000
1971	130	80,000
1970	140	87,000
1969	190	114,000
1968	205	154,000
1967	120	104,000
1966	95	104,000
1965	95	90,000
1964	105	107,000
1963	125	123,000
1962	105	118,000
1961	100	111,000
1960	130	115,000

Source: Alaska Crop and Livestock Reporting Service, Palmer, Alaska.

[19] Wayne Burton, *Defining Parameters of Agricultural Potential in Alaska*, Institute of Agricultural Sciences Bulletin No. 44 (Fairbanks: University of Alaska, 1975), pp. 3 and 4.

[20] Federal-State Land-Use Planning Commission for Alaska, *Resources of Alaska: A Regional Summary* (1975).

Yukon Basin.—The largest amount of the class 1 and 2 soils[21] in Alaska are in the Upper Yukon Basin. These are mostly located in the Yukon Flats, a major water fowl nesting area.[22] Prior to the construction of the trans-Alaska Oil Pipeline, the Upper Yukon was one of the most isolated areas in the state. The human population was small, and year-round transportation was limited to air, although water transportation was available during the summer. The pipeline road, when (or if) opened, will provide the first year-round surface access to the region. As (if) a secondary road network develops in conjunction with the pipeline road, the region will become much more accessible, and movement of commodities into and out of the region will be enhanced.

Tanana Basin.—The other major area with soils suitable for agriculture is the Tanana Basin. This region already has a developed transportation system which includes all modes: air, water, rail, and road. One area near Nenana has also been identified as having good agricultural potential, but it is limited by lack of a secondary road system.

TABLE 14—ESTIMATED LANDS AVAILABLE IN ALASKA FOR AGRICULTURE

[Thousands of acres]

Region	Class 1 (group A)	Class 2 (group A)	Class 3 (group B)	Class 4 (group B)	Class 5 (group C)	Class 6 (group C)	Range	Total
Upper Yukon Basin	1,626	1,571	1,625	724			(1)	5,546
Lower Yukon Basin		233		1,372	75	232	(1)	1,912
Tanana Basin	311	1,915		610	480		(1)	3,316
South Central	1,247			116		409	1,134	2,907
Kenai Peninsula	545					237	210	992
Alaska Peninsula, South							2,233	2,233
Dillingham Block		883		138	102		2,096	3,219
Alaska Peninsula, North					345	674	1,163	2,182
Kuskokwim Basin		406	355	355	189	426	(1)	1,731
Copper River Basin	153			14	15	104	(1)	286
Kodiak and islands			(2)	(2)	(2)	(2)	1,200	1,200
Reindeer grazing areas							100,000	[3] 100,000
Total	3,882	5,008	1,980	3,329	1,206	2,082	108,036	125,524

[1] No grazing lands were identified or included in calculations because of possible conflict with wildlife or other environmental factors.
[2] Not available.
[3] Estimates include only traditional reindeer grazing areas.

Source: USDA–SCS field notes adjusted by Federal-State Land Use Planning Commission work group. This is table 1 in Wayne Burton, "Defining Parameters of Agricultural Potential in Alaska," Institute of Agricultural Sciences bull. No. 44 (Fairbanks: University of Alaska, 1975).

Grain and hay farms have recently been organized in the Delta-Clearwater area of the Tanana Basin, approximately 100 miles southeast of Fairbanks. A land base of sufficient size is also present to provide for further extensive development. This area already has a primary and secondary road system and is located near the Alaska Highway.

Other areas.—The South Central and Kenai Peninsula areas have good transportation networks and are easily accessible to the Anchorage market. These regions have significantly less cultivable lands than the Upper Yukon and Tanana valleys, but they enjoy locational advantages because of their nearness to the population base of the state and tidewater ports. The remaining areas (Lower Yukon, Alaska Peninsula, Dillingham, Kuskokwim, Kodiak and the Aleutians) are either islands off the coast or are isolated from the road network of the state. These all contain lesser amounts of tillable agricultural lands, although significant livestock (including reindeer) range lands are present (Table 14).

PREVIOUS STUDIES

In 1969, average farm cost of production per acre was significantly higher in Alaska than it was in the other states ($124.69 per acre compared with $49).[23]

[21] Soils are divided into group and capability class for agricultural use. Group A and B soils have properties that make them suitable for crop production. Group C tends to be more susceptible to drought, has greater erosion potential, and tends to have more slope problems. Soil capability classification (1 through 6) considers both properties and slope, which are related to soil damage during use.
[22] FSLUP, *Resources of Alaska*, p. 283.
[23] U.S. Department of Commerce, Bureau of the Census, *Census of Agriculture, 1969* (1972).

Some of this difference results from the higher costs of doing business in Alaska, but a significant part is caused by individual farming operations that are too small to realize the economies of scale enjoyed by farmers in the other states. The reason for small operations here is that farm land in Alaska had its origin either in homesteading or other government programs, such as the Matanuska Valley colony program of the 1930s.[24] These programs tended to place small acreages (160 acres or less) in the hands of individual farmers.

According to a 1970 study[25] that cited 1967 statistics, average farm size for the Matanuska-Susitna region was only 79 acres. Farming operations were based largely on dairy enterprises. The report suggested that high production costs in the region were due in part to the small size of the farming operations and their resulting inefficiency. The report also developed budgets for dairy, grain, and potato enterprises and included both explicit costs of operations (such variable input expenses as labor, fertilizer, etc., and interest charges on loans) as well as implicit farm costs such as payments to operator labor, management, and owner equity). The budget analysis of grade A dairy and grain farms showed that both explicit and implicit costs of operations were not covered until farm size approached 280 acres for dairy and 320 acres for grain. For potato farming, however, a land area of only 30 acres was needed to cover all costs of production.

Given this budget analysis (even though it is ten years old) and the continuing small sizes of Matanuska farms, it is not surprising that agricultural production and sales in that region have shown little change over the period 1967–74.[26]

Agriculture in the Matanuska Valley has a significant advantage over other areas of the state, because it contains the most sophisticated market infrastructure. It has farm supply and service dealers, milk-processing facilities, a well-organized transportation system, and an easily accessible market. Its major drawbacks are the insufficient size of individual farms and highly speculative land values.

To gain a more complete view of agricultural potential in Alaska requires consideration of lands beyond the Matanuska-Susitna area. A 1967 study by the U.S. Bureau of Reclamation[27] centered on livestock production. The results indicated only limited prospects for a finished beef industry on the Kenai Peninsula, Kodiak Island, and the Aleutian Islands.

The study considered an integrated system with feed produced in the region and with cattle produced both locally and shipped in. Budgets were constructed for (1) cow-calf operations on Kodiak and adjacent islands, (2) "stocker" cattle operations that primarily used cattle imported from outside the state, and (3) a cattle feed-lot finishing operation. In all cases (except for a slaughter house) revenues were insufficient to cover explicit and implicit costs of operations. An important aspect of this study was concentration on the USDA choice retail market in Anchorage which requires significant quantities of grain to bring cattle to finished weights. This tends to reduce the advantage of the large amounts of natural grass lands found in Alaska. A subsequent study indicated that a large market for grass-fed cattle (using only limited quantities of grain) is currently available for boned-out beef (over 10,000 carcasses per year) in the Anchorage-Fairbanks area.[28] Although no production feasibility analysis has been completed, such a study seems warranted. A corollary analysis would be necessary to consider the regional infrastructural components required in this type of red meat production.

In a 1968 study,[29] updated in 1971,[30] Burton examined the developmental problems associated with Alaska agriculture and surveyed state markets and types of crop and livestock enterprises. He viewed quite optimistically future marketing possibilities for pork, beef, reindeer, and milk production. However, he saw the expansion potential of potato, vegetable, and fruit production as more limited. Budgets using 1965–67 data indicated that revenue from hogs, dairy products, and potatoes could cover all explicit and implicit costs of production.

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[24] U.S. Department of the Interior, Alaska Power Commission, *Development of New Lands in Matanuska-Susitna Borough* (February 1970).

[25] *Ibid.*

[26] *Alaska Agricultural Statistics*, various issues.

[27] U.S. Department of the Interior, Bureau of Reclamation, Alaska District Office, *Livestock Industry in Alaska* (January 1967). That portion of the U.S. Bureau of Reclamation that previously operated in Alaska is now called "The Alaska Power Commission."

[28] Stephens, et al., *Supplying Alaska's Red Meat and Poultry Markets*, p. 23.

[29] Wayne Burton, *Alaska's Agricultural Production Potential* (Ph.D Dissertation, Montana State University, 1968).

[30] Wayne Burton, *Alaska's Agriculture, An Analysis of Development Problems*, Institute of Social, Economic and Government Research Report No. 30 (Fairbanks: University of Alaska, October 1971).

Production costs were based on techniques and farm sizes prevalent at that time. Of the budgets given, only that for beef production could not generate sufficient revenue to cover all costs. This, however, was not surprising since Burton used the budgets from the Bureau of Reclamation's Kenai Peninsula livestock study.

Burton (1971) identified a large farming venture in the Delta-Clearwater area as an example of large-scale agricultural development. The goal of this farming operation, as defined in 1970–71, was to develop an annual production of 6,000 acres of barley and 14,000 hogs. Actual development to date has been somewhat different than planned. Although information is difficult to obtain, this same Delta farm as of 1976 has developed approximately 4,000 acres and, depending on market conditions, raises barley, straw or hay. There is presently no hog production enterprise, due in part to insufficient market facilities. A primary bottleneck was lack of hog slaughter facilities near the farm. All things considered, however, this large-scale farming operation must be considered a success to the extent that the owners continue to operate the farm, borrow funds, employ people, and produce large quantities of crops.

A 1969 study by Olson reviewed and assessed the Alaska reindeer industry.[31] The report states that Alaska Native owners of reindeer have only sporadically tapped markets beyond the traditional areas of production and consumption. In fact, because production is so tied to Native custom, Olson concludes that only non-Native management will bring about greater efficiency and increased production. He views this possibility with some dismay, because it may alter village life style. The advent of the Native corporations formed under the Alaska Native Land Claims Act may provide the stimulus for greater reindeer management efficiency by Native groups. From a marketing standpoint, significant markets, both locally and for export, exist with quite minimal input requirements (capital investments, labor, etc.) and production costs.

In 1972, the Tanana Valley irrigation study team completed the first in-depth agricultural study of a region other than the Matanuska-Susitna Valley.[32] The study, which was sponsored by the Alaska Power Commission, included information on soils, climate, water, crop yields, and irrigation, as well as economic analyses of crop and livestock enterprises. The study team identified 272,000 acres as potential farm land in the Delta-Clearwater, Wainwright-Eielson, and Totchaket regions of the Tanana Valley. It identified five types of potentially profitable farming operations: grain-hay, dairy, grain-hog, potato, and vegetable. The team then worked out projected budgets for grain-hay, grade-A dairy, and grain-hog farms at two levels of operation: 240 acres and 720 acres. It also worked out projected budgets for potato and vegetable farms of 40 and 120 acres. The study showed that a profit could result from all projected enterprises, with and without irrigation.

Yields, output prices, and input costs of this budget analysis were of 1970–71 vintage. Documentation in the report suggests that reasonable estimates were used. For example, higher labor costs were included because of the general difficulties in obtaining and retaining qualified labor in Alaska.

However, as with all previous studies mentioned, there are also problems with the Tanana Valley Irrigation Study. It emphasizes analysis of individual crop and livestock enterprises, but does not consider the aggregate situation. For example, the study does not consider the possibility of production increasing by 50,000 to 100,000 acres in Delta-Clearwater, and the resulting impact of increased competition among farmers in both the input and output markets. How would attempts by more farmers to purchase these inputs or services affect price and availability of fertilizer, labor, land, or loanable funds? As a greater supply of feed grains or red meat enter the local market, how quickly would price deteriorate? What are the sensitive economic variables involved in producing food products in Alaska for export markets? The answers to these questions will identify the major problems which may retard the development of a greater market share from local farm sources. The implication is a severe one. Farm sector feasibility is limited by the markets and market infrastructure and vice versa. As of yet, no one has developed a regional economic analysis that predicts the interplay between these factors to determine how each influences the other.

The studies mentioned have all contributed to economic knowledge about agriculture in Alaska. However, none of them has addressed the significant issue of regional economic feasibility in considering both farm and market questions.

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[31] Olson, *Alaska Reindeer Herdsman.*

[32] Tanana Valley Irrigation Study Team, *Irrigation Potentials—Tanana River Valley Alaska,* Supporting Report, (February 1972).

A review of two feasibility studies [33 34] shows the problem of limited infrastructure and market potential for new agricultural development to be less pronounced in the lower states. Generally, in every other state in the United States, significant variety and quantities of farm inputs, such as fertilizers and herbicides, are available locally, as well as some type of large-scale agricultural processing facilities. In addition, all the other states have sizeable markets for their agricultural products. None of the above is true for Alaska. This means that projected budgets measuring farm feasibility may not be meaningful if local inputs, including labor, are not available, and if there are no transportation, processing facilities, or clearinghouse functions for marketing within the state (or within 1,000 miles) for the particular product involved. And finally, feasibility studies in other regions of the United States do not have to deal with a banking system that knows little about local agricultural production except that, based on past history, it is a highly speculative venture.

In concluding this section, it seems obvious that too little is known about the interplay between enterprise production and markets to determine if, and under what conditions, large-scale agriculture in Alaska would be feasible. Just because an Alaska crop has a high production potential in a biological sense does not mean that its production is economically feasible. Nothing has been estimated regarding the impact of large-scale agriculture on employment, population, and income in a regional sense. However, in many respects a good start has been made toward understanding farm feasibility.

Markets and Their Infrastructure

For the following market analyses, the author makes two assumptions: (1) no long-term market gluts will occur in red meat or feed grain world markets, and (2) land in large units will be available for agricultural production in Alaska.

STATE MARKETS

There is little to be gained by developing estimates of statewide food markets in 1976 when there are few local agricultural products to be supplied to those markets. Even if development of large-scale agriculture in Alaska were to begin now, it would take ten years to obtain significant increases in production. Because knowledge of large-scale farming in northern latitudes is incomplete and because the private sector and the government lack adequate knowledge to deal with the problems, an estimate of twenty-five years seems more appropriate for obtaining significant increases in agricultural production.

Projecting statewide market size for the year 2000 (twenty-five years hence) requires estimating both state population and per capita consumption of agricultural products. Present consumption rates should provide some insight into the future. State per capita consumption or use-rate estimates are available for a few food products, such as read meat,[35 36] but these figures are either limited to regions, or they include tourists and short-term workers. Another source of information is the U.S. Army Corps of Engineers port-to-port data,[37] which includes food shipped to Alaska but does not divide it into discernible categories. We will therefore assume that Alaska consumers have consumption patterns similar to those in the rest of the United States. As Alaska becomes more urbanized and is increasingly populated by immigrants from the other states, its consumption should increasingly approximate national patterns.

Table 15 presents Alaskan consumption and production estimates for crop and livestock products in the year 2000 at a projected population of 820,000. It would be unrealistic to assume that in twenty-five years Alaska will be producing enough food to meet local needs. Agriculture in the other states is tied to a large, sophisticated agri-business complex which processes, packages, and transports more agricultural products than anywhere else in the world. Alaska agriculture cannot compete in providing a wide range of fully-processed food products to Alaska consumers at competitive prices. In addition, even where Alaska products can compete, consumers in Alaska have acquired store and brand

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[33] Norman Whittlesey and Walter Butcher, *Irrigation Development Potential in Washington*, College of Agriculture Research Center Circular 579 (Pullman: Washington State University, February 1975).

[34] Washington State University, *Horse Heaven Hills Irrigation and Development Potential*, College of Agriculture Study Team Report (Pullman: 1970).

[35] Wayne Thomas, Charles Marsh, and Christopher Stephens, *An Economic Analysis of Red Meat, Fish, Poultry, and Wild Game in Anchorage*, Institute of Agricultural Sciences Research Report 73–4 (Fairbanks: University of Alaska, March 1973), p. 4.

[36] Stephens, et al., *Supplying Alaska's Red Meat and Poultry Markets*, p. 9.

[37] U.S. Army, Corps of Engineers, *Waterborne Commerce*, 1974.

preferences that might well preclude them from purchasing home-grown products. All of these factors suggest that state production required to supply local markets will be significantly less than potential consumption. Table 15 shows that in the year 2000, only reindeer production will be greater than 50 percent of the projected state consumption.

TABLE 15.—ESTIMATED ALASKA CONSUMPTION AND PRODUCTION FOR AGRICULTURAL COMMODITIES IN THE YEAR 2000

Product	Alaska [1] consumption	Alaska [2] production
Beef (million pounds dressed weight)	95.5	11.5
Pork (million pounds dressed weight)	51.7	20.7
Lamb and mutton (million pounds dressed weight)	0.8	0
Reindeer (million pounds dressed weight)	0.8	2.6
Milk (million pounds)	200.0	100.0
Eggs (million dozen)	13.4	6.7
Vegetables and potatoes (thousand tons)	79.3	36.2
Fruit and berries (thousand tons)	1.4	.7

[1] Wayne Burton, "Defining Parameters of Agricultural Development Potential in Alaska," Institute of Agricultural Science bull. No. 44 (Fairbanks: University of Alaska, 1975).
[2] Author's estimates.

To supply statewide markets would require more land than is currently in production. According to this scenario, new land development will occur in the Tanana Valley and on the Kenai Peninsula (Table 16). The Matanuska-Susitna Valley (Southcentral) will produce high-value field crops (potatoes and vegetables) and will continue to produce milk only in large, concentrated farming operations. A net reduction of approximately 3,000 acres of cultivated land (primarily forage and grain crops) will occur in this region. Acreage in potato and vegetable production, both here and in the Tanana Valley, should increase but be constrained by limited processing facilities. Agriculture in the Tanana Valley should develop in both the Delta-Clearwater area and in the Totchaket area near Nenana in the form of small grains (barley and oats), pork, egg, and milk production.

This scenario also has agricultural acreage increasing on the Kenai Peninsula in the form of greater production of feed and forage for cattle. Greater range use will occur on Kodiak Island for cattle and on coastal grazing areas for reindeer. Cattle will be sold to provide lean carcasses for a state "manufactured-beef" market.[38] Reindeer production will supply local markets north of the Yukon River and be available at a retail level in more southern Alaskan communities.

TABLE 16.—ACREAGE NECESSARY FOR ESTIMATED ALASKA AGRICULTURAL PRODUCTION FOR THE YEAR 2000

Commodity	South-Central	Tanana	Kenai	Kodiak	Reindeer range
Beef:					
Barley			[1] 5,000		
Hay/silage			[1] 14,900		
Pasture			8,300		
Range				921,000	
Other			17,700		
Pork:					
Barley		13,500			
Other		8,400			
Reindeer: Range					20,000,000
Milk:					
Barley	[2] 1,400	8,000			
Oats	[2] 1,000	3,300			
Hay/silage	[2] 3,600	10,000			
Other	3,800	13,300			
Eggs:					
Barley		2,900			
Other		1,800			
Vegetable-fruit:					
Crop	1,950	650			
Other	1,300	450			
Total acreage	13,050	62,300	45,900	921,000	20,000,000

[1] A total of 3,400 acres of barley and 10,100 acres of hay/silage will be produced on the Kenai and shipped to Kodiak.
[2] A total of 5,700 acres of barley, 2,200 acres of oats and 6,600 acres of hay/silage will be produced in Tanana Valley for Southcentral dairies.

Source: Adapted from Table 2 and W. Burton, "Defining Parameters of Agricultural Potential in Alaska." Institute of Agricultural Sciences bull. No. 44 (Fairbanks: University of Alaska, 1975).

[38] Stephens, et al., *Supplying Alaska's Red Meat and Poultry Markets*, p. 22.

Food prices will determine whether or not this projection of agricultural development will occur in the next twenty-five years. Should prices continue to rise in the developed world (primarily the United States) near the rates of the past three years, agricultural development of new lands will become more feasible. Production costs must be considered, but these are heavily influenced by government policy. For example, interest on borrowed operating and investment capital can be fixed by law. State governments (Alaska included) can provide state-backed loans at low interest rates. Increased fertilizer production can be, in part, brought about by favorable federal and state decisions regarding location and development of natural gas fields and pipelines. Government-owned land in large acreages can be cleared and made available to private farmers at low cost. Price of fuel can be reduced by government edict and taxation policies. Government can support development of such infrastructural components as grain elevators and agricultural processing sites, and can improve transportation access either by low-cost loans or by direct purchase and development.

These governmental activities are possible in Alaska. The state agricultural revolving loan fund presently exists and provides low-cost loans to farms. Alaska statute AS 38.07.010, enacted in 1967, provides a state subsidy for land clearing. Increased development is occurring near the gas fields in the Cook Inlet area, and fertilizer production capacity is being increased. In addition, the development of the North Slope natural gas field and the resulting gas pipeline, should it be routed through Alaska, may allow fertilizer production in the interior.

If agriculture develops as suggested in Table 16, it would create a significant input market for this sector of Alaska's economy. The size of this particular market depends on the quantity of crops and livestock produced. Because the base of any production is land, approximately 74,500 acres of cultivated land will be required to meet the projected market in the year 2000. To this must be added 63 percent more land to be used for farmsteads, roads, and agricultural processing areas, bringing the total required land to 121,000 acres, excluding reindeer and cattle range (Table 16). The land market would quickly develop if large tracts were sold to private individuals. The complexities of leasing versus selling state land, with or without covenants, is beyond the scope of this paper, but must be considered before such decisions are made.

In addition to the required land base, certain quantities of production inputs are necessary for operation of agricultural enterprises. An estimate by commodity of labor, diesel, gasoline, liquid petroleum (L-P) gas, and electricity consumption is given in Table 17 by region. Fertilizer estimates by crop are given in Table 18.

How do these estimates compare with present Alaska agricultural requirements? In 1974, an average of 750 people were employed (full and part time) in Alaska agriculture. [39] The figure 1,054 given in Table 17 represents full-time jobs stated on an annual basis (for the year 2000). Since many of these can actually be accomplished by high school and college students and military people working part time, then the number employed, at least part time, will be greater than the 1,000 figure. No present cost estimates are available for farm diesel, gasoline, L-P gas, and electricity consumption; however, future use (year 2000) would be significantly greater than present use.

TABLE 17.—LABOR, DIESEL, GASOLINE, LIQUID PETROLEUM GAS, AND ELECTRICITY REQUIREMENT FOR ESTIMATED ALASKA AGRICULTURAL PRODUCTION IN THE YEAR 2000

	Labor (person-years)	Diesel (thousand gallons)	Gas (thousand gallons)	L-P gas (thousand gallons)	Electricity (MKH)
Southcentral:					
Milk	242	66	99	33	0.94
Vegetables and fruit	41	17	26	9	.07
Tanana:					
Pork	167	119	179	60	.65
Milk	98	60	91	30	.32
Vegetables and fruit	14	6	9	3	.03
Eggs	161	26	38	13	.10
Grain[1]	28	63	94	31	.04
Hay/silage[1]	24	53	80	27	.03
Kenai Peninsula: Beef	112	341	513	184	.86
Kodiak: Beef	54	(2)	(2)	(2)	(2)
Reindeer: Range	60	(2)	(2)	(2)	(2)
Total	1,054	751	1,129	390	3.04

[1] For transhipment out of region to Southcentral for milk production.
[2] Not estimated.

Source: Adapted from Table 3 and W. Burton, "Defining Parameters of Agricultural Potential in Alaska," Bull. 44, (Fairbanks: Institute of Agricultural Sciences, University of Alaska, August, 1975).

[39] Alaska Crop and Livestock Reporting Service, *Alaska Agricultural Statistics*, various issues.

TABLE 18.—ALASKAN FERTILIZER USE BY TYPE OF CROP FOR ESTIMATED ALASKAN AGRICULTURAL PRODUCTION IN YEAR 2000

[In thousands of tons]

	Barley and Oats for Grain	Hay/Silage	Pasture	Vegetables and Fruit
Southcentral	0.24	0.94	[1] 0	1.65
Tanana	1.42	2.00	[1] 0	.55
Kenai Peninsula	.85	5.66	3.15	0
Total	2.51	8.60	3.15	2.20

[1] Pasture use was quite small.

Source: Adapted from table 3 using coefficients derived from W. Burton, "Defining Parameters of Agricultural Development Potential in Alaska," bull. 44, (Fairbanks: Institute of Agricultural Sciences, University of Alaska, August, 1975).

Fertilizer use in 1974 for Alaska approximated 3,517 tons.[40] By the year 2000, according to this scenario, the state total should be 16,460 tons—a 368-percent increase. Nitrogen-based fertilizer in 1974 accounted for approximately 52 percent of the total or about 1,828 tons. If one uses the same percentage for the year 2000, the present Kenai nitrogen fertilizer plant (Collier Carbon, Inc.) is already producing far more than the projected state requirements for the year 2000. Presently, and probably for the next twenty-five years, the nonnitrogen components of fertilizer will come into Alaska from external sources.

To farm 74,000 acres would require a capital investment in farm buildings and equipment significantly greater than presently exists in Alaska. Although precise data are not available, new investment costs of animal facilities, shop, shop equipment, farm equipment and farm storage would probably range between 50 million and 60 million dollars (1976 prices).

There is another aspect of statewide farm supply and service markets yet to be considered. Farm production requires numerous off-farm services. These include banks; equipment, feed, and fertilizer dealers; agricultural processing centers (grain elevators, animal and vegetable processing plants, etc.); and such general community businesses as construction firms and clothing stores. The amount of such related nonfarm economic activity will be determined by the amount of new land brought into production and the crop mix. Approximately 17,000 acres of cultivated agricultural land is presently in production.[41] According to the scenario presented here, by the year 2000 there will be an additional 57,500 new acres. To assess the business development that may occur in conjunction with this new acreage, I used as a model a dry land farming area in central Washington.[42] However, the crop mixes in the Tanana and Matanuska valleys and on the Kenai Peninsula are more complex than the dry land example used. Therefore, the following projections are probably underestimated.

A total of twenty businesses, sixteen caused by new land development,[43] would be associated with agricultural development (Table 19). These businesses would employ 142 people with total off-farm population comprising 554 people. The distribution of businesses and people would be in some relation to the amount of acreage in each region. In the Tanana Valley, the businesses might well be located in or near the major urban center, Fairbanks, instead of in Delta Junction or Nenana.

[40] Alaska Crop and Livestock Reporting Service, *Alaska Farm Reporter*, November 1974.
[41] *Alaska Agricultural Statistics*, various issues.
[42] A. L. Walker, et al., *The Economic Significance of Columbia Basin Project Development*, Agricultural Experiment Station Bulletin 669 (Pullman: Washington State University, September 1966).
[43] The remaining four businesses are associated with agricultural land in production in 1976.

TABLE 19.—TOTAL EMPLOYMENT, NUMBER OF BUSINESSES AND POPULATION GENERATED BY AGRICULTURAL DEVELOPMENT IN ALASKA FOR THE YEAR 2000

Type	Per 10,000 acres	Per 74,500 acres
Secondary employment processing and marketing (number of workers)	1.1	8
Tertiary Employment:		
General business (number of workers)	13	97
Government (number of workers)	5	37
Total	19.1	142
Number of businesses:		
Contract construction	0.3	2
Manufacturing	.2	1
Transportation communication, and public utilities	.1	1
Wholesale and retail trade	1.5	11
Finance and real estate	.2	1
Services	.5	4
Total	2.8	20
Population: off farm	74	554

Source: A. Walter, et al., "The Economic Significance of the Columbia Basin Irrigation Project Development," Washington Agricultural Experiment Station bull No. 669 (Pullman: Washington State University, 1966), and author's estimates.

In conclusion, it would be appropriate to review the projections of crop land and agricultural enterprises that provide the basis for a projected 57,500-acre increase in agriculture to serve state markets. Agriculture in the Matanuska-Susitna Valley (Southcentral region) is expected to decline in acreage from the present level, but to increase in quantity of milk, vegetables, and potatoes produced. Much of the feed for milk production would be grown in the Tanana Valley and shipped and stored in the Matanuska Valley. Agriculture in the Tanana Valley would expand more rapidly in the Delta-Clearwater area, but the Nenana region would have the greatest percentage increase since it is starting at a zero production level. Pork and egg production would center in the Tanana Valley. However, agriculture will not be limited to supplying local markets. As noted in the next section, significant growth in Alaska agriculture will probably come from sales to export markets. In fact, development of agriculture for in-state markets will probably follow development of agriculture for export markets.

EXPORT MARKETS

Alaska can grow a variety of cold weather crops. An obvious crop is barley, which is used as both a human and animal food in a number of countries of the world; a significant potential market for barley and other grains is Japan.

Tokyo, Japan is about as far from Anchorage as is New York. Japan is a country with a large population and limited land area. The amount of cultivated land in Japan has dropped from 8,129,000 hectares (20,087,000 acres) in 1960 to 5,752,000 hectares (14,213,000 acres) in 1974.[44] During the period 1960-1973, grain, potato, and bean production declined in Japan (Table 20). On the other hand, production of livestock products, primarily pork and poultry, increased significantly during the same period (Table 21). Also, per capita consumption of pork and poultry products increased five-fold between 1960 and 1973 (Table 22).

Increased consumption of meat and poultry can be viewed as shifts to the right in the demand curve for those products (Figure 3). This increase in quantity consumed has occurred in large measure because (a) the taste and preference function of the Japanese population is shifting toward a more Western diet (higher in red meat and poultry protein), and (b) real income levels in Japan are rising. These factors tend to indicate a continued strong market in Japan for red meat and feed grains.

[44] "Food Problem and Japan's Agriculture, Forestry and Fisheries," *Look Japan*, Nov. 10, 1975, p. 6.

TABLE 20.—JAPANESE OUTPUT OF PRINCIPAL FARM PRODUCTS, 1960–73

[Thousands of tons]

	Fiscal year—					
	1960	1965	1970	1971	1972	1973
Grains	17,101	15,208	13,858	11,945	12,613	12,658
Rice	12,858	12,409	12,689	10,887	11,897	12,149
Wheat	1,531	1,287	474	440	284	202
Barley, rye	2,301	1,234	573	502	324	216
Corn	113	75	33	25	23	17
Maize	2	1				
Other grains	296	202	89	90	85	17
Potatoes	9,871	9,011	6,175	5,312	5,598	5,030
Beans	919	646	505	417	510	451
Soybeans	418	230	126	122	127	118
Others	501	416	379	295	383	333
Vegetables	11,742	13,490	15,131	15,777	15,837	15,315
Fruits	3,307	4,025	5,454	5,351	6,420	6,501
Orange	1,034	1,331	2,552	2,489	3,568	3,389
Apple	907	1,132	1,021	1,007	959	963
Others	1,366	1,562	1,881	1,855	1,893	2,149
Crude sugar	5	85	78	71	243	247

Note.—Figures preceding fiscal 1971 do not include Okinawa preference.

Source: Japan Ministry of Agriculture and Forestry, "Food Consumption Statistics." This is table 6 in "Look Japan," Tokyo, vol. 20, No. 235, November 1975.

Since domestic supplies of feed grains have been declining in Japan, the resulting difference between what is produced and what is needed to supply feed for the increasing livestock industry comes from import sources. The United States is a large supplier of feed grains, primarily corn and grain sorghum, to Japan. Other countries exporting feed grains to Japan include Australia, Thailand, Argentina, Canada and South Africa. In 1974, the United States supplied only 4 percent of the barley imported by Japan;[45] the total Japanese barley imports were 1,418,000 tons.[46] Barley imports are not presently controlled by the Japanese government and have a duty-free status.[47]

During the twenty-five-year period to 2000 A.D. Japanese consumption patterns will probably tend toward higher per capita consumption of red meat and poultry. Likewise, Japanese production of barley (for human and animal use) may increase, but not in proportion to feed requirements. Given these assumptions, Japan should be importing at least 2,000,000 tons of barley by the year 2000.[48]

There are three broad reasons why Alaska will probably not be able to capture a significant amount of this Japanese market:

1. To supply the entire Japanese import market for barley by 2000 A.D., would require that over 1,100,000 new acres of Alaska land be cleared, planted, and harvested, along with the corresponding development of a large agricultural infrastructure (this assumes a yield of seventy-five bushels per acre). The technical problems associated with such a large project over a twenty-five year period make it unlikely to occur.

[45] Bruce Greenshields, "U.S. Farm Exports to Japan May Rebound in 1975–76," *Foreign Agriculture* 13 (October 1975) : 4.

[46] "Food Problem and Japan Agriculture . . . ," *Look Japan*, p. 21.

[47] Greenshields, "U.S. Farm Exports to Japan . . . ," p. 3.

[48] The Japanese government estimates that in 1985, domestic consumption will reach 2,500,000 tons and imports 1,600,000 tons. Japan Ministry of Agriculture and Forestry, *Long Term Prospect of Production and Demand for Agricultural Products in Japan* (August 1975), p. 3.

TABLE 21.—JAPANESE OUTPUT OF LIVESTOCK PRODUCTS, 1960–74

[Actual figures in thousands of tons]

Products	1960	1965	1970	1971	1972	1973	1974
Dairying	1,887	3,221	4,761	4,820	4,939	4,908	4,864
Meats	392	793	1,410	1,575	1,694	1,776	1,990
Beef	142	208	261	275	295	227	293
Pork	147	364	648	750	769	858	964
Poultry	75	204	490	540	622	685	729
Eggs	1,063	1,734	1,801	1,794	1,800	1,803	

Source: Japan Ministry of Agriculture and Forestry, "Milk and Dairy Products Statistics" and "Egg Distribution Statistics," Ministry of Health and Welfare, "Sanitation Administration Duties Report." Figures on Poultry obtained from Livestock Bureau, Ministry of Agriculture and Forestry. This is table 8 in "Look Japan," Tokyo, vol. 20, No. 235, November 1975, p. 6.

TABLE 22.—JAPANESE ANNUAL PER CAPITA CONSUMPTION OF PRINCIPAL FOODSTUFFS, 1960–73

[In kilograms]

	Fiscal year—					
	1960	1965	1970	1971	1972	1973
Grains	149.6	145.0	128.5	127.0	125.0	124.6
Rice	114.9	111.7	95.1	93.2	91.7	91.1
Wheat	25.8	29.0	30.8	31.0	30.9	31.0
Barley, rye, etc	8.9	4.3	2.6	2.8	2.4	2.5
Potatoes	30.5	21.4	16.2	16.5	16.6	16.2
Starch	5.5	8.3	8.1	7.8	8.0	7.9
Beans	10.2	9.4	9.8	10.0	9.8	9.8
Vegetables	99.7	109.6	115.6	119.5	117.8	112.4
Fruits	22.3	28.5	38.2	38.1	44.2	43.7
Meat (excluding whale meat)	3.4	6.7	11.5	13.3	14.2	16.2
Beef	1.1	1.4	2.0	2.3	2.4	2.3
Pork	1.1	2.7	4.7	5.1	5.6	6.4
Poultry	.8	1.9	3.7	4.3	4.7	5.1
Others (mutton, etc.)	.4	.7	1.1	1.6	1.5	1.4
Chicken eggs	6.3	11.6	14.8	14.9	14.6	14.5
Milk, dairy products	22.3	37.4	50.1	50.7	51.8	52.9
Sugary foods	4.3	6.6	9.5	9.9	10.6	11.1
Marine foods	27.8	29.2	31.8	33.3	33.3	34.3

Note.— (1) Figures above relate to unadulterated foodstuffs. (2) Figures for fiscal 1972 include Okinawa preference.

Source: Japan Ministry of Agriculture and Forestry, "Food Consumption Statistics." This is table 2 in "Look Japan," Tokyo, Vol. 20, No. 235, November, 1975.

2. Significant price competition might develop if the other suppliers of Japanese barley come to fear the loss of a major market.[49] An intense price competition and resultant market uncertainty would have greater impact on new land development in Alaska than on an existing land settlement in other regions of the world.

3. Japan would likely find it undesirable to break old trade arrangements and buy a majority of its barley from Alaska, given the spotty history of agriculture in the state and its limited experience (even twenty-five years hence) with large-scale barley production.

Considering these reasons, I assume that only a small portion of the Japanese market, less than 10 percent (or about 100,000 acres), will be easily accessible to Alaska grain producers by the year 2000. The Tanana Valley area near Delta Junction contains over 200,000 acres of land which could be used to grow barley. Large scale development for barley there would require at least one grain elevator for necessary drying and storage before shipment to a tidewater port (probably Anchorage). Rail transportation would probably be the cheap-

[49] This assumes the numbers of suppliers to be small, and each therefore would be able to assert some influence on price.

est way of moving the grain to port. If a rail spur were constructed to Delta Junction, the elevator and the acreage would probably develop in that area.

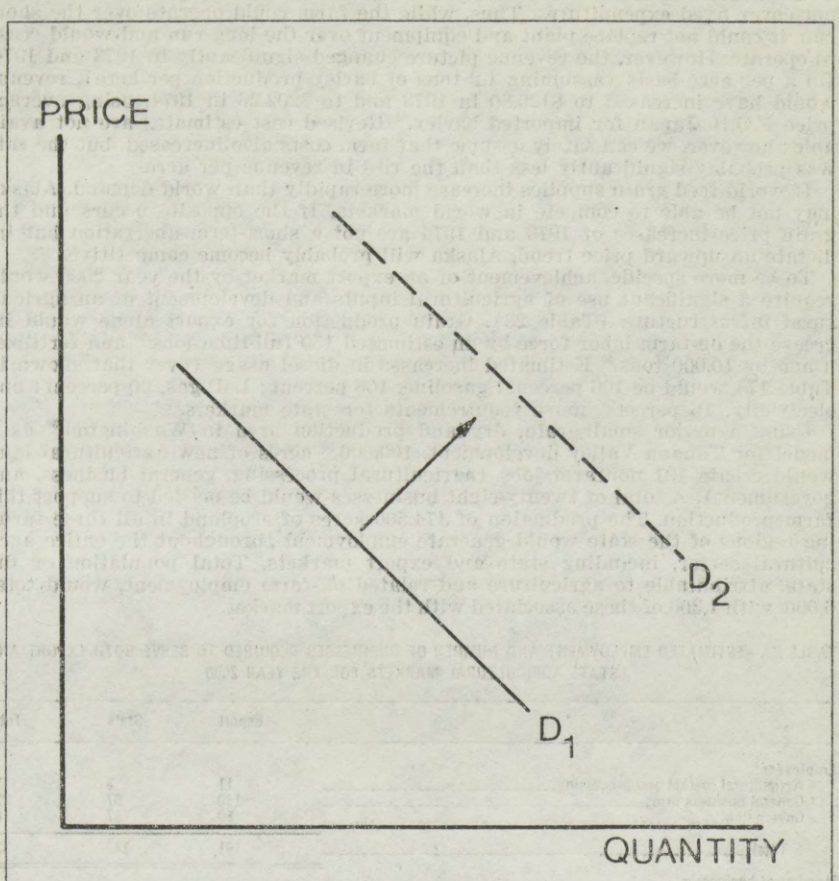

Figure 3: A Representation of the Japanese Demand Curve For Red Meat and Poultry, Where D_1 = 1960 and D_2 = 1974.

A 1972 study analyzed the feasibility of growing grain and hay in the Delta-Clearwater area on several farms varying in size up to 720 acres.[50] Total farm expenditures[51] (fixed plus variable costs) for a 720-acre grain/hay operation was estimated at $88.98 per acre assuming yields of 1.2 tons per acre. The variable expenses portion of this was broken out at $54.23 per acre for this same farm.[52] Revenue from sales to Japan would have generated $76.49 per acre F.O.B. Japan in 1973.[53]

[50] *Tanana Valley Irrigation Study*, p. VI–20.
[51] Based on 1971 data.
[52] A transportation cost per ton from point of production to Japan is not included in these total or variable cost figures.
[53] *Look Japan*, p. 21. This assumes an average price of $63.74 per ton F.O.B. Japan.

The implication is that although revenue could have covered variable expenses in a synthesized Delta-Clearwater grain/hay farm for barley production, it could not cover fixed expenditures. Thus, while the farm could operate over the short run, it could not replace plant and equipment over the long run and would cease to operate. However, the revenue picture changed significantly in 1973 and 1974. On a per acre basis (assuming 1.2 tons of barley production per acre), revenue would have increased to $129.80 in 1973 and to $202.26 in 1974, using average price F.O.B. Japan for imported barley.[54] Revised cost estimates are not available; however, we can safely assume that farm costs also increased, but the rate was probably significantly less than the rise in revenue per acre.

If world feed grain supplies increase more rapidly than world demand, Alaska may not be able to compete in world markets. If the opposite occurs and the grain price increases of 1973 and 1974 are not a short-term aberration but indictate an upward price trend, Alaska will probably become competitive.

To be more specific, achievement of an export market by the year 2000 would require a significant use of agricultural inputs and development of an agricultural infrastructure (Table 23). Grain production for export alone would increase the on-farm labor force by an estimated 150 full-time jobs [55] and fertilizer usage by 10,000 tons.[56] Estimated increases in diesel usage (over that shown in Table 17) would be 106 percent; gasoline, 106 percent; L–P gas, 90 percent; and electricity, 16 percent above requirements for state markets.[57]

Using a major small-grain, dry-land production area in Washington [58] as a model for Tanana Valley development, 100,000 [59] acres of new agricultural land would create 191 nonfarm jobs (agricultural processing, general business, and government). A total of twenty-eight businesses would be needed to support this farm production. The production of 174,500 acres of cropland in all three farming regions of the state would generate employment throughout the entire agricultural sector, including state and export markets. Total population of the state, attributable to agriculture and related off-farm employment, would total 6,000, with 1,300 of these associated with the export market.

TABLE 23.—ESTIMATED EMPLOYMENT AND NUMBER OF BUSINESSES REQUIRED TO SERVE BOTH EXPORT AND STATE AGRICULTURAL MARKETS FOR THE YEAR 2000

	Export	State	Total
Employees:			
Agricultural market and processing	11	8	19
General business firms	130	97	227
Government	50	37	87
Total	191	142	333
Number of businesses:			
Contract construction	3	2	5
Manufacturing	2	1	3
Transportation, communication, and public utilities	1	1	2
Wholesale and retail trade	15	11	26
Finance and real estate	2	1	3
Services	5	4	9
Total	28	20	48
Population:			
On-farm	585	4,111	4,696
Off-farm	745	554	1,299
Total	1,330	4,665	5,995

Source: A. Walter, et al., "The Economic Significance of the Columbia Basin Project Development," Washington Agricultural Experiment Station bull. 689 (Pullman: Washington State University, September 1966), and author's estimates.

[54] *Look Japan*, p. 21.
[55] Calculated for 100,000 acres of production using coefficients from U.S. Department of Agriculture, *Agricultural Statistics* (1973), p. 449.
[56] Calculated for 100,000 acres of production using coefficients from W. Burton, *Defining Parameters of Agricultural Production in Alaska*, pp. 13 and 28.
[57] *Ibid.*, pp. 14–17, 28.
[58] Walker, et al., . . . *Columbia Basin Project* . . . , AES Bulletin 69.
[59] Depending on method of farming used, as much as 200,000 acres of land might have to be cleared to obtain a yearly average of 100,000 acres in production.

The required farm capital investment in buildings and equipment to provide for the export market would be extensive. If the 100,000 acres comprised 50 individual farming operations, they would require approximately 100 tractors, 50 combines, several hundred farm implements, trucks, and small buildings. New investment costs for farm equipment, shop, shop equipment and farm storage for 50 farmsteads would total approximately 8 to 10 million dollars (1976 prices). A grain elevator would also be necessary, with an investment cost of around three million dollars (1976 prices), to provide sufficient drying and storage capacity for both export and state markets.

The export market would also require development of specialized rail transportation to Anchorage and a grain-loading facility there. Since 100,000 acres could produce only 180,000 tons of export, an extensive port-loading facility would not be necessary. According to 1975 prices, an investment of approximately $2.5 million would be required. The tonnage of grain would require eighteen ships of 10,000 dead-weight ton capacity (Liberty or Victory steamship types) to transport the grain to Japan. This type of ship is presently being operated by firms involved with the international grain trade.[60] This means that once Alaska grain reached a tidewater port such as Anchorage, the existing distribution system could handle transportation to Japan.

Japan should not be the only country considered for grain exports from Alaska. Numerous countries in Western Europe, as well as the Soviet Union, also import feed grain. The west coast area of the U.S. is also deficient in feed grain. I have emphasized the Japanese market for feed grains here because it is reasonably close; Alaska and Japan have had long-established trade ties, and Japan is looking for politically stable supply areas to provide food products for its home market.

From an Alaska viewpoint, the creation of an export feed grain base would stimulate development of a red-meat industry within the state. Large quantities of locally produced grain would reduce the difficulties of obtaining feed for animal rations. This would provide for the development of both small and large scale pork and beef enterprises. The state then would be able to supply a greater portion of Alaska's pork and beef consumption needs (Table 15) and possibly produce pork and beef for an export market.

SOME FINAL THOUGHTS

I have indicated no agricultural development for the Yukon Basin, Alaska Peninsula, Copper River Valley and Kuskokwim Basin. Development beyond small farms supplying local markets is possible in the next twenty-five years, but not expected. Little is known of the agricultural potential of these areas; many are remote from surface transportation systems; and land ownership at this time is unsettled. Having the potential for and achieving a large-scale agriculture are two different things. In the next twenty-five years and beyond, only the possibility of a high return on investment, which would depend on food prices continuing to increase, will cause development in these areas.

What about the regions identified in this report—Kenai Peninsula, Kodiak, and the Tanana Valley? The amount of beef produced in Kenai and Kodiak should increase, because the state, through its Division of Agriculture and University of Alaska, is working on an expanded red meats and forage research and development program which should pay off by the next century. The industry will, for the first time, be receiving technical production support and, at the same time, facing an expanding manufactured (lean carcass) beef market.

The Tanana Valley has the most possibilities for agricultural development because of a large land base, a developed transportation system, and an embryonic agriculture. Land-use planning projects are underway in both Delta-Clearwater and Nenana, which when complete, will describe and promote use of new lands for agriculture. If the economic incentive is present, and positive state and federal land policies are put into effect, these lands will be developed.

The export market for grain is the base for large-scale development of agriculture. There are risks involved here, however. During soft market conditions, local producers in Alaska and elsewhere might be faced with world grain prices that are lower than cost of production. If a significant agriculture is to be developed in Alaska, the state may have to develop a support and subsidy program (in

[60] Letter from Kenneth Casavant, Associate Professor of Agricultural Economics, Washington State University, 1976.

conjunction with Federal programs) to protect against weak market years. Agriculture in Alaska may not be able to sustain itself in the early period of major development (the next twenty-five years) without such state support. This type of policy decision must be much more fully explored before an intelligent decision can be made for or against state involvement.

Finally, other commodities besides barley and pork could be produced in Alaska and exported. Reindeer could easily move into the exotic meat trade and be shipped in small amounts to many markets throughout the world. Milk could be produced in the state, dehydrated, and shipped to export markets such as Japan. Another possibility is foreign export of beef and pork. One problem associated with foreign exportation of milk and red meat is the strict sanitation regulations placed on these products by foreign governments. Another problem is that markets are never certain because many foreign governments place quotas on red meat and milk, and these vary by year. A major advantage of feed grains is that in countries like Japan, a quota system is currently not used, and the commodity has low perishability; therefore, minimum sanitation regulations are issued by the importing nation.

In conclusion, it should be observed that the estimated projections presented here are meaningless unless (1) a land base is made available to agriculture and (2) world market forces provide an economic incentive for agricultural production in Alaska.

Appendix

Perceptions of Reality—Alaska's Agriculture and Food Distribution System[1]

In this section we set forth a number of our perceptions concerning Alaska's agriculture and its food distribution system. Readers of this report may disagree with a number of our perceptions, and in fact, some disagreement is expected. However, this disagreement can be helpful in focusing on those areas of inquiry where additional information is needed.

Our perceptions take either the form of statements of fact or issues that need an answer. They are presented in six major categories, with sufficient detail to attempt a clear, but concise, presentation.

LAND

1. Land serves as a base for renewable and nonrenewable resource industries.
2. There will be competition between various renewable industries for the use of the land.
3. Land can be classified on a single-use basis or a multiple-use basis. A major question is which lands for which purposes?
4. Alaska currently has a scarcity of private land. Other than the Native lands, the amount of privately owned land comprises an area smaller than the District of Columbia. Agricultural development has been seriously hindered by this scarcity of land. Not only has there been little opportunity for agricultural expansion into large commercial farms, but land has been bid away from agricultural uses in favor of subdivision settlement or homesites.
5. There appears to be a relatively strong demand by individuals for homesites and recreational sites of 5 to 160 acres. This demand could most likely be satisfied from land other than large blocks of potential agricultural land. Land that has good potential for commercial agriculture could be primarily reserved for agricultural use.
6. Large quantities of land suitable for cereal grain and forage production are located in the Interior along major rivers. The exact acreage is somewhat indeterminant, but it amounts to millions of acres. (The Soil Conservation Service estimate is 17 million acres of agricultural land in Alaska.)
7. Native corporations control sizeable quantities of potential agricultural land. At some point in time, these corporations may choose to develop these lands for agricultural production or enter into an arrangement to have the lands developed. The decision processes would be more internalized than that of the state.

THE DEVELOPMENT PROCESS

1. Agriculture was the basic industry in the early development of the lower 48 states. Industrialization came later as agriculture moved through the nation,

[1] From a report prepared by J. Edwin Faris and R. J. Hildreth for the Joint Federal-State Land-Use Planning Commission for Alaska in cooperation with the Agricultural Experiment Station, School of Agriculture and Land Resources Management, University of Alaska.

especially the West. In Alaska, agriculture never developed into a sufficiently large or pervasive enough industry to be called basic. Because Alaska can now be considered somewhat industrialized, agriculture would have to be added to the industrial base rather than vice versa. One would not expect agricultural development in Alaska to follow the general pattern experienced by most of the lower 48 states.

2. There is no large, strong political and economic power base for agriculture. There appears to be little opposition to agriculture *per se*. Thus there appears to be a more or less indifferent attitude toward agriculture. Opposition would be expected to occur when and if conflicts between the uses of land arise and agriculture is a contender.

3. The perceptions that most individuals have concerning the potential of agricultural development in Alaska is negative. This perception would need to be changed if agriculture is to succeed in Alaska.

4. Agricultural development policy is interrelated with general economic development, e.g., growth policy, settlement policy, land and other resource policy.

5. The 40- to 160-acre homestead type of farming operation has not led to significant agricultural development. It is not likely to lead to significant development in the future. There may be some exceptions for very intensive crop production.

6. Alaska contains large land areas, so the creation of large commercial farms is possible at the start of the development process. The situation is more comparable to the development of large farms on the west side of California's San Joaquin Valley than the smaller farm units in the Columbia Basin Project of Washington State.

7. If expansion of agricultural output in Alaska takes place, it will not come from the expansion of the current system. Not only would the type of farming likely be different, but the farm operators would be expected to primarily come from the lower 48 states or from nonfarm employment in Alaska.

8. Agricultural development occurs in a process of stages or steps. A strong and dependable grain and forage economy is the first step to a strong livestock economy. Thus, one would expect the grain and forage to be produced internally or be imported. For Alaska the latter does not appear to be economically feasible on a large scale. Vegetable production on a large scale requires a rather sophisticated infrastructure. Such an infrastructure is most difficult to create from scratch.

9. Many people see a dilemma in agricultural development: Which comes first, the land reservation or the proof of success? Agricultural lands need to be available before agricultural development can take place. But it may be necessary to demonstrate that agricultural production is economically viable before lands could or would be set aside for agriculture.

AGRICULTURAL OUTPUT

1. Alaska, as compared to the lower 48 states, has unique climate conditions. This uniqueness makes it extremely unlikely that agricultural production practices would be directly transferable from the lower 48. At the minimum, adaptive research would be needed to make production technology applicable to Alaska's conditions. Systems of producing, storing, and marketing agricultural commodities would apt to differ from those in the lower 48 states. This is consistent with differences among these states; e.g., irrigation in the West and lower grain yields in the Southeast than in the Midwest.

2. The current and future state, national, and international needs for agricultural output will greatly influence the need for agricultural development.

3. The development of an agricultural industry in Alaska could lead to increases in gross state product and gross national product over time.

4. Limited data prevent performing a rigorous estimate of costs and benefits of a potential agricultural industry. First, there is really very little comparable agriculture in Alaska at the current time. Second, public and private costs of the necessary infrastructure are not known. Third, the social costs and benefits need to be estimated.

5. There are a number of specialty crops, such as seed crops, where Alaska has a unique advantage over other production areas.

6. Very satisfactory yields of barley and oats have been attained on the type of agricultural soils found in interior Alaska. Yields of wheats tested recently are less certain. This land might need to be irrigated in some areas or summer

fallowed in others to obtain satisfactory and dependable yields. It appears that the rivers could serve a most important role in the transportation network.

7. Heat losses from pipeline pumping stations or other industrial endeavors may in some cases be useful to agricultural production or processing. A controlled environment greenhouse production unit could probably be developed using the heat losses to produce such crops as vegetables, flowers, and house plants. The heat might also be used to help power a pelletization plant for agricultural forages.

8. The recreational horse population is a most serious competitor for the limited amount of hay and grain produced in Alaska. This drives up the cost of hay and grain which makes it less profitable to produce milk and red meat animals. With a strong grain economy in Alaska, this distortion would not occur.

9. Agricultural research, although limited, indicates that the production potential is great. One way to determine if it would also be economically profitable is to promote agricultural development in an area based on the large, efficient-size farm concept.

AGRICULTURAL INFRASTRUCTURE

1. Significant development of the agricultural potential in Alaska would absolutely require major public and private investments in the infrastructure. Without attempting to determine which investments are public and which are private (or perhaps both), some major infrastructure investments would need to be made in (a) water-based transportation facilities; (b) roads; (c) education; (d) agricultural research and extension; (e) storage, drying, and processing facilities; and (f) input supply firms such as those supplying fertilizer and insecticides.

2. It is possible that Alaska's farmers could have a competitive advantage in obtaining certain fertilizers and other petrochemicals in the future relative to a number of farming areas in the lower 48 States. This is contingent upon more of the petroleum being processed in Alaska.

3. Transportation rates may tend to work adversely against agriculture. The rates have been based on low volumes or historical patterns. With larger volumes and competitive pressures, the rate structures should change and become more favorable toward agricultural production and marketing. This includes both rail and water freight rates.

4 The South and Kenai Peninsula areas have a reasonably adequate transportation network to the Anchorage market. These lands have potential for vegetable production on a small scale until a better infrastructure is developed. Grazing of cattle also could increase, with increased slaughter capacity and marketing channels.

5. A large portion of Alaska's population is in, or adjacent to, urban centers. The well-developed food distribution system serves a large majority of the State's population. The food chain infrastructure is based on a food-import economy.

THE ENVIRONMENT

1. The side effects of various types of agricultural enterprises and organizations upon the environment need to be given attention.

2. If agriculture were to develop on a very large scale, it would undoubtedly affect the Native culture and style of living in some areas. Some adjustments could be made to minimize these effects. Opposition to the development of agriculture in these areas may materialize.

3. There would be environmental effects resulting from agricultural production. The type and magnitude of these effects as now seen appear to be based more on value judgments than on analytical data. For example, a conflict may not exist between the use of land for agricultural purposes and for certain wildlife habitat. In fact, agricultural production could increase the number of some types of birds and decrease others or perhaps decrease the number of large fur-bearing animals.

(This report was partially funded by the Joint Federal-State Land-Use Planning Commission for Alaska.)

The resolution stated below was passed by the National Association of Conservation Districts during the national meeting in Hawaii on February 6, 1976.

Approximately 4,600 members of the NACD attended the national meeting. The NACD has a total national membership of more than 2 million people.

ARABLE LANDS IN ALASKA

Alaska is predominantly a food-dependent State, producing less than 15 percent of the food consumed within its borders. It is a future major source of energy for the Nation and is experiencing, and inevitably will continue to see, an increasing population, thereby increasing its food dependency. Increased food-dependency would heighten Alaska's vulnerability at a time of increasing strategic importance to the Nation.

Congress must within five years of the date of the Secretary of the Interior's withdrawal of 83 million acres of "National Interest" lands in Alaska, decide upon the proper relegation of those lands, overlapping the time that Alaska native corporations are selecting 40 million acres of land allowed under the Alaska Native Land Claims Settlement Act.

The 83 million acres of d-2 lands withdrawn for tentative inclusion in National Forest, National Park, Wildlife Refuge, and Wild and Scenic River Systems by the Secretary of the Interior contain considerable acreage identified as having potential agricultural use.

Obviously, Congress should act on the basis of the best information available on present and future uses of National interest lands in Alaska. Of those bills now before the Congress concerning this issue, HR 6848 introduced by Alaska Congressman Don Young is the only one fully recognizing multiple use management of these lands and providing adequate consideration of lands suitable for range, agriculture and forestry.

In view of these critical circumstances the National Association of Conservation Districts urges that Congress name a panel of recognized authorities within pertinent fields of interest to impartially assess the desirability of protecting some or all of Alaska's potential arable lands, rangelands, and productive forest lands for agriculture, forestry and other multiple use development.

STATEMENT OF DR. JAMES W. MATTHEWS, DIRECTOR, COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF ALASKA, FAIRBANKS, ALASKA

Agriculture and food production in Alaska appears to be on the verge of substantial development. I don't believe such development will occur if it is based primarily on a philosophy of self-sufficiency. Such a philosophy has been in existence since World War II, conditioned by a belief that Alaska might be cut off from the rest of the country and find it necessary to rely entirely on its own resources.

Today we are in a different ball game. It appears unrealistic to believe that given advances in military technology and transportation systems the past two decades that self-sufficiency is a valid concept for defense purposes. It appears even more unrealistic as one views Alaska's accelerating entrance in many areas of economic endeavor. As we look at oil and minerals, fishing and marine resources, forestry, areas of Alaska's largest natural resource development activities, we find these are not based on a self-sufficiency concept, but are important elements in national as well as international economic processes.

I believe that agricultural development should be based on a similar pattern of activity. At first glance it may appear that self-sufficiency is the first step, national and international involvement should be step two and three. Such a pattern has not caused much development the past thirty years. It is true that Alaska's agriculture has not developed to a point where specialization and volume makes it competitive at the national or international levels. I believe we would make much more rapid progress, however, if research and education and capital development were geared toward such objectives. If we don't, we will continue to be subject to increasing specialization and efficiency achievements of other states and countries. In seeking specialization and volume, we are not much different than such areas. We are, however, at a substantially later stage of development.

Alaskan farmers have proven in a substantial way that they can produce grain, potatoes, cool weather vegetables, a variety of berries and ornamental plantings. Lacking specialization and volume, they have also been subject to rapidly changing economic circumstances or decisions made outside the state, drastically affecting farming systems.

Alaskan farmers have traditionally faced large challenges in their efforts to establish successful farm enterprises and systems in a largely undeveloped area. They have faced this challenge largely lacking the community and marketing infrastructure essential to successful agricultural systems in the rest of the nation.

This process has required substantial initial capital and operating cash outlays, usually subsidized by off-farm income as well as income from available loans and other sources. Farmers have faced even larger challenges in their becoming involved in production systems where basic data on lands, soils, forest, ranges, water and climatological conditions is either lacking or so broadly generalized that it is inadequate for management decisions in specific locations.

I believe that federal resources would be wisely used if they were directed in Alaska towards filling the gaps and accelerating the focus on soil capability assessments, studying ground water supplies and recharging capabilities for irrigable agriculture as well as community needs. It has increasingly been said that water will be the gold of the 21st century and beyond. Alaskan water resources are known to be large, but just how they can be related to agricultural needs is only dimly perceived. Similarly, soil and snow survey systems are as vital for total community development and protection as they are for agricultural development.

Very limited assessments have been made of the interrelationships of commercial forest areas, particularly significant in interior Alaska as related to intensive farm production. With the majority of Alaska's potential intensive agricultural soils in the interior, and with these being either intermingled with or adjacent to forest lands, early, broad assessment and continuing study appears essential.

Closely related to the above natural resource research needs is a condition of scant information of a climatological nature so important in farm management systems. In a subarctic environment of generally cool weather growing conditions, cool soils, timing of fertilizer, pesticide control and other materials are usually very critical. Knowledge of micro-climates and adequate data bases for prediction and forecasting is generally lacking as a basis for such critical decisions. It is not possible to transfer information from research in other parts of the country to assist in decisions on such practices.

Alaska has vast areas of rangeland generally vacant except for big game and lesser species of wild animals. Considerable parts of such areas are projected to have potential for domestic livestock management systems. Again research programs have only touched the edge of such areas and at very limited scales. Accelerated range studies appear as essential prerequisites to further development. Except for limited work with reindeer and musk ox, almost no attention has been focused on the development of indigenous species.

Socially as well as economically, Alaska is on the edge of or actively involved in substantial change. Over the past decade nearly fifty new second class cities have been formed as legal entities within Alaska's local government system. I doubt whether there is another area of the country exposed to such rapid development of local government units or where conditions are so challenging in the development process. I refer to conditions such as very limited community human resources, limited economic support bases, isolated communities, limited communication facilities and intercultural characteristics that h a m p e r development.

Mixed in with such change is the Alaska Native Land Claims Settlement, which will allocate approximately 44 million acres to such Alaskan residents. When that process is complete, for the first time a significant percent of Alaska's lands will be in private ownership. Today lands held privately total less than one percent, a condition drastically different from other states in the United States.

Paralleling the transition of lands to Alaska native ownership is the potential for a projected 80 million acres to be allocated to one of four federal management systems. Of these four systems, the Forest Service has the broadest multiple use regulations and could permit under eixsting authority some agricultural activity. However, it appears that even their regulations would need modification unique to Alaska if more intensive development is to occur within national forests. This condition is a large and significant problem with the intermix and adjacentness of agricultural and forest environments.

In neither case, that of the transition of lands to private ownership or to large federal ownership patterns, has there been much assessment of the impact

of such action on future agricultural development. One might argue that is primarily an Alaskan concern and should be supported largely by state resources and programs. One can also, and I believe more logically, argue that the acreages potentially involved are substantial enough to play an important role in national as well as state development. Consequently, data bases need to be developed that recognize and interpret such conditions and that provide for orderly future development. They appear essential where federal government is to be involved in direct management activity of lands with potential priority state use such as agriculture.

If I read Alaskan interests and sentiments accurately, and as a concerned Alaskan and professional Extension educator of nearly twenty years of experience in the state, I would say there is a great concern that major decisions will be made on development or nondevelopment of Alaskan resources on inadequate data bases. Unwise decisions in either direction can do substantial and perhaps irreparable damage to Alaskan residents of today as well as future residents. Once the momentum of such decisions are in effect, it is usually very difficult to withdraw or divert them economically or effectively.

Consequently, I would argue for an increasing and broadening federal role in Alaska, particularly as it relates to developing broad production systems that are potentially involved in the national pattern of activity. The largest activity needs appear to be in the resource analysis areas of soil, water, climate, and the interrelationships that exist between intensive and range agriculture and forest management activtiy. A related significant area is that of analyzing and developing regional and national economic conditions that influence Alaskan agricultural development.

I don't believe that either Alaskans or the nation will benefit from a development support policy that is based on a philosophy of Alaskan self-sufficiency as a primary goal. Rather, I think such a policy would be self-defeating and result in inadequate development of Alaskan resources for internal state use as well as a contribution to the national systems.

As a Director of Extension programs, I would comment that building productive educational efforts is often hampered by the paucity of information levels existing. Not only do we range across a broader area of developmental and associated educational needs, we often must do this from inadequate data bases and devote, as a consequence, an extraordinary amount of effort in developmental rather than delivery processes.

I would like to recognize at this point your committee's interest in and efforts to establish a broader national support for forestry Extension education. Hopefully that effort will soon result in new resources to respond to broad educational needs. I don't believe I need to stress more that such programs are perhaps more important in Alaska and are very timely now. They are essential in our struggle to respond to educational challenges associated with vast and sweeping changes in Alaska's natural resource development and use. I have inserted for the record a nationally endorsed forestry Extension program plan released in January of this year.

I believe it is a fair statement to say that at no other point in Alaska's history has there been a need for such a broad range of information required to respond to the *now* problems. With the existing broad interaction of most Alaskan resource development in the national and international scene, the quality and relevance of that information has to be high and timely. It appears that the cost-benefit ratios to the nation as well as the state would be very favorable if resource analysis assessments were greatly accelerated at the federal level in in those areas already undergirded by national analysis systems.

As a Director of Cooperative Extension programs, I know that inadequacy in data bases have substantially impacted on our effectiveness. Although I am proud of the many contributions Alaska Extension workers have made to Alaska's agricultural development, I believe we could do more with modest resource increases if our resource data bases were more comprehensive and adequate.

Finally, I would indicate that environmental protection regulations already established pose a major problem to Alaskan agricultural producers of the present as well as the future. They dramatize the uniqueness of this great north country's natural environment. That is, most baseline studies that accurately portray amounts of nitrates and particulate matter in river systems are yet to be made. Most Alaskan agricultural development of the future is

projected on or closely adjacent to rivers and streams. The challenge of establishing baseline studies is large. That condition is magnified by the general knowledge that Alaskan river systems contain a high degree of largely glacial material. They also drain vast bog areas. Such conditions lend support to estimates of unusually high natural volumes of particulate matter and nitrates. These are critical conditions, as your committee well knows, in establishing point source pollution control programs in agricultural management systems. Those conditions also call for early and large attention to research assessment well beyond the resource analysis per se.

It argues also for an agricultural systems approach that links Alaska into the national and international levels at every possible linkage point. To plan for development in a more limited sense would, I believe, be detrimental to the nation as well as Alaska.

Attached for the record are three publications. The first is a 1974 Alaska Rural Development Council publication on Alaskan agricultural potential. This study identifies more than 15 million acres suited to intensive cultivation and millions more for range production. A second publication produced in March of 1976 describes the different management patterns that could exist at the conclusion of land transfers to Alaska natives and the federal government. A third publication describes a need for and presents a program for broadened involvement of Extension educational systems in forest management and development.

Thank you for this opportunity to testify in support of Alaska's potentially much larger role in food production systems of our country.

COMPARISON OF POTENTIAL ALASKAN FARMLAND ACREAGE WITH SELECTED STATES

1 Alaska's potential acreage or intensive agricultural development—18,000,000 acres.[1]
2 Selected States land utilization:

USE OF LAND IN FARMS[2]

[Millions of acres]

	Land in farms	Cropland	Pasture and woodland
Washington	19.0	6.8	12.2
Oregon	20.5	4.1	16.4
California	37.0	9.0	28.0
Nebraska	47.8	18.8	29.0
Iowa	33.7	20.0	13.7
Ohio	17.6	9.5	8.1
Indiana	18.0	10.5	7.5
Minnesota	31.0	18.0	13.0

[1] U.S. Soil Conservation Service estimates, 1976 (does not include open rangeland).
[2] Agricultural Statistics, U.S. Department of Agriculture, 1971, p. 439.

STATEMENT OF RAY MORGAN, CHAIRMAN, TANANA VALLEY RURAL DEVELOPMENT COUNCIL

Sorry that the Tanana Valley Rural Development Council was unable to present our thoughts orally at the Fairbanks meeting. Senator Gravel is on our mailing list and receives copies of the minutes of our quarterly meetings. As these minutes will show we have been involved a number of times in discussing agriculture potentials in Interior Alaska. We have always tried to involve the Alaskan native in our discussion. This is one point in which I have been asked by some of the council members to emphasize to this committee. The Athabascan Indians in Interior Alaska will own about 14,000,000 acres when the lands claim settlement is made. Most of this land is remote from roads but is adjacent to the Tanana and Yukon River systems. More than half of the approximate 5 million acres of potential agriculture land in Interior Alaska will be under the ownership of the local Native villages and Doyon. This then should be easy to understand who holds the key for agriculture development in Interior Alaska. Some Alaskan Agriculturalists do not seem to recognize this. Therefore the Tanana Valley Rural Development Council would encourage you to include representatives from the Tanana Chiefs on all agriculture committtees concerned with agriculture in Interior Alaska.

If our organization can be of assistance to you please let us know.

MILTON H. LICHTENWALNER,
Talkeetna, Alaska, August 22, 1976.

Re: Agriculture in Alaska

Hon. WALTER HUDDLESTON,
Senate Agriculture and Forestry Subcommittee, U.S. Senate,
Washington, D.C.

DEAR SENATOR HUDDLESTON: I would like to offer the following comments to augment the testimony you heard in Palmer, Alaska, August 16th concerning agriculture in Alaska. How my observations would affect Federal agricultural policy in Alaska, I don't know, but hopefully you would. My observations are distilled from 30 years experience in agriculture, of which 16 years are involved directly in farming, as I operate a small farm at mile 222 Alaska Railroad, about 80 miles north of Palmer, Alaska.

1. *Availability of land.*—It is my belief that there is adequate land available for agriculture to expand total production several times (say 4 to 5) before vast new areas need to be opened up in the Yukon-Kuskwokwim areas to the West and Northwest beyond the Alaska Range of mountains.

The problem is that land now adequately supplied by roads, rail, and electric power is not being farmed, even though there are market incentives, and tax (subsidy) incentives to farm this land. Hay, grain, and the common vegetables (carrots, potatoes, cabbage, etc., etc.) are always in short supply especially in winter. In 1968, and as amended in 1974 the State of Alaska adopted a "Farm Land Use Tax Act" which forgives practicing farms up to 80% of the property tax levied against farm land. On my farm the tax is thus reduced from about $1000 to about $200 for this year. Basically, to qualify, the farmer must show that at least 10% of his gross annual income is derived from the sale of agricultural products or service (renting pasturage for horses for example). Considering the complaints I hear from nonfarming land owners about the high and increasing level of real estate taxes, this would be a major inducement to grow, at least hay on idle acres now growing up in brush. In addition to this tax incentive there are also the usual conservation programs of which you, I hope, are thoroughly familiar. Finally, there seems to be no shortage of money for capital improvement through the Alaska State Agri. Revolving Loan Fund, The Alaska Rural Rehabilitation Corp., The Federal Land Bank etc. (but NOT the FmHA).

2. *Manpower and Education.*—You put your finger on the sensitive nerve when, in Palmer, you stated, "The climate in Alaska is unique—to say the least." And, Senator, that is about the MOST that can be said of it. The nearest climatic analogue to the Anchorage-Palmer region is found in the Moscow-Leningrad region of the Soviet Union. For all practical purposes this climate, agriculturally is sub-arctic to arctic. Even so, as other witnesses pointed out the technical problems of soils, climate, crops, soil management, application of machinery, etc. have been largely solved. What we do not have is a population with the interest, education, and experience in sub-arctic agriculture to apply the available technology to the available land to make even a dent in the available market. And the number of people possessed of the knowledge, experience and technique, in my opinion is declining. What is worse there appears to be no way of increasing, of turning it around to develop even a small cadre of farmers who can pass their practical and theoretical knowledge on to others. We are an endangered species. We are like American Indian arrow chippers who lost our technology when the Great White Father began to supply firearms. The University of Alaska is a land grant college, but so far as I can tell the United States of America is not teaching agriculture in any functional way that would produce more farmers. So far as I know, exactly one college level class in Agriculture was taught in Alaska last school year, a class in forage production at the Palmer Community College, in the heart of Alaska's "farm belt". A class in soils was also offered but not enough interest was expressed on registration day to meet the requirements to fund the course. Of the ten students in forage production four were already employed by the government in agricultural enterprise, three were practicing farmers, and three were "general interest" students.

Even if large numbers of students did demand a full agricultural curricula in Alaska there would not be enough staff to teach the classes. Please recall that we are talking about arctic and sub-arctic agriculture. The only people competetent to teach the classes directed toward agriculture in Alaska are the staff of the experiment stations, and they are already working full time. It would be next

to impossible to ask these research people to carry a full load of research plus a full teaching schedule at the same time.

And, it is useless to import a teaching staff from the other states to teach arctic agriculture. They don't know anything about it. That seemed to me to be the failure of the University of Alaska's agricultural curricula when I matriculated there in 1946, hoping to learn agriculture. The program was a fake, however well intentioned. I finally graduated with a B.A. in Economics, class of 1950. It is still a fake.

3. *Summary.*—A. There are not enough research people who have sufficient knowledge of arctic agriculture to carry on a full scale program in arctic agriculture now.

(*B*) Because these people cannot be spared from their jobs now, there is no one at all to staff a full scale agricultural college oriented toward arctic agriculture even if we had one.

(*C*) The number of full time farmers competent to farm these Alaskan lands (ready snowy wastes from November through April) is small and declining.

(*D*) Because the number of people who know what can be done is so small, there is little awareness that it (profitable commercial agriculture) can be done at all.

(*E*) Because so few people are aware of the possibilities there is no demand for the teaching of the technology required to create the product on a viable dynamic commercial scale.

(*F*) Because there is no demand there is no capability to provide the service—the teaching of agriculture, hence little production of crops.

4. *Conclusion.*—We, farmers in Alaska, who are trying to make our livelihood by farming, are on a downward spiral that we, by ourselves, cannot turn around. Turning from my general observations to my private view of the agricultural future in Alaska, I predict that commercial farming in Alaska as you hear about it in your subcommittee in terms of "million of bushels of grain, problems of large feedlots and the price of cotton," to quote you, will never materialize in the next ten years anyway. Commercial farming will continue about the same or decline. The agricultural future may be horticultural rather than agricultural. Until you come up with a better program, my private program for Alaskan agriculture is 1,000 new home gardens a year. That will at least get some people involved in growing things in a way that does not cost a great deal of money, teaches people that crops can be grown here, and keeps the idea alive. All in all the future of agriculture looks pretty dismal to me, because there seems to be no way to break the vicious circle that continues to make things worse.

Thank you,

MILTON H. LICHTENWALNER.

P.S.—College administrators scoff at my idea that assuming competent teachings, the only way to start an agricultural education program in Alaska that is meaningful is to draft the students, to wit: one of every 20 full time students at University of Alaska must enroll in agriculture. No classes of any kind start anywhere on any campus in Alaska until this quota is filled. Such a draft would do the job. If you can think of something better, let me know.

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