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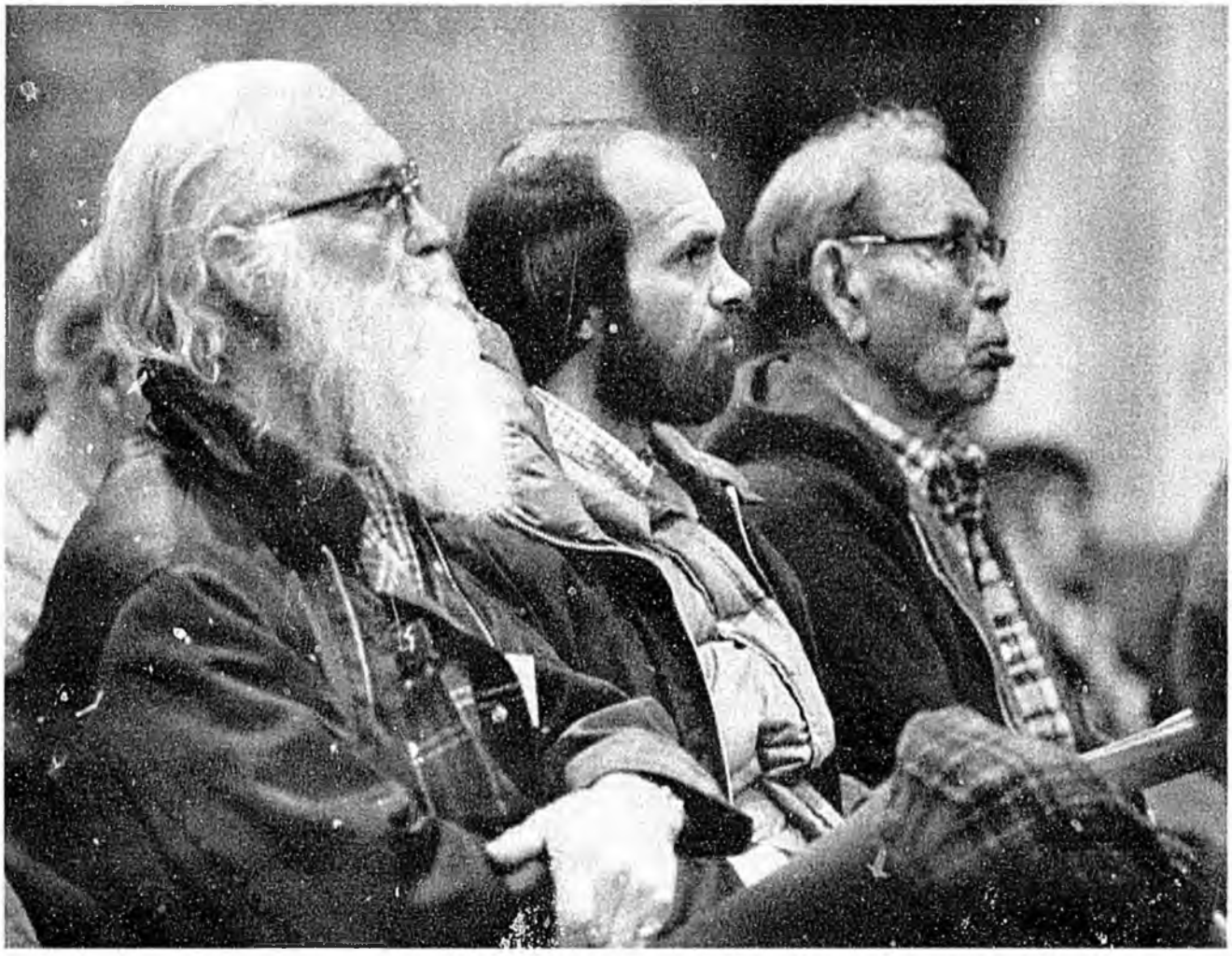
Ten years ago, or os, we attempted to export some peas to Oregon for a test. There were comments like: 'That was coal to New Castle', and to a large degree, it was. You wouldn't think that one vanload of peas to Oregon would upset anybody, because it probably was less than 10 minutes of their normal, operational procedure. I learned a lesson, at that particular time.

They agreed to cooperate and evaluate a vanload of peas and give us a marketing report. But, somehow or other, very immediately our vanload of peas got lost into their two million pounds a day. And, to get any information out of them that might express any type of future competition, or anything that might look like some place else in the world grew better peas than Oregon really wasn't publishable.

* * *



Mayor Coghill: One of the problems that we've seen in Agriculture, both in the Big Delta area as well as in the Point MacKenzie area, is the negativism that is being generated by the way those fields were cleared. We believe that there is a resource made available by the clearing of this land in wood fiber. We talked about it over a year ago -- two years ago at a seminar, that we were looking at getting into a shear cutting; going in first of all harvesting the round-logs, the house log, the logs that were available for market in the round, and then going into the area with a shear system; shearing off at the root level all of the wood mass that would be needed to be cleared, and then going in with a root-plow and then root-raking so that we save the soil at its original stance.

I'm not saying that this will be the way that it will be done. You'll notice in your booklet that we have the clearing of fiber, harvest, marketing, preparation for cultivation on the third page. We're offering a proposal, and we wish to have industry give us their proposal to go into these two townships and, at our design, to clear that land. We feel that it can be done and should be done, because as we look at it, as we get further down the line, as a very exciting thing from the standpoint that it's going to open up a whole new industry in wood fiber processing.

We'll talk about the fact that hydro-electric power is coming into being; that the Susitna Dam Project will be underway. There's an awful lot of interest; it's going to happen and it's just around the corner.

In the making of those dams, there's an awful lot of form material that is going to be needed and a lot of wood materials are going to be needed in order to place that particular installation in place. Fiber board is going to become a very necessary thing. We can provide that right here in the Interior. As you can see, Koyukon down on the middler Yukon around Galena, is starting to get into the Agricultural Program in a large way. They're going to be doing a lot of clearing; they're going to need some kind of a system set up.

We're proposing, and I have with me today Mead Treadwell, who I will introduce to you shortly who is working with Senator Mike Coletta of the Anchorage area on the wood fiber program. We find that we've come upon a program that is going to create a new industry in Interior Alaska. As we look at the clearing that is going on in the Galena area, we can foresee that they will be sending their chips up to Nenana for transshipment.

There are two different kinds of chips. There's what they call the white chip, which is marketable on the international market. That will, of course, be the first harvest that will come out of there, after the house logs and the logs that will be needed for our basic round log industry here in Nenana.

Then, what happens to all the rest of the chips? We're finding that there's quite a few tons of chips, per acre, that will be used or will be manufactured as we clear. We propose that we wind row these and that we set them up and dry them for hog fuel. That we use the hog fuel -- and, that's not swine fuel -for the purpose of firing boilers. You fire boilers at MUS in Fairbanks. The boilers at Healy are adaptable to using a wood fiber as well as a coal substance for generating energy.

We see that, possibly, in the Totchaket area, after we get into these two townships, that a small generating unit might be established in the heart of the Totchaket area instead of going to a very expensive system of trying to get Golden Valley or the REA to establish a line system in there.

Like I said before, these are all 'in jello' and we're looking at them, because we're looking at everything on the economic curve on the market side of it. It can be done; it can be done right in the field. The new technology that's coming about, as far as the wood fiber industry, is very exciting. I think that this is one of the areas that we've opened up; we've taken a peek at it; it's in its infancy; and it's one of those areas that's going to excite us, because the by-product -- When I listened to the vegetable presentation -- I think that Gene has done an excellent job in where he's at. He's given you some negative approaches to it, but it's just like looking at the Delta program.

The Delta Program was a grains program. There was no indication at the outset that they would start getting into a 'red meat' system. But, that's evolving at Delta with the development of livestock which eat Delta barley.

As we progress in developing this whole program, other things are going to fall out; other things are going to happen.

The City of Nenana has already negotiated with the Alaska Railroad to take over the Port Facility. By February, we'll have a Port Authority in place. We'll be operating the total river operation on the port; we will, by necessity, do that by contract with the carrier that is now in place. The idea behind it is to get ourselves into a position to be able to put bunkers on the Nenana River; to be able to receive wood chips; or to be able to receive grain, as we develop the Agricultural Program further west, because of the rail system.

I think that we're just seeing the tip of the iceberg.

I would like to indroduce to you now, Mead Treadwell, who came all the way from Boston to be here at this particular symposium to give you a report. And, it anybody hasn't received one of these handouts, why we've got a whole box of them here.

Mead Treadwell, Timber Industry Consultant to Senator Mike Colleta, Anchorage

Mead Treadwell: I used to laugh when they say that an expert is somebody who comes from out of town with a brief case. I'm not an expert. My background is basically as a journalist and I am now a student at Harvard Business School. I am working with Senator Colleta on a number of different proposals to try and increase the amount of small business going on in the State and to try to use the State resources in such a way as to make that happen.

Senator Colleta has been interested in the projects going on at Delta and Point MacKenzie. We've been looking at the potential of the wood at Totchaket, as probably the best place for looking at a diversified wood fiber products industry.

In going about this, there were three (3) basic studies that have already been paid for by the tax payers that are worth looking at again, in showing how this is feasible.

First is the one that was done for the State Division of Energy last year by Batellle, which says, 'assessment of bio-mass versus energy for the Delta Agricultural Project', which received very limited circulation.

Second, is a very thorough study called, 'Feasibility of Structural Fiber Board', manufacturer in Alaska that was commissioned by the Fairbanks Industrial Development Corporation and U.S. Forest Service in 1977. That looked at both the costs of bringing a particle board plant on line in the Interior or Anchorage area, and also the markets for particle board, not only in Alaska, but around the Pacific Rim.

The third report which I have with me is one that was done by the military, as recommendations for local military installations to use such as food fiber in their area and wood chips in their area for energy.

All these are fairly constructive cost estimates, which apply here; which show that, individually, there are three (3) things which can help make the cost of clearing the land here in the Totchaket area self-liquidating.

I have written them up in a brief report. They are outlined on the thrid page of that report. First, is wood chips for fuel and electric boilers.

At the present time, land is cleared by dragging a chain between two large bulldozers and knocking the trees down in one way and then bringing the bulldozers back and chaining the trees the other way; then pushing the trees up in wind-rows. What that does: It takes a very valuable resource, which are these trees, and it tends to diminish their value right away, by mixing them with moss, stones, and dirt and piling them in wind-rows. That happens to be one of the fastest ways of clearing the land. I recognize that the primary purpose here is getting agriculture going. You can't get agriculture going unless you have a lot of land going quickly.

Because Jim Drew has told us earlier, you really need a lot of infrastructure to make it happen.

Regardless of the way the land is cleared, however, the wood can be chipped for use in electric boilers. I've talked with the major utility companies in the State, and all of the coal burning boilers in the Anchorage and the Fairbanks area can be converted to using wood chips. It's more difficult to convert Healy, which uses pulverized coal, but the utilities at the military bases in the Fairbanks and Anchorage areas could start using wood chips as a supplement tomorrow, if there was a way to transport chips to them. This, when you look at the cost of clearing could be applied as a credit toward the cost of clearing for agriculture.

The agriculture needs are: You need to get the land cleared quickly. So, once you get that stream of chips going into energy, then the next thing to do is to put a filter in front of it. One of the suggested filters is this picture (part of the report) -- it's called a vacuum airlift segregator. It was developoed by the U.S. Forest Service in Hope, Michigan where they're using it for pulp chips in the Great Lake states, using wood fiber very similar to what we have in this area; spruce, birch and aspen.

What this does, as you can see: It has a conveyor belt. The chips go through it. You've got three (3) vacuum hoods. The first one picks up the lightest stuff, the foilage; the second one picks up the clean wood chips and the third on picks midlings.

The clean wood chips -- If you use this filter, and especially if you use another filter in front of that, can be exported on the pulp market just the way round wood chips are being exported now. This is the type of thing that goes to Japan; is made into tissue paper. But, whatever it's used for, it ends up making money. In fact, the developer of this system, believes that just by grinding up the foilage; if the land is cleared in the summer, and using the hot fuel midlings that remain after you take off the whole sheet of chips, that can pay for the cost of the machine itself. Whatever clean, white pulp chips you get out for export is for pure profit.

What you're looking at here -- for an area the size of Totchaket is a $200,000 machine which can handle 20 tons an hour.

The next step is something which requires a coordinated effort on the part of the State and somebody in private industry, who is interested in doing this. This is to go much further and take a look down the road, and say that we're going to have two (2) million acres of agriculture into production by the year

2,000. Say, if we're going to do that, we're going to be clearing a lot of acres of land. And, if we're going to be clearing a lot of acres of land, that's a lot of tons of wood bark that could be used right here to make things like this, which right now, we import. All the panelling you see right here is brought up from the States. That could very easily be manufactured, using the wood fiber that's coming off this land.

A letter that you can see from the foremost builder of these fiber board plants at the end of this report -- on the second page of the letter: 'Could you assure an annual supply of say, 100,000 tons of green wood, at a reasonable cost for a reasonably long plant life span, say, an economic life of ten (10) years'? I went back to the report and looked at the weight and the composition of the bio-mass of Delta. There it tells us: 'That is unburned bio-mass, actual trees, were getting 15 to 18 tons per acre'. Being very conservative about what you get out of this filter processing: If you're getting ten (10) tons of wood per acre, that is 10,000 acres a year of bio-mass that you would need to sustain a fiber board plant in the Interior. That's as far as supplies are concerned.

We're talking about here at Totchaket, 40,000 acres to be cleared within a period of a little more than a year. That's one way of looking at it.

The other way of looking at it is: If you want a fiber board industry in the State and you want it in the long-term, that fiber board industry is going to have to behave like any other industry in the long-term, and that is to regenerate the land. In the beginning when it's trying to establish a foothold and get going, we can combine the process of clearing agricultural land with the process of getting a fiber board plant going.

Finally, I would urge those of you who are interested, to attend George Sampson's workshop. He knows a lot more about the technical part of this than I do. We may have some discussion later this afternoon. Thank you.

Clearing, Wood Fiber Harvest and Ground Preparation Workshop
George Sampson, Moderator
Research Forester Institute of Northern Forestry, Fairbanks

George Sampson: Our group didn't reach any unanimity on the solution to clearing wood fiber harvest to marketing and preparation of the ground, which probably doesn't come as a surprise to anyone.

We were nearly unanimous in support of the idea of utilizing material that is removed. I say 'nearly' -- The idea was again brought up of the value of burning the material on site and its value for future crops on the site. This was countered with the agrument that we could remove the material, burn it elsewhere and bring the ashes back and scatter it, and have the best of both worlds.

The big problem that we see, as far as the clearing and utilization, is timing. Timing, first of all, with getting anyone interested in harvesting the timber on the site -- because, at this stage, we don't have very good information on what is available. It's hard to get any 'hard' information from industry as to what they would do with the material out there unless they have volume information to use in developing estimates.

Then, we have trouble with timing of getting the land cleared and into agriculture and still utilize the timber. There is a basic conflict between timber utilization here and getting the land cleared for agriculture as soon as possible.

If we build an industry sufficient to remove the timber on the proposed time schedule, they will be looking for other timber when this is gone. The idea was expressed that this could lead to 'timber mining'. (In the event that we did get an industry that could handle this volume of timber in such a short time.)

So, we recognize that this problem exists, regardless of whether the utilization of the timber is undertaken by the State before transferring land to the farmer or whether the timber is transferred to the farmer when he gets the land, and he's expected to utilize it while clearing the land. The problem is still there in getting the timber utilized and still getting the land into cultivation early, which is the goal of the farmers, obvioulsy, since this is going to be their business.

There was some interest expressed for export of the timber to be removed, either in log form or chips. It was pointed out that, this time, we don't have any means of exporting chips from the site. The Alaska Railroad doesn't have a single chip car. It's doubtful that we have enough trucks to move the volume of chips that would be taken out of these sites, if we didn't go the railroad.

Fire danger, of course, was mentioned. Dick Jackson of the Department of Natural Resources reviewed the fires that have occurred on the sites and what might likely occur as land clearing begins on the site. The potential for fires is very large.

It seems that regardless of what clearing procedure is followed, a fire plan would probably be needed before clearing begins. This would, at least, reduce the potential for fires.

The demand for firewood that exists should be recognized, but again, we would have trouble moving the volume of firewood off in a short time. For a long-term project, firewood would be excellent.

The problems with 'chaining' were again discussed. On some sites, soil may be lodged in the root wads and go into burn piles, if chaining was the route taken. Some of the good soils is piled up that would be better left in place.

There were a couple of representatives of future land ownerships that will adjoin this property present. They were very concerned with what occurs on this property and the effect it will have on the timber on their lands. For example, if slash is left from road building or land clearing, it would create insect infestations which will spread to their property. They are very concerened about this. They are also very concerned about fire; fire from the Totchaket site spreading onto their property and destroying their timber.

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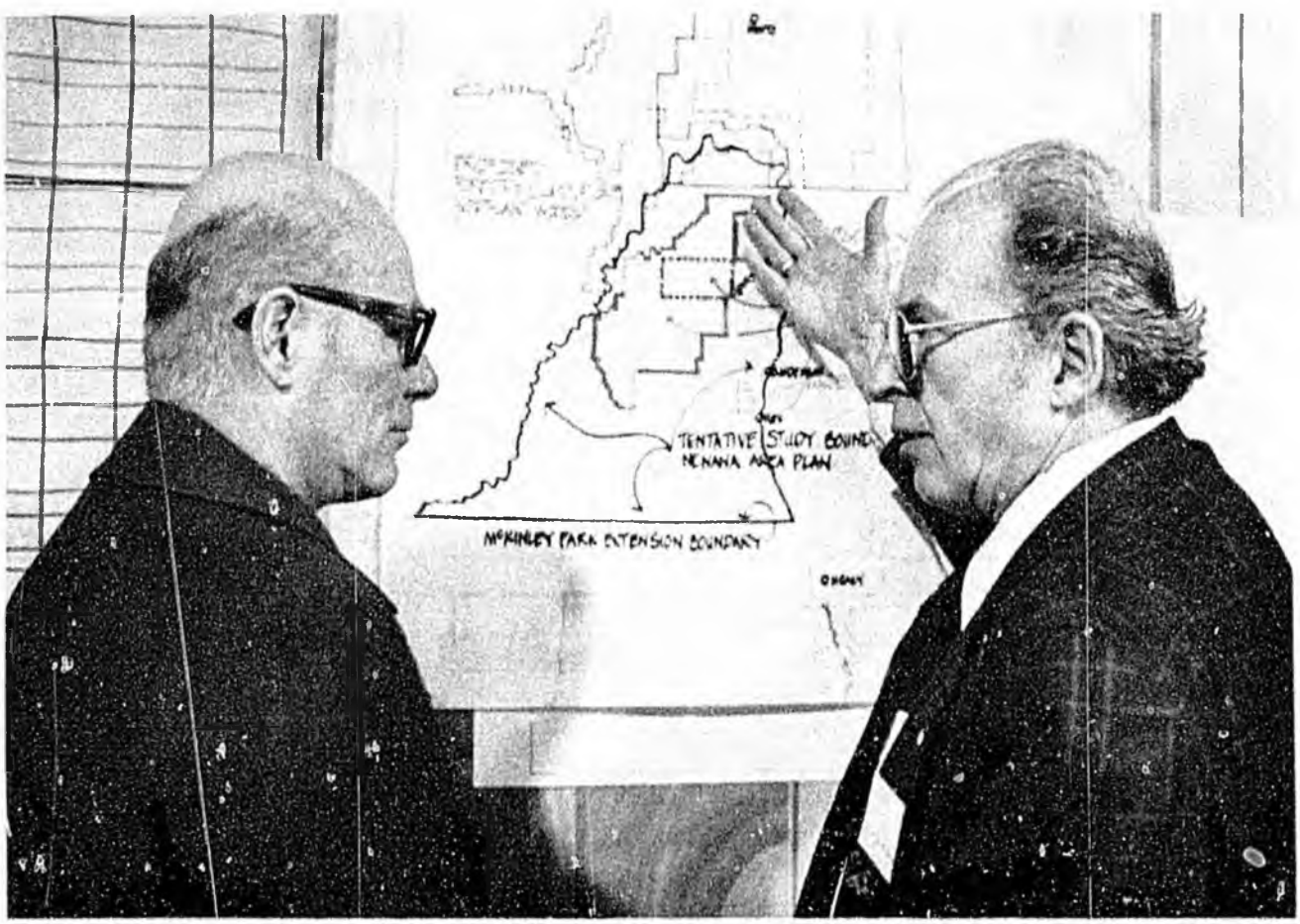

Agriculture Design Workshop
Dr. Robert Weeden, Moderator
School of Natural Resources, University of Alaska, Fairbanks, Alaska

Workshop Summary by James Fisher, Department of Agriculture, Anchorage

Questions considered by the Agricultrual Design Section were:

1. Soils information for the proposed agricultural project was the first subject discussed. It was explained the soil survey had been made by photo interpretation with field checks, which was as detailed as would be accomplished for farming purposes.

    A. Engineering work was being accomplished by borings every quarter mile for roads and core drilling for bridge areas was in process or soon would be.

2. What was ground water availability:

    A. Nobody was sure of the precise progress of water inventory, if any was under investigation.

    B. Unknown was the manner in which the aquafer might flow or general perculation characterics of the soil.

    C. Was there any need to check immediately for ground water availability or status?

D. Executive Director AAAC pointed out that most of the emphasis in agriculture had been on dry land farming and if irrigation considerations were to be undertaken, new approaches were necessary.

E. The question about ground water was prompted by a phrase "droughty soils" in the soil survey report.

3. What are the climatic conditions in the area:

A. Are they highly variably?

B. There are a number of micro climates in the area.

C. After clearing will wind patterns change? Answer: Probably not much.

D. Can no tillage, or minimum tillage, practice findings under study at the Delta Agricultural Project be extrapolated to this project?

E. Should final wind protection requirements be deferred until farmers are on the ground?

F. What detailed meteorological information is required? How does one insist that soil protection be accomplished if the results of wind erosion will not be a cause for economic loss within the life time of the owner?

G. Soil Conservation Service (SCS) representative stated no soils information other than the existing survey, was necessary--other than onsite surveys after individual farm layouts were available.

4. Land form questions:

A. Where would the Nenana River go if it floods? Answer: It should not be close to the proposed project area.

B. Protection against flooding might be afforded by one quarter mile green belting, if such practice is followed in this project as has been accomplished in places in the Delta Project.

C. Will access routes be affected by the land forms or ice jams or the rivers?

5. Thermokarst is not a problem in the area designated for the project. Thawing in sands which might have ice in them are believed to have an inconsequential potential impact.

6. Access: Will there be competition with proposed direct access by bridge?

   A. Are alternate routes known?

   B. Is there a need to design alternate access?

7. What types of farms are to be designed for:

   A. Has enough planning for infrastructure been accomplished to date, so such infrastructure will permit approachable variety of farming plans?

   B. What will be the <u>end production objectives</u> for the farms in question?

   C. How will design for flexibility for changes in the future be accomplished?

   D. It was pointed out that the State has not settled on (1) an agricultural marketing system or (2) a transportation system, so flexibility is exceedingly important.

   E. If the size of farm is to vary, it should be designed for largest size reasonably foreseeable.

8. What are the chances for another service community:

   A. Will another community occur in the project area?

   B. Is <u>another community</u> in the project area necessary?

   C. A strong caution was raised to avoid the encouragement of a competative community i.e. to Nenana to avoid the diversion of energies that occurs from competative desires in competing communities.

9. Should conservation practices be mandatory before disposal:

   A. It was pointed out that State regulations require conservation plans for State disposed lands.

   B. Should windbreaks be recommended prior to disposal of property.

   C. Should there be an allowance on flexibility to accomdate to local best management practices to accomdate for conservation concerns.

10. What are wildlife and recreation concerns:

   A. Are there any great conflicts in the area.

B. Fish & Game has apparently done little planning to date--however, there are no present apparent severe conflicts. Only recently has Fish & Game started to put resource values on maps in the project area.

C. There was cauiotn that any alternation of habitat would change the species population.

11. Is there any area near the project which will require forage considerations or availability?

A. What is the value of the Native grasses in the area?

B. Would a cow/calf operation convert the existing Native forage to something else when regrowth occurs?

C. It was observed that a major problem with livestock is presently lack of a disease transmission control system. Planning and organization for such a system is presently in process and should be available before too long.

D. The moderator commented a plan for the area should encourage a variety of types of farming which should hopefully be better to live in and would provide the other advantages of diversity.

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Summary by Mayor Coghill: In summary, I would like to thank everybody for coming out to this program. I know that the 20th of December is a bad time for a lot of people to travel away from their homes. But, if we didn't hold it 'to the 20th', we would probably be about 45 days down the road before we could get 'on line' again. As you've seen the chart -- we're really trying to press an awful lot of things into an awful short time frame. If we can't meet some of those schedules, we'll at least have a target that we can shoot to.

The two townships that we chose, of course, we've said were the two patented townships. The question was raised: 'Well, if you're going to go into the shear cut program, how are you sure that you can get those two townships done in that time frame?' We say that if we can get half of it done or we can only get a third of it done and the proposal that we're putting out in the paper (is the one that's in your little packet) as to how we can do this.

We feel that the harvesting of the natural fiber on the land is a very important factor. The questions that were raised by the workshops are very important to us, because they raise the things that we possibly 'skirt over'. We're looking very strongly at getting into the processing program, whether that be in fact, at Nenana or whether that be in fact, some place in the Interior or that part of this program be in the Matanuska Valley and some of it be in the Delta area or part of it be in the Fairbanks area or part of it be in the Nenana area.

As we progress in our push to get Totchaket-Nenana West on program, we find that we're bumping into area where there is concern about provincialism. we're not looking at 'provincialism', we're looking at trying to fit a total AC program into the Interior or into the State of Alaska, be it part of it coming from the chain; part of it coming from the Kenai Peninsula; part of it coming from the Matanuska Valley; part of it coming from Delta; and/or down the river. Not much was said about Koyukon, but the Koyukon project at Galena is going great guns. If you get a chance to go 'down river', you'll see some very fine, small vegetable farm programs going right now. They're using the old ox-bow areas where the Yukon River used to wander. They're finding that the soil's conditions in those areas are great.

They did this same thing at Aniak two years ago. They had a very successful part. When they talk about wildlife, they find that wildlife has a tendency to migrate towards these areas, because that's the least resistance of their food requirement. I think that Delta's finding that out with the buffalo. The buffalo just dearly love that barley, because it's the easiest thing for them to get and the natural flow of animals is: To get the food at the least resistance. We find that in the Totchaket area and particularly this plateau, that we're not interfering with the natural flow of caribou or moose or anything else, because they basically stay in the river areas along where there's more foliage and there's a great area.

To answer the question about the logging on the farm tract areas: If you'll look at the ground proofing, and when Bill Copeland and his crew get done with the ground proofing, that particular area that we're talking about in those two townships, there very very little spruce tree or the log-type tree that you would need to get into that. We might be able to then take a look at it. It brings up the question: Where can we then have a selection, and maybe we can talk the State into a position that: In another area that has good forest area, that we would get those people that are going to be on the AG plots, the farmers; that they be given a 'house log' permit to go in there and get their logs.

This is the whole thing; trying to put all of these pieces together. We're still kind of in a 'jello' position. It was brought out by all of the questions that were asked in these workshops as to where we're at.

I sure want to thank everyone of you for participating in them. I want to wish you all a Merry Christmas. And, when we get down the line in January and we get our summation put together, we'll be sending all of you that have registered a copy of that. Unless there's something that somebody else has to say, I guess we can adjourn our seminar. Thank you very much for coming.

* * *

PARTICIPATION

City of Nenana Representatives:

1. Mayor John B. Coghill Nenana
2. Councilman Terry Forness Nenana
3. Councilman Bob Knight Nenana
4. Planning and Zoning Commission Chairman Milt Jauhola Nenana
5. Steve Bainbridge Fairbanks
6. Jerry Smetzer Fairbanks
7. Bob Thomas Fairbanks
8. Kathy Schedler Fairbanks
9. Gene Whiting Fairbanks
10. Kaye Knutsen Nenana
11. Bev Staley Nenana
12. Kathy Shaw Nenana
13. Mary Hollander Fairbanks
14. Cynthia Fields Fairbanks
15. Charlie Backus Fairbanks

State of Alaska Representatives

1. Larry Soden DOTPF Fairbanks
2. Mike Tinker DOTPF Fairbanks
3. Bob Pollock AAC Fairbanks
4. Scott Grundy ADF&G Fairbanks
5. Dick Jackson DNR Fairbanks
6. Ed Kern DNR Palmer
7. Bill Copeland DNR Fairbanks
8. Nick Carney DNR Wasilla
9. Doug Lowery DEC Fairbanks
10. Art Davidson DNR Anchorage
11. Peggy McNees DNR Anchorage
12. Dick Reger DNR Fairbanks
13. Enzo Becia DNR Anchorage
14. Ron Mitchell DNR Anchorage

Alaska Legislature

1. Senator Bettye Fahrenkamp Fairbanks
2. Representative Pappy Moss Delta Jct
3. Representative Bob Bettisworth Fairbanks
4. Representative Ken Fanning Fairbanks

U.S. Federal Representatives

1. James E. Fisher D.Ag Anchorage
2. Charlie Marsh D.Ag Anchorage
3. George Sampson D.Ag Fairbanks
4. C. R. Eager ARR Anchorage
5. Jim Vancura D.Ag Fairbanks

University of Alaska Representatives

1. Jim Drew Fairbanks
2. Alan Epps Fairbanks
3. Fred Husby Fairbanks
4. Carol Lewis Fairbanks
5. Tony Gasbarro Fairbanks
6. Wayne Thomas Fairbanks
7. Bob Weeden Fairbanks

Private citizens

1. Richard Huntsman Fairbanks
2. Lyndon Funk Fairbanks
3. George A. Hobson Nenana
4. Lee Fett Delta Junction
5. Russ Talvi Fairbanks
6. Sig Restad Palmer
7. Frank Buck Delta Junction
8. Randon Guy Juneau
9. Ed Rose Nenana
10. Ron Nelson Fairbanks
11. John Hendricks Fairbanks
12. Don and Alice McKee Fairbanks
8. Ray Morgan Fairbanks

Private Citizens

13. Berle Mercer Healy
14. Mike and Leslie Holz Nenana
15. Al Cronk Doyon Fairbanks
16. Phil Berrian Doyon Fairbanks
17. Larry and Karla Zervos Fairbanks
18. Art Weideman Nenana
19. Nina Cotter Nenana
20. Celia Hunter Fairbanks
21. Charles Knight Fairbanks
22. Clifford Jury Nenana
23. William R. Wood Fairbanks
24. Bud Williams Fairbanks
25. Charlie Fannon Fairbanks
26. Cecil Gates Nenana
27. Vic Van Ravensway Nenana
30. Steve LaRue Fairbanks
31. Ed Yarmak Anchorage
32. Mead Treadwell Anchorage
33. Dale McKee Fairbanks
34. Fred Pratt News-Miner Fairbanks
35. Alfred Starr Sr. Nenana
36. Martha Ketzler Toghotelle Nenana
37. John C. Irwin Nenana
38. Robin Carter Nenana
39. Skip Slater Nenana
40. W.W. Roberts Fairbanks
41. Mike Roberts Fairbanks
42. Allison Persinger Fairbanks
43. Karen McCluskey Fairbanks
44. Howard Holbert Nenana
45. Hinton White North Pole

The Nenana Livestock Report

AG 102

Prepared For

Office of the Governor
Special Projects

In Coordination With

The Alaska Agriculture Action Council
and
The City of Nenana

Prepared By
Featherstone Corporation
2400 Frederick Avenue
St. Joseph, Missouri 64506

February 15, 1981

PREFACE

Featherstone Corporation has been requested to prepare this report on the economic justification and methodology for an Alaskan livestock industry. The livestock industry in the Lower 48 has been in existence for a long time and has developed slowly to what it is today. To a person outside of the industry there are certain mysteries which are difficult to explain. In reading this report such a person will question many such aspects of the report and there will be no footnotes or backup information to substantiate many statements. The personnel in Featherstone have over 100 years of combined experience in the industry and have consulted with people on this report with many years of experience in their area of expertise.

Featherstone was commissioned to write this report in only three months and was asked to emphasize the working methodology of the industry. To comply with these requests, charts, schedules, and tables have been used that are well established as doctrine for the industry but the documentation for them has not been researched and presented. As a result this report has become a practical guide on how to develop the industry on the individual producer level and is not a scholarly disertation. Featherstone has enjoyed preparing this report for what it considers to be a unique situation and believes it contains a wealth of practical information that should help Alaska build a strong livestock industry.

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INTRODUCTION

The purpose of this report is to determine the economic feasibility of an expanded livestock industry in Alaska and to find a practical way to expand that industry if found to be feasible. Featherstone Corporation of St. Joseph, Missouri was sub-contracted by the City of Nenana, Alaska (under a contract with the State of Alaska) to make this report. The sub-contract was awarded on October 20, 1980 with the restriction of being finished by February 15, 1981. The time restriction has limited Featherstone's ability to learn all of the particular idiosyncrasies of Alaska's nature and economics. Consequently, if after reading this report the City of Nenana or the State of Alaska feels certain aspects of the report may not be applicable in Alaska, they should contact Featherstone for discussion on those points.

The restricted time has also necessitated making this one assumption that is critical to the report: Alaskans respond to marketing and economic stimuli in the same manner as people in the Lower 48 Continental United States (Lower 48). For example, in dealing with the population as a whole Featherstone has assumed the per capita consumption of different meats will become the same as in the Lower 48 if the price relationships are the same. The same thinking assumes that producers will respond to economic conditions the same as in the Lower 48. Featherstone feels that in making this assumption, the validity of the report is not affected. In traveling through the state, Featherstone found that total costs were higher than the Lower 48, but relationships between costs were similar.

The time limitation has also restricted the scope of this report to the two primary species of livestock grown in the Lower 48: Cattle and Swine. Poultry, lamb, and other species were not considered. The poultry industry is highly technical and has become so specialized only extremely large facilities have survived in the Lower 48. The population of Alaska was not found to be sufficient to support such a facility. The lamb industry, wild game, etc. has a rather narrow market and per capita consumption. The economic impact is rather small. The beef industry having a 105 pound per capita consumption and the pork industry about 60 pounds, has a major impact.

The economic advantages to raising livestock became readily apparent when the transportation costs were considered. As a result, a relatively small amount of time will be devoted to proving the economic viability of the two species. The practicality of developing, timing, and creating the infrastructural needs of the livestock industry will be dealt with in great detail.

To be successful, a large sum of money must be invested in the industry in the beginning years. The people of Alaska, as a result, are going to expect a return on that investment and expect it the first time. As a result of that expectation, the effort must be done properly the first time. To be done properly two areas must not be neglected. The first area is sufficient money to create an industry that is large enough to perpetuate itself. The second area is adequate expertise to solve the technical working problems of the industry. Featherstone will paint a picture of the monetary aspects of the industry with a rather broad brush. That is to say, the figures used in this report will familiarize the reader with what size of investment dollars are needed and in what broad amounts. The actual hard costs will vary from the 1981 dollars used in the estimates.

This report should also give the reader an idea of the technical equipment that will be needed in the industry initially. The expertise to operate that equipment efficiently must be found. An opinion will be given on how that expertise must be gained. In the final analysis, however, the State must look at the expertise needs of the industry in the same manner as monetary needs. Both will be an investment which will pay handsome dividends if done properly.

Featherstone does not believe the methods and ideas presented in this report are the only ones from which the industry can be created. It does believe, however, that the ideas presented will produce an industry designed for the State in the most efficient, and economical manner. One must realize, however, that efficiency and economics are not the only consideration when political decisions must be made. If adequate monies and expertise are committed, however, Featherstone believes a livestock industry in Alaska can evolve (after all considerations are made) that is economically viable.

Before beginning the body of the report, Featherstone would like to acknowledge the help it has received. The staff of the Mayor's Office in Nenana has been most helpful in supplying local information and maps. The Alaska Agricultural Action Council and the faculty of the University of Alaska have supplied a great quantity of data that has been invaluable and very expeditious to this report. Ellerbe Alaska has collaborated on this report giving local data and insights which has facilitated making this report. Featherstone wants to thank all of these people and institutions for their help.

During the development of this report, Featherstone was requested to prepare a preliminary report for the development of future legislation. That report was made on December 1, 1980 and transmitted to the Mayor of Nenana. In that report some very rough preliminary figures were used. This report has refined and changed some of those figures. If the reader has had access to the preliminary report some very significant changes will be noted but the conclusions reached will be found to be the same.

SUMMARY

In order for this report to be understood by as many readers as possible a short synopsis of the cattle and swine industry in the Lower 48 was put at the beginning of the report. Some variations of this description will be found by the reader during the sections describing the proposed industry in Alaska. The variations were made to compensate for local conditions.

To determine the economic viability of a livestock industry, the present transportation costs were used as a base competing figure. Featherstone determined if the local industry could produce cattle with added costs of less than $67.50 per head and swine for less than $20.25 added cost per head, the industry could compete and become viable. In order for these figures to be valid all added costs associated with producing and processing livestock in Alaska had to be analyzed. Each species was then analyzed for what extra costs would be needed in Alaska.

The cattle industry was divided into four sections or phases to determine added costs for the industry. Each phase was then subdivided into weather, labor, and technological related added costs for the industry in Alaska. The sum of all costs for the different phases was found to be $41.95 per head which was less than the transportation costs of $67.50. The difference of $25.55 leaves more than an adequate margin for deeming the industry potentially economically viable.

The swine industry was only divided into two phases — the production and processing phases. Each area was subdivided into the relevent costs and they totaled $12.77 per head. The transportation factor being $20.25 left an advantage to the local industry of $7.48 perhead, which appears adequate.

The industry having been found to be economically viable, the development of the industry within those added cost perimeters was described. It was determined that the cattle industry and swine industry should be built to handle 50% of the market needs of the rail belt. Such a sized industry would need 26,250 head of cattle and 70,000 head of swine per year, which would be large enough to make a single processing facility with dual kill floors feasible. These figures were used to size the producing segments of the industry.

The beef industry needs 70% of its animals feed lot finished and 30% for manufacturing or hamburger purposes. The 30% will be produced from cull dairy animals and cull beef breeding stock which are by-products of their industries. The 70% amounted to needing a beef herd of 20,000 cows. After comparing investment needs, operating costs, and labor needs of various size cow-calf operations, it was determined the average size best suited to Alaska was 750 head per operation. The industry would require 27 such operations. Because of the variations in climate within the state of Alaska it was recommended that the cow herd be divided between four areas of the state to reduce problems. Eight areas were identified as having potential for such operations.

Through the use of silage and pasture feeding, Featherstone determined four acres would be needed to support each cow-calf unit. As a result the industry would require 80,000 acres for such operations. The breeding stock recommended was Herefords, Angus, Short Horns, and crosses of these breeds. Due to the expense and handling problems, only half of the herd needs to be shipped to Alaska and that half would produce the other half. A variety of ages was also recommended to prevent problems. The total cost of a cow-calf operation with land, breeding stock, feed handling equipment, and general facilities was found to be $2,145,000.

The growing operation was dealt with briefly due to that phase being the simplest. Three types of potential operators for this phase were discussed, cow-calf operators, barley farmers, and feed lot operators, each requiring little management or capital input. The total investment needs for this phase were put at $6,100,000.

For the feed lot operations Featherstone recommends two 5,000 head lots be constructed with a continuous self flushing waste removal system. A simple feed mill system using high moisture barley and mixing trucks were found to be as cost efficient and as maintenance free a system as possible which is desirable for Alaska's purposes. Even though the feed lot is smaller by Lower 48 standards and the feed mill is simple, the management requirements were deemed critical. The basic feed lot management techniques must be combined with diplomatic abilities to handle such a job in a new area like Alaska in order to be successful. The investment requirements for each feed lot was figured to be $2,398,000 and it was recommended one good manager could oversee the operations of both lots.

The last recommendation for the cattle industry was for improved experimental facilities at the University of Alaska. The best such facility would be a model cow-calf operation with a small feed lot attached. The benefits and the revenue from such an operation could not be estimated but to Featherstone it seemed invaluable to a the industry in the long term.

To accomplish the development of a cattle industry in the shortest possible time, a schedule by calendar quarters was developed. The key element to promoting the industry is the processing facility and it was determined such a facility could some on stream the third quarter of 1983. In order to meet such a schedule and have animals available to slaughter, positive steps had to be taken in the second quarter of 1981.

The swine industry sized to produce 70,000 animals per year was developed using 144 sow confined farrow to finishing operations. Each unit produces 2,500 pigs per year so it was determined 28 such operations were needed in the grain producing sections of the state. Featherstone recommended twelve (12) units being in Nenana, twelve (12) in Delta, and four (4) in Fairbanks to allow supplying feed mills large enough demands to gain adequate economics of scale. The confined farrow to finishing units described in the report have six buildings each with special requirements and construction techniques to provide the most efficient growing techniques feasible in Alaska. The specialization described even included a day by day work schedule for the week required to operate such a unit which can be done by a "Mom and Pop" farm family.

The feed requirement of swine was found to be just as specific as the unit's design. Each unit will need 2,100,000 lbs. of total rations which will contain 892.5 tons of high moisture grain. The different rations for the different growth and development phases of swine required a feed mill capable of handling a variety of components. The feed mill will need to produce 206 tons of ration per week for twelve units to be kept in feed.

The breeding stock for a 144 sow unit should include 15 boars and all of the breeding animals should be selected carefully for proper genetic characteristics. The production of these breeding animals should be done in specialized 144 sow units operated by pig breeding specialists trained in the Lower 48 to maintain the needed genetic quality.

Because of the specialization and level of management required in these confined units little of a veterinarians service should be required. Featherstone did however recommend the Univeristy of Alaska operate one of the confined units as a research and teaching facility. After the initial investment in such a facility with the proper staff, it could be almost self supporting and at the same time be responsible for more of the growth of the industry than any other facet.

The investment needs of the swine industry were determined to be as follows:

Confined Units	$12,600,000
Breeding Stock	1,864,800
Feed Mill & Equipment	2,076,000

A time schedule is laid out on the same basis as the beef industry heading toward animals produced in time for a processing plant to be opened in the third quarter of 1983. Units in areas already cleared like Delta would be on schedule but units on lands that have to be sold and cleared like Nenana would be ready within 9 months with animals for the processing facility.

As mentioned earlier a processing plant is seen as critical to the development of the livestock industry. The construction of a proper facility would promote this private sector of the economy faster than any other single investment. To make this investment economically viable both cattle and swine should be processed in the same plant to improve the by-product recovery income, utilization of labor during start up, and reduce managerial overhead. The plant should be located near the animals to reduce transportation costs and it should be owned by a cooperative venture to promote participation and growth in the producing segment of the industry.

The kill floors for each species is described with major operations detailed with the carcasses from each specie in their own coolers. The various cuts made from the carcass for different mechandizing techniques, however, are performed in a common cooler. To improve profitability Featherstone has described in the processing plant a cured meats operation, and a lunch meat manufacturing operation. The increased investment in such operations pays excellent dividends since these products have greater margins than carcass meat.

The sales of meat products should be to all of the different markets of Alaska in order to capture 50% of the total market. Featherstone calculated if the military market and 75% of the hotel, restaurant, and institutional market is sold only 22% of the retail market will be needed to obtain 50% of the total market. The military and HRI markets should be emphasized since they are not brand conscious and are more receptive to new suppliers.

The cost of a processing facility that can handle the needed number of animals and supply the various markets required was determined to be $3,517,900. The design, engineering, and construction period was determined to be 24 months on a fast track basis and 34 months on a conventional building basis. Even though the fast track method may increase the cost, to have a plant on stream 10 to 12 months sooner may have a positive psychological benefit worth the price.

One of the necessary criteria to make the economic analysis valid using transportation costs as a basis to determine viability, is that the industry must be as independent as possible. The development described is of an adequate size that few infrastructural needs outside of Alaska will be required. After the initial machinery is installed, the only needs of the industry should be medical supplies, vitamin mineral premix, and a hide market. Featherstone identified adequate in state infrastructural support for the industry in veterinarians, by-product markets, protein supplements, supplies and miscellaneous maintenance requirements. The in-state infrastructural needs however should not be very great if proper supervision is given to the machinery in the producing and processing segments of the industry.

The bottom line figure for the whole industry that many readers are concerned with is almost $90,000,000 with land for cattle included and $60,000,000 without the land. By some accounting methods some additional costs may be considered. In the above figures are no working capital beyond the initial breeding stock and no monies for utilities which can be purchased from public companies. The working capital cost for the livestock industry for the most part is owed to another segment of the industry and on an industry-wide basis appears to duplicate entries. Also to determine the amount of such working capital now, would be useless since the value of agricultural products would have to be priced on a world basis which fluctuates greatly from year to year. The majority of such investment would be two and three years from now and the working capital needs could vary greatly in that time.

Legislation to implement the industry was found already in existence for the Delta projects and Point MacKenzie project. Featherstone found no need to change what has been found needed for these projects. What was recommended however was on a long term industry incentive type legislation. Extended price supports, improved research facilities, funding, and staffing, and the creation of a Department of Agriculture with its own Commissioner where the main legislative changes recommended. None of these recommendations will impact the start up but will greatly effect the long run development of the livestock industry and whether it becomes self sufficient or always dependent on the Lower 48.

In piecing the whole industry together the economic benefits derived by the state appear to make the investment and effort very worthwhile. The annual payroll will be slightly over $3,000,000 but with the established multiplier effect applied to this payroll the total impact of the industry will be $15,300,000. Additionally the present drain of $27,800,000 of sales and transportation costs to Seattle will be stopped. Even if the cost of meat in the retail shelves is not reduced significantly, the creation of jobs and the improvement of the local economy by the livestock industry will have a great impact. Not only is the state's economy affected but small communities like Nenana will be significantly effected and stabilized economically. Featherstone described how a livestock complex can be developed in Nenana which is the most feasible opportunity for economical development of the area that could otherwise be wasted by the state. As will be noticed in this report, the industry is very complex and intertwined. Rural communities best development chances are with agriculture. The livestock segment of agriculture is an excellent opportunity for these rural areas to supply a product which is sorely needed by the Alaskan economy. An investment in livestock is an excellent one for the state and for rural areas.

SECTION I

OVERVIEW OF THE LIVESTOCK INDUSTRY IN THE LOWER 48

Featherstone Corp. realizes many reacers of this report have little, if any, background in the livestock industry. For this reason, a very general overview of the industry has been written to try and familiarize the average reader with what happens when and where with cattle and swine.

A. The Cattle Industry

Classifications of Cattle

Bull — Male animal

Cow — Female that has had a calf.

Heifer — Female that has not had a calf.

Steer — Castrated male.

Feeder Calf — Calf that is weaned from the cow.

Fat Cattle — Calves that are ready for slaughter.

A cow is considered to be one producing unit. This unit in a year's time must produce and wean a calf. The cow is very much like a small factory in the way she works. She takes roughages like grass, clover and alfalfa and converts it into red meat. Most of the land that is used to produce beef is suited only for this purpose. The land is usually rough, might have low fertility or limited rainfall. The ground described, if it was row cropped, would be ruined in just a few years and would be considered waste land incapable of growing anything. Having a feed supply for cattle is important. One must know how much feed you will need to feed during the winter months.

The main time cows are fed is during the winter months when the pastures have quit growing and been grazed off. A cow on the average will need 2 lbs. of hay per 100 lbs. of weight. This will, of course, vary with weather conditions and the state of the cow. If you had a 1000 lb. cow and you fed 2 lbs. of hay per 100 lbs. of body weight for 180 days it would take 3,600 lbs. of hay. Pasture is another important feed source.

Pasture feeding is just turning the cow out to eat grass or whatever is growing on the land. The carrying capacity of the land varies from 2 acres to 100 acres per cow. This, of course, depends on weather conditions and fertility of the ground.

It doesn't matter whether the cows are eating hay or pasture, they must have water and minerals on a free choice basis. Cows are very good at balancing their mineral needs themselves. A cow will do a good job of eating but in return she must raise a calf and wean it.

The cows reproductive system operates very much like the humans. The cow will come into heat every 21 days on the average until she is bred. When the cow is bred she will carry the calf for about nine months and then give birth. During that nine months there are diseases that can cause the fetus to die during pregnancy. The fetus can be re-absorbed by the cow's body or the calf will be born dead. In the last three months of pregnancy the nutritional needs of the cow changes.

The nutritional level of the cow goes up in the last three months of pregnancy because the calf's body will increase in size by at least 50%. The calf will be taking nutrients from the cow's body. The cow's system is stressed at this time. If the proper feed and minerals are not fed at this time the cow will break down her body tissue to feed her developing calf. She will break down muscle and fat tissue to provide energy for her calf. She will take the calcium from her bones to develop the bones of the calf. This process is called Ketoeises or pregnancy disease.

After the calf has been in the cow for about nine months it is ready to be born. Generally when a cow is ready to have a calf she will get off by herself to have the calf. Cows will generally have their calves in the early morning hours or in the evening hours. It is best to check the cows twice a day, once in the morning and evening. If a cow is getting ready to have a calf, check her every hour until she has had the calf. The cow will have a water bag appear just before she has the calf. The cow should have the calf within two hours after the water bag has appeared. The size of the calf will vary with the breed, but the weight range is from 60 to 120 lbs. at birth. If the cow is having trouble having the calf, you need to either examine the calf and cow or call the veterinarian. The calf can live from 6 to 12 hours inside the cow after the water bag has appeared.

The calf is now ready to spend seven months with the cow until he is weaned. The cow's milk for the first month of the calf's life is the main source of his food. The cow's nutritional needs is very high at this time because she has to produce milk for her calf and maintain her body at the same time. For a calf to grow and reach a high weaning weight the cow must be able to produce the milk for the calf. If a cow is a poor milker her calf will be poor doing and have a low weaning weight. If a cow is a poor milker the cow should be culled because it takes just as much feed to feed a good cow as it does a bad one. After the calf is a month old he will start to eat hay and any other type of feed.

A calf will get natural immunity to many diseases for the first three months of the calf's life from the cow's milk. But after 3 months of age the milk is becoming less and less part of his diet, so the calf's immunity has to be brought back up by a vaccination program. The best way to set up a vaccinating pro-

gram is to talk to your veterinarian. Usually at the time of vaccination the bull calves are casterated and made into steer calves.

Some people creep feed their calves while they are still nursing the cow. The calves will be heavier and will be easier to start on feed than those that weren't, but creep feeding is an additional cost. A person must take under consideration the cost of the feed to put on a pound of gain on the calf in comparison to the price per pound for the calf. The calf at weaning time should be some where around 7 months of age and weigh 350 to 500 lbs. The calf is now ready to enter another phase of his life.

When a calf is weaned from the cow he is called a feeder calf. The feeder calf is started out on a growing ration that is high in roughages and low in grain. The calf will be on a growing ration for about 3 to 5 months or until they weight about 700 to 800 lbs. Then the calf is started on a finishing ration.

The finishing ration is a ration that is high in energy but low in crude fiber. A finishing calf will on the average have an 8 to 1 feed conversion (8 lbs. of feed to put on a pound of gain). A calf should finish out from 1,000 to 1,200 lbs. A calf should finish out in about 100 days with the calf gaining about 3 lbs. a day. The calf is now ready to be marketed.

To market a fat calf you can either take the calf to an auction or have a cattle buyer come out to your feed lot and bid on your animals. After the animal is bought he is ready to start a journey through the slaughter house.

The United States Department of Agriculture (USDA) dictates how an animal should be slaughtered and what types of facilities that can be used. But any way the calf is fasted over night to reduce the rumen contents. The animal is then stunned and bled, then hung by his hind legs on an overhead rail system. The next thing to happen is the hide is removed. Now the chest cavity is split open to allow evisceration of the animal. The "H" bone in the rear end is split to start the evisceration. The stomach is opened to allow the viscera and pluck to fall out. The animal is then split into 2 halves down the back bone. The carcass is then shrouded. Shrouding is putting a sheet over the carcass to absorb any blood on the carcass and to spread the fat out more evenly. The carcass is put into the cooler to chill and be graded.

The beef carcass has two different grades. They are quality and yield grade. The quality grade is based on the amount of fat and marbling that is present in the meat (marbling is fat streaks in the meat). The quality grades are based mainly on four factors.

1. Class or kind of meat.
2. Sex classification (if applicable).
3. Maturity.
4. Marbling and firmness of rib eye muscle.

There are five quality grades. They are: Prime, Choice, Good, Standard, and Utility. Prime has the highest amount of marbling and fat. On the other hand Utility has hardly any marbling or fat.

The second grade used on beef cattle is yield grade. Yield grade is based on the yield of boneless, closely trimmed retail cuts from the round, loin, rib, and chuck in comparison to the warm carcass weight. There are four charateristics used to help determine the yield grade.

1. The amount of external fat.
2. Amount of kidney, pelvic and heart fat.
3. The area of the rib eye muscle.
4. Warm carcass weight.

There are five yield grades numbered 1 through 5. Yield grade 1 has the highest degree of cutability with Yield grade 5 having the lowest degree of cutability. So higher the Yield grade the more meat you will have from the carcass.

The head is worked up by removing the tongue, and cheek meat. Then the head is opened and the brain is removed. The hide is salted and sent to a tanner. The hide can be made into shoes, clothes, and gloves. The Viscera has several parts that are specialty foods. The pauch and reticulum are two parts of the stomach that are saved for food and are called tripe. The lungs and heart are called pluck and are served as food. The bile salt from the liver is used as a drug for liver patients. Insulin from the pancreas is saved for people that have diabetes. The rumen contents are dried and sold as feed additives. The blood can be dried and used as protein source.

The carcass is ready to be broken down further. Beef that is used in restaurants is cut into serving portions before they get it.

Beef going to retail outlets is sent in one of four ways: Half carcass, quartered carcass (fore or hindquarter), primal cuts (see 8 primal cuts on Beef Chart), or fabricated (primals that are defatted and partially or totally deboned). Fabricated beef has become very popular recently because of labor efficiencies and reduced weight in shipping to the store.

After a store gets the meat they have to merchandise it. Meat does not have a very long shelf life. Store owners want to sell the meat as quickly as possible, so they only cut enough meat to meet each day's demand. They wrap the meat in plastic wrap to help maintain the color of the meat. Then the product is put in display cases to keep the best color of the meat.

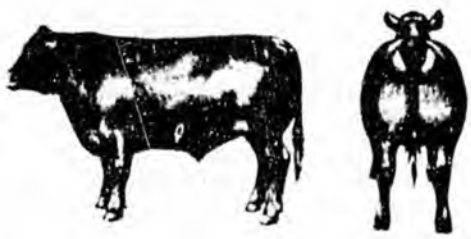
TABLE 1-A

SLAUGHTER STEERS

U.S. GRADES

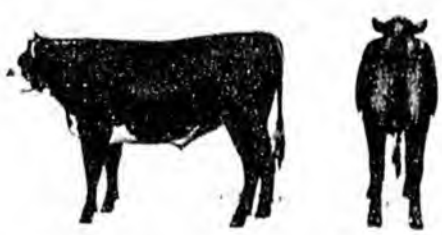
(QUALITY)

PRIME —



CHOICE —

GOOD —



STANDARD —

UTILITY —

COMMERCIAL, CUTTER, AND CANNER GRADES ARE OMITTED

COPIES OF THE OFFICIAL UNITED STATES STANDARDS FOR GRADES ARE AVAILABLE ON REQUEST

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
LIVESTOCK DIVISION
WASHINGTON, D.C.

AUGUST 1969

TABLE 1-B

SLAUGHTER STEERS

U.S. GRADES

(YIELD)

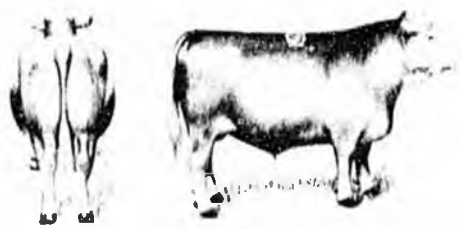
YIELD GRADE 1 —

YIELD GRADE 2 —

YIELD GRADE 3 —

YIELD GRADE 4 —

YIELD GRADE 5 —



COPIES OF THE OFFICIAL UNITED STATES STANDARDS FOR GRADE ARE AVAILABLE ON REQUEST

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
LIVESTOCK DIVISION
WASHINGTON, D.C.

AUGUST 1969

TABLE 1-C

BEEF CHART

Wholesale and Retail Cuts

Numerals in circles ◯ refer to wholesale cuts and major subdivisions of such cuts. Letters refer to retail cuts.

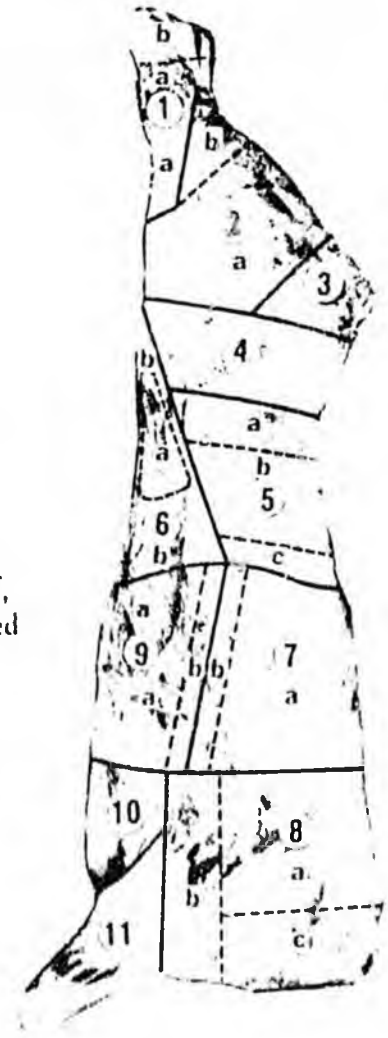
(1) HIND SHANK
a. Soup bones
b. Hock

(6) FLANK
a. Flank steak
b. Stew or ground beef

(9) PLATE
a. Stew, ground beef, or boned and rolled pot roasts
b. Short ribs

(10) BRISKET
Stew or boned and rolled pot roasts

(11) FORE SHANK
Soup bones or ground beef



(2) ROUND
a. Round steaks or roasts
b. Pot roast

(3) RUMP
Roasts or steaks

(4) LOIN END
Sirloin steaks or roasts

(5) SHORT LOIN
a. Porterhouse steaks
b. T-bone steaks
c. Club or Delmonico steaks

(7) RIB
a. Rib roasts or steaks
b. Short ribs

(8) CHUCK
a. Chuck rib roasts or steaks
b. Arm pot roasts or steaks
c. Stew or ground beef

YIELDS OF WHOLESALE CUTS AND SUBDIVISIONS

Percentage of Carcass Weight

(1) to (6) HINDQUARTER	48.0%
(1) to (3) Round and Rump	24.0%
(1) Hind Shank	4.0%
(2) Buttock	15.5
(3) Rump	4.5
(4) and (5) Full loin inc. suet.	20.5
(4) Loin end	9.0
(5) Short loin	8.0
Kidney Knob	3.5
(6) Flank	3.5

(7) to (11) FOREQUARTER	52.0%
(7) Rib	9.5%
(8) Chuck	24.5
(9) Plate	8.0
(10) Brisket	6.0
(11) Fore shank	4.0

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B. The Swine Industry

Swine is a monogastric animal, which means they have a single stomach very much like man's. Hogs have to have a high energy feed that is low in fiber. The main feed source for swine is feed grains like corn, barley, wheat, milo, and oats in the midwest. Swine need a protein supplement to finish balancing the ration for amino acids that the grain is lacking. The protein supplement is made from soybeans or other protein rich material like rapeseed or fish meal. For a hog producer to survive he must have producing sows.

Each producing female is considered a unit. A sow is a female hog that has had pigs. A gilt is a female hog that has not had pigs. The boar is the male hog. One sow should have two litters of pigs per year. She should wean at least eight pigs per litter to pay for the cost of feed, labor, and facilities to care for her. The gestation period for sows is about 112 days after she has been bred. If she is not bred the first time she will come back into heat every 21 days until she is bred. The sow has a reproductive tract that is especially designed for having at least eight pigs at each farrowing.

The sows reproductive system is one of the most efficient. Once the sow is bred, her system changes to support the fetal pigs.

During the first 74 days of gestation the sow will be fed 5-6 lbs. of 12% ration (12% means the ration has 12% protein). The last 38 days the protein level of the feed will need to be raised to 14% and the quantity of the feed raises to eight lbs. You raise the proteins level and feed level because the fetal pigs will put on 70% of their body weight in this last period. A week before the sow farrows she should be fed a ration that is high in bulk and is a laxative. Oats are the best feed for this purpose. Three days before she farrows the sow should be moved into the farrowing house. One day before she farrows she should be given only water. The day she farrows she should be given only water, then she should be started back on feed gradually.

The temperature for the pigs needs to be 90° F. on the floor where the pigs are. The best way to obtain this is heat from the floor. The two most common ways to obtain this is either with heat boards or with heat in the floor. You should farrow the sows in farrowing crates. The crates provide a place for the pigs to get away from the sow. It is cheaper to heat the floor than try to maintain the air temperature at 90°F. inside a farrowing house. The pigs are a fast growing animal but they must have care to reach market profitable.

The six weeks that the pigs are on the sow is the cheapest gain you can have. Baby pigs are born deficient in iron. If the pigs are born on dirt they don't need additional iron but if they are born where they cannot get to dirt they will need iron. They can be given iron through injection or by feed. Little pigs start eating within one week of age, so feed should be in front of them two days after birth. To start pigs on feed you need a sweet feed (high in sugar) to get them started quicker on feed. This feed should be medicated (medicated feed has some type of antibiotic to fight diseases and viruses). The pig starter feed is sweet and also high in protein.

The high protein level is needed because the pigs are growing at a very rapid rate. The protein level is between 18-20%. When the pigs reach 5 lbs. the protein level is reduced to 16%. By the time the pigs are six weeks of age they should weigh 25-30 lbs. and they are ready to be weaned from the sow. When the pigs are weaned they are vaccinated for eraspilas. It is a very common and contagious disease in hogs.

When the pigs are a few days old the male pigs are castrated. Male pigs are called boars but after they are castrated they are called barrows. Pigs at weaning are called feeder pigs because they are ready to be put onto a feeding floor.

Feeder pigs are fed a 14 to 16% hog ration. The hog will take about four months to finish out. The ideal weight for a fat hog is 210 lbs. When the fat hogs have reached the desirable weight you now have to make the decision of how you will sell the animals. You have four ways to sell your hogs. They are auction, buying stations, direct buying and grade and yield.

Auction is one of the most common ways to sell hogs. You take the hogs to a sale barn. Then the hogs are put through a sale arena where livestock buyers bid on the animals. Whoever has the highest bid gets the hogs.

Buying stations are stations that are set up in the country by slaughter companies. These stations buy hogs on the bases of that day's hog market at the terminal markets. The price they pay for the hogs usually allows for transportation cost and the cost to operate the facility.

Direct buying you take the hog to the slaughter house. They buy the hogs and run them directly into the slaughter plant.

Grade and yield is a fairly new concept in selling hogs. You take the hogs to the slaughter house. The animals are slaughtered and the dressing per cent of the four lean cuts to the amount of fat is determined. The four lean cuts are the ham, loin, picnics, and boston butts. If a person has a heavy muscled animal you will get more money per pound of pork.

The United States Department of Agriculture (USDA) has set standards for grading fat hogs. The system is set upon the bases of the yield of the four lean cuts in comparison to the chilled carcass weight. The grades are set up by numbers with U.S. #1 being the best and U.S. #4 being the worst. Here is the chart with the percent of the four lean cuts to make each grade:

Grade	Yield
U.S. No. 1	53% and over
U.S. No. 2	50 to 52.9%
U.S. No. 3	47 to 49.9%
U.S. No. 4	Less than 47%

These grades were set up so there is a standard way of grading hogs and when a person says a No. 1 hog you know what they are talking about. The hogs are now ready to start their journey through the slaughter house.

The hogs are fasted over night before they are slaughtered. This allows the stomach to empty out so there is less stomach material to handle. The pigs are run into a narrow alley where they are stunned. The hogs jugular vein in the throat, is cut so the hog can bleed. Then the hogs hind legs are shackled and hung upside down on a conveyor chain. The hog can either be dehaired or skinned. The animal is ready to be eviscerated.

The chest is split open and then the belly is opened to allow the viscera to come out. Then the head is removed. The hog is then split in half down the backbone. The carcass is put into the chill room for 24 hours. In that time the temperature of the carcass is brought down to 35°F.

The head and viscera must be worked up separately. The head is put onto another line where the tongue, brain and snout are removed as specialty items to be sold in stores or restaurants. The viscera is broken down with the heart, lungs, liver, stomach, and intestines are separated out and made ready for resale. The heart, lungs and liver are sold either to restaurants or stores. The intestines can be used for casings for lunchmeat or sausage.

The carcass, after chilling, is ready to be cut into salable cuts or to be cured. The carcass goes through 12 steps of cutting.

After the hog has been broken down into the separate portions they are ready to be shipped or cured.

The hams, bellies, and sometimes front shoulders are moved into the curing department where they are injected with a pickling solution. The next step for the meat is the smoking. The meat that is smoked must be heated to an internal temperature of 137°F. or 150°F. if it is to be ready to eat. The larger cuts like hams take 8 to 12 hours to smoke with the smaller cuts taking less time.

Sausage is made from meat and fat from hogs. The meat and fat are chopped or ground up into small particles. The meat is now a jelly like substance called emulsion. Spices are then added to the emulsion and mixed. The emulsion is now ready to be stuffed into casings. The type of casings vary from edible to synthetic casings. Some sausages are ready to be sold but others need to be cooked in order to finish the process.

Some of the by-products from the hogs are turned into money. The blood from the hog is dried and is used as a protein source in dog and hog feeds. The fat from hogs is rendered into lard that is used for cooking. The skin can be used for footballs or dressings for burn victims to prevent them from dehydrating. The stomach contents can be dryed and used as feed for animals. So, the only part of the hog that is not used is the squeal, but give them time.

TABLE 2-A

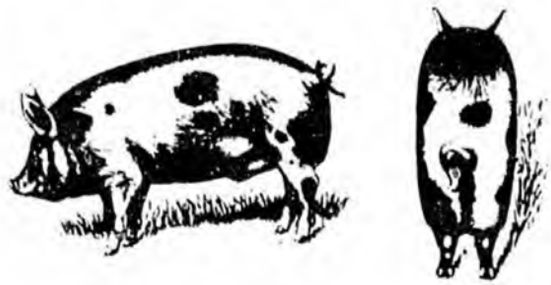
SLAUGHTER SWINE

U.S. GRADES

U.S. NO.1

U.S. NO.2

U.S. NO.3



U.S. NO.4

U.S. UTILITY

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
LIVESTOCK DIVISION
WASHINGTON, D.C.

COPIES OF THE OFFICIAL UNITED STATES STANDARDS FOR GRADE ARE AVAILABLE ON REQUEST

NOVEMBER 1969

TABLE 2-B

PORK CHART

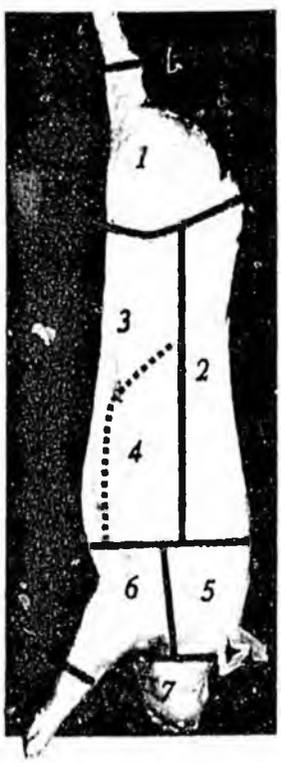
Wholesale and Retail* Cuts

1 HAM
- a. Butt end or half
- b. Shank end or half
- c. Center slices

3 BELLY

4 SPARERIBS

6 PICNIC
- a. Picnic roasts
- b. Arm steaks



2 LOIN
- a. Loin chops
- b. Rib chops
- c. Loin and rib roasts
- d. Canadian Style bacon

5 BOSTON BUTT
- a. Boston butt roast
- b. Blade steaks

7 JOWL
- a. Jowl bacon square

*Only some of the more common retail cuts are listed
Numerals refer to wholesale cuts. Letters refer to retail cuts.

EXPECTED YIELDS OF CUTS

Percentage of Carcass Weight

1. Ham**	19.8	6. Picnic**	8.3
2. Loin**	16.7	7. Jowl	2.8
3. Belly	14.6	8. Lean Trim**	5.7
4. Spareribs**	3.4	9. Fat	16.4
5. Boston Butt**	6.7	10. Miscellaneous**	5.6

The expected yields shown above are an average for the U.S. No 2 grade. Yields for the cuts identified by ** would be higher for the No. 1 grade, lower for No. 3, and still lower for No. 4.

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
LIVESTOCK DIVISION
WASHINGTON, D.C.
1968

SECTION II

GENERAL ECONOMIC RATIONAL TO PROVE VIABILITY

It has been estimated that 98% of all meat consumed in Alaska is brought in from the Lower 48. The product arrives by barge and airplane and shipped intrastate by rail or truck to a central distribution point. If an Alaskan based meat processing facility produced that same product for distribution, that facility would serve as a central distribution point. Consequently, if the Alaskan facility can produce product ready for distribution for the same or less price than the present central distribution facility receives the product, the Alaskan facility can compete. In order for the Alaskan facility to produce that product it must purchase livestock and process that livestock and the resulting by-products for prices that permit suppliers to make a profit. The same logic holds true for the livestock producer to sell his animals, he must be able to buy his needed inputs at a price that permits his suppliers to make a fair profit.

The meat industry in the Lower 48 has existed since the advent of refrigerated rail cars in 1865. In that 115 year period the industry has developed to the point where American consumers spend the largest share of their food dollar on meat as compared to any other foodstuff. Over the years different segments of that industry have had good years and bad years but in the long run has survived and is presently viable.

If it is assumed that Alaskans respond to marketing and economic stimuli in the same manner as people in the Lower 48 and if an Alaskan processing facility can produce meat products for the same price as the central distribution facility presently receives that product, the livestock industry of Alaska would be considered economically viable. By thinking this way, one sees that the local Alaskan processor to be viable must have no greater additional costs to produce product than the transportation costs from Seattle to Alaska.

This consideration is only true if certain factors hold true. The first factor is the quality factor of the product. The local industry must produce the same quality product that the market presently demands. The second factor is that the local industry must consider all facets that are different from the Lower 48. The two biggest differences that must be considered is the cold climate and the relatively small market size. The third factor to consider is that the local industry must be a complete miccrocosm that needs little from the Lower 48. The more outside suppliers or buyers that are needed in order to compete, the more variables exist in determining viability, and the more chance for long run failure. The more world market pressures are reduced on the Alaskan livestock industry, the transportation factor to determine viability increases in validity.

To determine that transportation costs the six of the major retailers (Safeway, Market Basket, Foodland, McPeaks Badger, Northland Hub, and Quality Meat Co.) of Alaska were contacted. The stated cost ranged from $12.00 per hundred weight (cwt.) to $19.00 per cwt., with air fresh product costing $36.00 per cwt. An average for all meat products from all the stores was found to be $15.00 per cwt. In order to make this figure valid for the whole livestock industry the hundred weight costs should be converted into per head costs for consistency. To find per head costs the transportation charges can only be assessed to what is shipped to Alaska. The by-products, bones, and trimmings are removed in the Lower 48 resulting in only 450 lbs. per beef animal and 136 lbs. per swine being shipped to Alaska.

Calculation of Shipping Weights

	Beef	Pork
Live Weight	1,000 Lbs.	220 Lbs.
Dressing (Carcass) Percentage	60%	62%
Dressed Weight	600 Lbs.	136 Lbs.
Fabricating Percentage	73%	——
Delivered to Store	450 Lbs.	136 Lbs.

The resulting weights are multiplied times $15.00 per cwt. to give transportation costs per head of $67.50 for beef and $20.40 for pork. If the added costs of raising and processing these animals in Alaska is less than these figures the industry is considered to be as viable as the industry is in the Lower 48.

Before looking at each species to determine viability, the validity of this method of proof should be discussed. In a normal economy, transportation costs or advantages of one plant within an industry are considered to be short term and not valid for a long run decision. In Alaska, however, there is no competing domestic industry and transportation advantages of the local plant become long term. If competition between domestic plants should occur both would have the same costs (or disadvantages) and the same advantages compared to the present system of shipping product.

In a practical sense one must realize with increasing energy costs transportation costs are going to increase making the $67.50 and $20.40 advantage per head increase. Relatively little will have to be shipped from the Lower 48 to supply this industry and relatively little will have to be shipped to (or be consumed by) the Lower 48. To repeat, the more complete the microcosm of the livestock industry, the more valid the transportation advantage becomes in proving economic viability. Featherstone will attempt to develop (on paper) as complete a microcosm as possible considering the relatively small market existing in Alaska. In the following two sections of this report the economic proof for each species will be developed. Only the economic factors that increase or decrease costs because of Alaskan conditions will be discussed. The total development of the industry will be discussed in detail in subsequent sections.

SECTION III

DETERMINATION OF ECONOMIC VIABILITY OF A CATTLE INDUSTRY

The cattle industry in Alaska is a long term industry that has an economic cycle of approximately 10 years compared to 4 to 5 year swine cycle. Generally the long term nature of this industry has caused high inventory costs with lower margins but a more stable long demand has been created. Because of this long term low profit nature many new innovative techniques have been developed recently by the beef industry. Fabrication, improved by-product recovery, manure utilization, and increased size of diversified segments are some of the more significant innovations. All of these highly capital intensive techniques, however, have reduced the cost of processing and distributing beef by only $5.00 to $6.00 per cwt.[1] This fact highlights the extremely high cost by relationship that Alaskans are experiencing by having to pay $15.00 per cwt. for transportation costs.

Another interesting point is that even without these new modern techniques, smaller, older operations without some of these innovations have been able to overcome this relatively small cost advantage with good service and marketing techniques. Without the high costs of pioneering these innovations, Alaska's beef industry can start up using most of these techniques and have the advantage of the lower transportation costs and the better service of a small local operation. By starting the industry from almost the beginning Alaska even with its small market place should be able to take advantage of many techniques to make production costs relatively the same as in the Lower 48. In this section Featherstone will discuss only those techniques of the industry that Alaskans cannot use that will increase costs.

To determine total added costs experienced in Alaska in the beef industry Featherstone has broken those costs down into the following factors: weather related costs, labor related costs and technological and transportation related costs (as discussed previously above) that are applicable because of having a small market. Each of the four (4) phases of the beef industry (cow-calf phase, growing phase, finishing phase, and processing phase) will be reviewed using these costs areas. The total of these cost differentials (cost differentials will be established using the North Central and North Western sections of the Lower 48 as a base figure) on a per head basis must be less than the $67.50 transportation cost in order for the industry to be deemed viable.

A. Cow Calf Phase (Animal Weight Birth to 350 lbs.)

1. Weather related costs

Featherstone has not been able to find any significant cost differential in this area. The reader may want to refer to Table #3 related to the total cost of raising a feeder calf was $123.55 per cwt. Featherstone believes this cost will hold true for Alaska even with the increased costs of winter feeding on account of the efficiency of feed production due to the longer days and lower elevation of Alaska. Without improved pasture management techniques developed in the Lower 48, the Tanana Valley, Matanuska Valley, and the Kenai Penninsula areas have produced on an acre basis more hay and silage tonnage than is experienced in northwest sections of the Lower 48. This phenomenon is attributed to the fact that the Alaskan areas are lower in elevation and have more daylight hours. The increased feedstuff production Featherstone feels more than offsets the costs needed to winter cow herds in Alaska for an additional one month compared to the north central area.

The only other weather related costs that may be considered is the affect winter will have on the calf crop percentage. After talking to animal husbandry people in the Lower 48 and a few ranchers in Alaska now producing calves, Featherstone feels with good management the calf crop percentage should not differ from those experienced in the northern tier of the Lower 48.

2. Labor Related Costs

The average amount of outside hired labor shown in Table 3 is 0.91 hours which is figured into the charts at federal minimum wages. For practical purposes the minimum wage in Alaska is twice the federal standard. This doubling will increase the cost of the calf $1.00 per cwt. or $3.50 per head. The wages shown for the operator and family labor have not been increased on account of the technology discussed in the next paragraph.

[1] William F. Williams, "The Changing Structure of the Beef Packing Industry," TAMA, Inc., Lubbock, Texas. In "Small Business Problems in Marketing of Meat and Other Commodities, Part 4, Changing Structure of the Beef Packing Industry," hearings before the Subcommittee on SBA and SBIC Authority and General Small Business Problems of the Committee on Small Business, House of Representatives, Washington, D.C., June 25 and 26, 1979, pp. 68-69.

3. Technological and Transportation Costs

Most of the farm labor done by the operator and family members is related to harvesting of feedstuffs and winter feeding periods. Featherstone feels any increase in these labor costs will be offset by the use of modern silage and haylage techniques discussed in Section V. No present cow-calf enterprises in the Lower 48 has the advantage an Alaskan enterprise will have of starting with modern equipment. In the Lower 48 operators have inherited equipment with the enterprise or owned it for several years with only a few new pieces of equipment. With financing terms available to these operators similar to those afforded Delta barley farmers, these technilogically advanced pieces of equipment will be used to reduce on farm labor. Similarly, these financing arrangements should keep these operators interest charges similar to those shown for the Lower 48.

Once the cow herd is established in Alaska there will be no additional transportation costs for operating a cow-calf herd. Featherstone feels that the one time shipment of the "Grandparent" herd to Alaska should be considered a state investment and that cost should not be depreciated or costed out over the future life of the industry. The only applicable transportation cost would be for the feed supplement shipped from the Lower 48. Each cow-calf unit should consume 72 lbs. per year and shipping cost should be $8.00 per cwt. making the per head cost $5.76.

B. Growing Phase (Animal Weight, 350 to 750 lbs.)

1. Weather related costs

This segment of industry produces the cheapest weight gain at the lowest labor cost of the total industry. At this stage the animal is rapidly growing bone and muscle tissue, and is relatively self-sufficient. The 400 lbs weight gain is accomplished in 140 to 180 days on roughage feed, minerals, vitamins, salt and a very small amount of grain that depends on how fast the gain is desired and market conditions. As described in Section V this gain can be done on pasture or in confinement with silage. Featherstone is recommending that during the hard winter period between December 15th and February 1st, the area's cooperative feed lot should be used or shelter should be provided of some sort to preserve the animals body heat to reduce weight loss. The cost of confinement for cattle will be discussed in part C-1 of this section of the report. Since space should be figured for these feeder calves in the confinement units they must be considered one turn or a 100 day period in the confinement unit. The added cost per head per turnover in the confinement unit for Alaska in C-1 is $4.34/head. Since only one-third of the feeders will need confinement, the cost of $4.34 for the industry should be spread over all of the feeders or $1.45 per head for a yearly average.

2. Labor related costs

Of all phases of the livestock industry the growing phase of the cattle industry is the least labor intensity. Only during periods of winter feeding is any labor required beyond weekly inspections and periodic filling of self-feeders with salt, vitamin, and mineral supplement. The winter feeding costs will be the same as in C-2 of this section which is $1.66 per head per turn of the confined feed operation. This cost again should be spread over all the feeders for an industry average of $0.55.

3. Technological and Transportation Costs

All of the technological aspects of growing feeder cattle that are used in the Lower 48 are usable and feasible in Alaska. No additional costs should be assigned from a technological basis.

The only additional transportation costs should be for the shipment of the salt, mineral, and vitamin supplement from the Lower 48. Each head in this phase should consume 37 lbs. and shipment costs should be $2.96 per head.

C Finishing Phase (Animal Weight, 750 lbs. to market weight)

1. Weather related costs

All additional costs of finishing cattle in Alaska will center around the costs of the confined feeding units. The economics of confined feeding units in the Lower 48 will be proved in Section V to be viable. The additional costs of building in and for Alaska's weather conditions are the only costs that need to be considered. All other costs are the same as in the Lower 48. Corral Industries, Incorporated is the largest builder of confined cattle feeding operations in the world and has the most advanced technology available on the subject. Corral Industries President, Richard Bunger, was contacted regarding additional construction costs of units described in Section V built in Alaska. Mr. Bunger's firm has built a similar unit in Calgary, British Columbia, in Canada and using that as a reference point he extrapolated the additional cost to be $80. to $100. per head of capacity to build an operation in Alaska.

Using $100 as the added cost factor, the interest on that money and the depreciation must be determined to find working cost per head. The operation is designed to turn 3.6 times per year but on a practical basis 3.0 times is more feasible. Using the assumptions and figures from Table A the interest cost is $2.76 and the depreciation cost is $1.67 per head for a total cost of $4.34 per head.

TABLE 3*

COSTS AND RETURNS OF COW-CALF ENTERPRISES, ALL SIZES, NORTH CENTRAL, 1979[1]

(Amount in dollars)

Item[2]	Costs and returns per cow			Costs and returns per hundredweight feedor sold[3]					
				Supplementary enterprise, shortrun[4]		Primary enterprise, shortrun[4]		Primary enterprise, longrun[4]	
	Cash	Non-cash	Total	Cash[5]	Non-cash[5]	Cash[5]	Non-cash[5]	Cash[5]	Non-cash[5]
RETURNS (per cow)									
Feeder calves (1.706 cwt)	150.53		150.53	80.09		80.09		80.09	
Feeder yearlings (1.386 cwt)	96.96		96.96						
Cull cows (1.312 cwt)	67.92		67.92	21.98		21.98		21.98	
Gross returns	315.41		315.41	102.07		102.07		102.07	
DIRECT COSTS (per cow)									
Improved pasture (2.301 acres)	32.53	16.02	48.55	10.53		10.53		10.53	5.18
Small grain pasture (0.017 acre)	.33	.17	.50	.10		.10		.10	.06
Native pasture (1.604 acres)	2.35	2.35	4.70	.76		.76		.76	.76
Hay (1.480 tons)	18.88	14.24	33.12	6.11		6.11		6.11	4.61
Silage (0.581 ton)	4.44	3.63	8.07	1.44		1.44		1.44	1.09
Grain and concentrate (4.025 cwt)	18.30		18.30	5.92		5.92		5.92	
Protein supplements (0.532 cwt)[6]	5.14		5.14	1.66		1.66		1.66	
Salt and minerals (0.719 cwt)	5.96		5.96	1.93		1.93		1.93	
Subtotal, feed	87.93	36.41	124.34	28.45		28.45		28.45	11.78
Veterinary and medicine	4.29		4.29	1.39		1.39		1.39	
Livestock hauling[7]	1.13		1.13	.37		.37		.37	
Marketing[8]	2.30		2.30	.74		.74		.74	
Fuel, lube, and electricity	12.12		12.12	3.92		3.92		3.92	
Machinery and building repair	21.02		21.02	6.80		6.80		6.80	
Subtotal, other production items	40.86		40.86	13.22		13.22		13.22	
Hired labor (0.91 hour)	3.03		3.03	.98		.98		.98	
Interest on operating capital[9]	5.67	2.99	8.66	1.84		1.84		1.84	.97
General farm overhead	8.71		8.71			2.82		2.82	
Total direct costs	146.20	39.40	185.60	44.49		47.31		47.31	12.75
OWNERSHIP COSTS									
Machinery and equipment, RITI[10]	1.18	15.62	16.80			.38		.38	5.06
Buildings and facilities, RITI[10]	2.50	39.21	41.71			.81		.81	12.69
Livestock, RITI[11]		53.56	53.56						17.33
Total ownership costs	3.68	108.39	112.07			1.19		1.19	35.08
OTHER COSTS									
Operator and family labor (12.13 hours)[12]		40.26	40.26				13.03		13.03
Management		23.66	23.66				7.66		7.66
Land taxes	20.18		20.18			6.53		6.53	
Total cash and noncash costs	170.06	211.71	381.77	44.49		55.03	20.69	55.03	68.52
Total nonland costs[13]			381.77	44.49		75.72		123.55	
Returns to land and risk			−66.36					−21.48	

[1]Prices are the averages received or paid by producers. See text for more complete information.

[2]Physical quantities per cow. Where applicable are shown in parentheses.

[3]Sum of returns or designated costs per cow divided by the hundredweight per cow of steer and heifer feeder calves and yearlings sold.

[4]See text for an explanation of the economic character of the enterprise and length of planning period.

[5]Cash costs are the cash outlays for production items, the market values of readily salable items such as grain and taxes, and insurance. Interest on direct expenses is apportioned between cash and noncash costs. Interest on all durable assets is listed as an opportunity cost, assuming full producer equity.

[6]Only the costs of providing fencing and livestock water, if needed to graze crop residues, are charged to the cow calf enterprise. These costs are included in equipment operating and ownership costs.

[7]Costs are for customer hauling only. Producer supplied hauling costs are included in labor and machinery operating and ownership costs.

[8]Marketing costs reflect the extent to which producers utilize direct or farm sales of feeder cattle.

[9]Interest is charged on the cost (or assigned value) of all direct inputs and arbitrarily divided between cash and noncash in proportion to their shares of total direct costs plus operator and family labor costs minus hauling and marketing fees.

[10]Replacement reserve, interest, taxes, and insurance. Repairs are included above.

[11]Depreciation is charged for herd bulls only. Brood cows are assumed to be raised from heifer calves born in the operation, and salvage values are recovered through the sale of cull cows.

[12]Operator and family labor is valued at the hired labor wage rate.

[13]Costs that need to be covered to justify operation under the assumed situation.

*Costs of producing feeder cattle in the United States — Final 1977, Preliminary 1978, and Projections for 1979. Prepared by the Economics, Statistics, and Cooperatives Service, U. S. Department of Agriculture for the Committee on Agriculture Nutrition, and Forestry, United States Senate. August 6, 1979.

TABLE A

	Interest		Depreciation
Cost	$100		$100
Interest per year	x 8%*	Life of Unit	÷ 20
Cost per year	$ 8		$ 5
Annual Turnover	÷ 3		÷ 3
Cost per head	$2.76		$1.67
Combined Cost per head		$4.34	

*Assumed interest cost would be subsidized by state support similar to the Delta project. The 8% figure will be used throughout this report.

2. Labor-related costs

Four hired hands to operate the confined unit will be needed which will have an additional cost of $3 per hour over the minimum wage paid in the Lower 48. The total additional cost for the $3 per hour will be on an annual basis $24,960. The capacity of the unit on an annual basis is 15,000 head, making the additional labor cost per head $1.66.

By properly locating the confined feeding unit near the processing facility a great amount of labor can be saved that is traditional in the Lower 48. Labor used to transport finished cattle to the processing unit can be virtually eliminated with proper location. Also if accessibility to a railhead is available the purchase of vitamin and mineral premix in bulk or railcar quantities can create a labor savings. For short, any additional wage rate in Alaska for other than those four hired hands can be made up in reduced amount of labor needed by proper planning.

3. Technological and Transportation Costs

All of these costs were included in Mr. Bunger's estimate of construction of a confined unit in Alaska. The only additional transportation would be the unit itself. The animal transportation costs would be the same or less than the Lower 48. The technological costs of confined units over conventional open pen feed lots will be offset by improved efficiency as demonstrated in Section V.

Again the vitamin and mineral mix must be shipped from the Lower 48. At this phase an animal will consume 42 lbs. of the mix and shipping cost wil be $3.36 per head.

D. Processing Phase (Slaughtering)

1. Weather-related costs

The additional weather related cost of the processing phase will be in initial construction. The plant is to be built to process 100 head a day or 26,000 head per year for 20 years or 520,000 head. Again the added initial cost must be figured by the head plus the added annual interest cost per head. Featherstone with Ellerbe Alaska have estimated the construction cost of the shell building for the processing unit to cost $88 per square foot which is $24 per square foot more than the Lower 48. The total plant has 29,550 square feet for both cattle and swine and overhead costs are traditionally allocated on a tonnage basis. Consequently the beef will be allocated 62% of the construction costs which gives the following additional costs to the beef operation:

$24/ft.^{2} x 29,550 ft.^{2} x 62% = $439,704

The construction cost per head equals:

$439,704 ÷ 520,000 = 0.847

The additional construction interest per head equals:

($439,704 x 8%) ÷ 26,000 = 1.353

The resulting additional cost per head of the initial construction is $2.199.

2. Labor-related costs

To determine the additional costs related to labor Featherstone compared the labor contracts of the meat cutters in grocery stores in Alaska and the average contract of meat cutters in grocery stores in the Lower 48.

In the Lower 48 average hourly costs with fringe benefits was found to be $12.75 and in Alaska $17.50 or a difference of $4.75 per hour. In large efficient plants in the Lower 48 it requires 45 man minutes to slaughter a beef animal and 50 man minutes to fabricate that carcass. Featherstone has estimated from smaller plants the size proposed for Alaska the respective times will be 60 man minutes to slaughter and 60 man minutes to fabricate. The additional costs are shown in Table B:

TABLE B

	Lower 48	Alaska
Hourly Rate	$12.75	$17.50
Slaughter Time	.75 Hrs.	1.00 Hrs.
Slaughter Cost	9.56	17.50
Fab. Time	.833	1.00
Fab. Cost	10.62	17.50
Fab. & Slaughter Cost	20.18	35.00
Difference		+ $14.82 per head

Obviously the 73% increase in labor costs is not due to hourly rate. Part is due to the smaller plant which is a technological cost and should be in the following part. For the sake of clarity, however, the total labor cost is shown here.

3. Technological and Transportation Costs

The major additional technological costs due to operating a processing plant in Alaska is the power costs. Using the power rates in the Lower 48 and the rates of Golden Valley Electric Authority a 50% differential was found, but that results in a cost differential of only $0.72 per head. Additional laboratory expenses for U.S.D.A. purposes will be $0.15 per head. If miscellaneous costs of $0.13 per head are added the total of this section will only be $1.00 per head.

In order to start an industry that is technologically equal with the Lower 48, Alaska must transport in the equipment that will be needed to operate that processing facility. Except for replacement pieces, however, once the equipment is in Alaska maintenance of the equipment can be performed locally. As a result the only transportation costs that need to be considered is the initial added costs of shipping the equipment to Alaska. To avoid damage much of the machinery should be shipped via truck directly to the construction site from the manufacturer. This added cost is estimated to be $100,000. Similarly the interest and depreciation cost of this added investment must be determined. The expected average life of processing equipment is 10 years.

Depreciation Costs

($50,000 ÷ 10 yrs.) ÷ 26,000 hd/yr. = $0.192/hd.

Interest Costs

($50,000 ÷ 8%) ÷ 26,000 hd/yr. = $0.154/hd.

Total transportation of equipment equals $0.346 per head added to the $1.00 per head for technological costs gives a total cost for this area of $1.35 per head.

The following is a summary of the additional costs per head of raising and processing beef in Alaska:

SUMMARY OF ADDITIONAL COSTS

	Cost per Hd.
Cow-calf Phase	
Weather Related	-0-
Labor Related	$3.50
Technological & Transportation Related	5.76
Growing Phase	
Weather Related	$1.45
Labor Related	.55
Technological & Transportation Related	2.96
Finishing Phase	
Weather Related	$4.34
Labor Related	1.66
Technological & Transportation Related	3.36
Processing Phase	
Weather Related	$2.20
Labor Related	14.82
Technological & Transportation Related	1.35
Total Additional Cost	$41.95 per Hd.

The difference of the transportation costs of fresh beef per head to Alaska and the additional costs of raising and processing beef in Alaska is:

$67.50 – 41.95 = $25.55 per head.

The full economic impact of the beef industry on Alaska will be discussed more fully in the Conclusion — Section XI. At this point, however, the major concern of this section has been verified — the beef industry in Alaska can be economically viable.

SECTION IV

DETERMINATION OF ECONOMIC VIABILITY OF A SWINE INDUSTRY IN ALASKA

As described in Section III, Overview of the Industry, the swine industry has a relatively short economic cycle due to multiple births, a short gestation period, and a short period of time needed to raise a pig from birth to market weight. In response the swine industry has been a relatively profitable industry compared to the beef industry and has progressed technically at a faster pace. Where 15 years ago confined hog feeding operations were just being tested and all farrowings were done on dirt floors in farrowing houses, today it is estimated that between one-third (⅓) to one-half (½) of all swine brought to market come from confined units that farrow and finish the animal. This improved technology reduces the effects of weather changes and stress on the animal making costs and weight gain predictable and repeatable. By constructing these confined farrowing to finishing operations to withstand the climate of Alaska the same weight gains and cost of gains as expected in the Lower 48 should occur in Alaska. Consequently the additional costs in raising swine in Alaska will be related to the building costs, the higher labor rates to operate the unit, and the cost of transporting vitamin-mineral suplement to Alaska.

The standard confined unit that Featherstone recommends is a 144 sow unit built by Sands Livestock Systems, Inc. These units will produce on a practical basis 2,500 pigs per year and have a depreciable life of 20 years during which 50,000 pigs will be marketed. Using cost estimates from Ellerbe Alaska and Sands Livestock, Featherstone feels the additional cost of constructing such a confined unit in Alaska will be $100,000. The additional interest and depreciation costs are the following:

Depreciation Costs

$100,000 ÷ 50,000 pigs = $2.00 per pig marketed.

Interest Costs

($100,000 x 8%) ÷ 2,500 pigs per yr. = $3.20 per pig marketed.

This size unit was selected by Featherstone because it could be operated by a 2 person farm family very efficiently. The farm family, however, will have a full time job that goes on 52 weeks of the year with no time available for vacations. As a result, Featherstone recommends the cooperative related to swine maintain a person that can operate the confined units during periods of vacation, sickness, and emergencies. Such practices are becoming more common in the Lower 48 as the size of farm families have been decreasing. To have such a service in Alaska the additional costs will be $260 per week figuring an 8 hour day 6½ days a week at $5.00 per hour. Such a service will be used an average of three weeks per year for a total of $780 per year or $0.312 per pig marketed.

Featherstone has estimated the consumption of vitamin and mineral supplement consumed per head to be 3.19 lbs. per head. This material is not available in Alaska and must be transported in at a cost of $8.00 per cwt. Consequently the added cost related to the supplement is $.255 per pig marketed.

The cost of building a processing unit for the swine industry will have the same added cost as associated with the cattle industry since it will be a combined plant. The total square footage of 29,550 will have 38% of the space allocated to pork and will have the same additional cost of $24 per square foot. The total additional cost is:

$24/ft.² x 29,550 x 38% = $269,496

The plant will process 320 head per day or 83,200 head per year for its 20 year depreciable life. The related interest and depreciation costs are as follows:

Additional Interest Cost:

($269,496 x 8%) ÷ 70,000 = $0.308 per head.

Additional Depreciation Cost

($269,496 : 20) ÷ 70,000 = $0.192 per head.

The resulting total additional cost is $0.500 per head for weather related cost of the swine processing unit.

Again the labor related costs of processing swine will be determined in the same manner as beef was calculated.

	Lower 48	Alaska
Hourly Rate	$12.75	$17.50
Slaughter Time	.25 Hrs.	.35 Hrs
Slaughter Costs	$ 3.19	$ 6.13
Cutting Time	.20	.30
Cutting Costs	$ 2.55	$ 5.25
Slaughter & Cutting Costs	$ 5.74	$11.38
Difference	$5.64/Hd	

Remember that part of this cost is higher labor rates and part is due to a decrease in efficiency on account of the small size of the plant. The next major additional cost area is power costs. In the Lower 48 the average power cost to process swine is $0.96 per head. With a 50% increase in power from G.V.E.A., the added cost is $0.48 per head. Due to the greater number of carcasses, even though the tonnage is less, Featherstone estimates the U.S.D.A. and laboratory additional costs will be the same as beef — $0.15 per head. Using the same miscellaneous cost of $0.13 per head the total additional processing cost without labor is $0.76 per head.

The processing unit for swine must also ship in the equipment from the Lower 48 which will be an added cost that must be considered. Pork equipment, however, is smaller and lighter weight and Featherstone estimates the added shipping cost to be $40,000 via truck. Similarly the interest and depreciation cost of this added investment must be determined. The expected life of processing equipment is 10 years.

Depreciation Costs:
($40,000 ÷ 10 yrs.) : 70,000 hd/yr. = $0.057 per head

Interest Costs:
($40,000 x 8%) ÷ 83,200 hd/yr. = $0.046 per head

The total additional transportation expense for the swine processing equipment equals $0.10 per head.

The following is a summary of all added costs for raising and processing swine in Alaska:

Confinement Unit	
Depreciation Cost	$2.00 per head
Interest Cost	3.20 per head
Labor Cost	0.312 per head
Transportation Cost	0.255 per head
Processing Unit	
Interest Cost	$0.308 per head
Depreciation Cost	0.192 per head
Labor Cost	5.64 per head
Power, Laboratory, Misc.	0.76 per head
Transportation	0.10 per head
Total Additional Cost	$12.767 per head

The difference of the transportation cost of fresh pork per head to Alaska and the additional costs of raising and processing pork in Alaska is:

$20.25 – $12.77 = $7.48 per head

The full economic impact of the pork industry in Alaska will be discussed more fully in the Conclusion · Section XI. At this point, however, the major concern of this section has been verified — the pork industry in Alaska can be economically viable.

SECTION V

DEVELOPMENT OF A CATTLE INDUSTRY IN ALASKA

In this section of the report Featherstone will outline how a cattle industry should function in Alaska. It is from this example that the added cost factors were derived to prove the industry could be economically viable. Without a doubt some who read this section will say to themselves that it could be done another way. There are almost as many ways to produce beef animals as there are people in the industry. Undoubtedly, within a few short years after the industry gets started in Alaska, different methods will be tried and a great variety of techniques will be used in different parts of Alaska.

The methods described for each phase in this report, however, will be some of the most modern available in the Lower 48 and represent the condensation of thinking from successful operators (and suppliers of successful operators) of every segment. As is true in a lot of areas of agriculture, many of the most modern practical techniques used by the industry are passed on by word of mouth and little documentation from written sources are available. Most of what is written is from research done by suppliers and their data must be tempered. As a result Featherstone has little documentation beyond verbal discussions to offer. Featherstone, however, is confident the methods and figures shown here are reliable and if properly applied in Alaska will produce the indicated results.

In this section six main subjects will be discussed. The first subject will be the sizing of the industry for Alaska. The next three subject areas will be the three distinct phases of producing cattle — the cow-calf operation, the growing phase, and the feed lot finishing operation. To maintain and help the modern needs of the industry, next to be discussed will be the facilities that the University will need for good research and extension work. The final subject will be the time schedule and funds needed for the industry to develop in an orderly fashion.

A. Size of the Industry

The American public including Alaskans consume an average of 105 lbs. of carcass beef per person per year. Carcass beef (600 lbs. per head) refers to the animal *after* slaughter but *before* fabrication, or any trimming or boning. Because carcass beef is traded between packers it is easier to track slaughtered (or carcass) weight than after it has been fabricated.

The per capita consumption times the population of the market will give the total market demand. The marketing of fresh meat in Alaska will be discussed in Section VII, Development of a Processing Unit, and in that section Featherstone gives its reason for why a local plant can obtain 50% of the market demand. Using the 50% and the 105 lbs. per captia as givens, the only remaining figure needed is the population of the market. Featherstone feels that the most readily accessible market is the rail belt area between Anchorage and Fairbanks. Although much of the Bush and Juneau areas is supplied from the rail belt area, a lot of special handling is required of the market. To set up the marketing, transportation, and handling structures for the Bush and Juneau areas in an infant industry for the state would be an unnecessary burden.

The 1980 U.S. Census[1] for the rail belt gives the following data:

Anchorage	173,992
Kenai Borough	25,072
Mat-Su	17,938
North Star Borough	53,799
Total	270,801

Adding an extra 10% for population not in boroughs, census error and growth for the next few years until the plant is constructed, a round figure of 300,000 market population appears to be appropriate. The following mathematics gives the resulting size of the industry:

Population	300,000	
Per Capita Beef Consumption	x 105 lbs	per year
Total Annual Beef Consumption	31,500,000 lbs	per year
50% of Market	15,750,000 lbs	per year
Carcass Weight per Head	÷ 600 lbs	
Head Slaughtered per Year	26,250 head	
Days Worked per Year	÷ 260	
Head Slaughtered per Day	101 head	

In conversation with Scott Goldsmith of Institute of Social and Economic Research he has informed Featherstone that using projection models with different assumption of private and government activities, the population of the rail belt by the year 2000 is expected to be between 422,000 and 546,000. If the 422,000 figure is put into the previous calculations to determine daily slaughter rate a figure of 142 head per day is reached. As a result Featherstone feels the beef slaughtering portion of the processing facility should be built to handle 100 head per day and have capacity to expand to 150 per day.

[1] Anchorage Daily News, Dec. 8, 1980 p 1

As a result of these calculations the industry must be sized to raise enough animals to maintain an initial kill rate of 100 per day. A rough rule of thumb in today's industry is that 70% of the beef animals slaughtered are finished cattle that will grade U.S.D.A. Good or better. The remaining 30% are used for manufacturing purposes like sausage and hamburger. Normally this 30% comes from bull calves and cull cows of dairy herds and cull animals from beef herds. Although the figure varies over time, 30% is a good working figure. Initially this number of cows and other cull animals will not be available, but as the herds mature and the Point McKenzie dairy project grows the same ratios as found in the Lower 48 will be experienced in Alaska.

The average of 70 fat cattle killed per day creates an annual demand of 18,550 head. The normal calf crop that reaches maturity is 94% of the cow herd with good management. This means a herd of 19,734 or nearly 20,000 head of beef cows is needed in Alaska to keep the processing plant operating. The rest of the finished fat cattle industry (the growing and finishing operations) should be initially sized to handle 18,550 head per year.

B. The Cow-Calf Operation

1. Size of Herd

The cow-calf operations in the Lower 48 have had the most difficult time showing a profit of livestock related fields. There are a variety of reasons for low profitability. The biggest reason is the number of calf producers in the industry. Many farmers produce calves as a secondary income to their main crop. As a result the calf operation is rarely totally costed out and frequently the operator sells at a loss and does not realize it. These small operators also produce a small number of animals making the feed lot operator or the growing operation discount the animals in order to overcome the cost of getting a whole pen of cattle eating and gaining at the same rate. The handling costs of mixing small lots of cattle gets quite expensive. The big calf producers prices are driven down on account of these small operators, but he does have the benefit of lower costs through improved utilization of livestock handling equipment, of labor, and of handling practices by buyers.

The Alaskan cow-calf operation, as will be shown in this section, will be working against many weather related problems not experienced in the Lower 48. These added problems practically dictate that the Alaskan cow-calf operations be large operations to reduce costs and pay for the added problems. The following Table 4 shows the average investment needs broken down by sizes of operations in the Lower 48:

TABLE 4*— AVERAGE ACQUISITION AND 1977 REPLACEMENT COSTS PER COW FOR SPECIFIED FACILITIES AND BREEDING STOCK USED IN COW-CALF ENTERPRISES BY AVERAGE SIZE OF ENTERPRISE AND BY REGION, 1977[1].

(Dollars per cow)

All regions	Average acquisition cost[2]			1977 replacement cost				
	Buildings and facilities	Machinery and equipment[3]	Total	Buildings and facilities	Machinery and equipment[3]	Total	Breeding stock[4]	Total plus breed stock
Herd size								
All sizes	154 90	67 50	222 40	345 76	118 22	463 98	340 39	804 37
Less than 100	188 13	93 72	281 85	427 80	164 14	591 94	334 00	925 94
100 to 199	134 83	70 02	204 85	302 30	122 62	424 92	335 25	760 17
200 to 499	118 46	32 58	151 04	261 37	57 06	318 43	358 75	677 18
500 to 999	87 85	10 16	98 01	199 76	17 79	217 55	336 92	554 47
1,000 or more	108 42	85	109 27	266 06	1 48	267 54	363 70	631 24

[1] Investments include [illegible] purchase prices or contract costs of construction.

[2] Average acquisition costs [illegible] 1977 replacement costs [illegible] purchase or construction. Buildings range from [illegible] years of age; other facilities, machinery, and equipment average 4 years of age [illegible].

[3] Includes [illegible] investments in [illegible] are not included.

[4] [illegible] used in the feeder cattle enterprise.

TABLE 5*— Costs of Cow-Calf Operations of Various Sizes in 1977

(Amounts in dollar per cow unit)

Size	Less than 100			100 to 199			200 to 499			500 to 999			More than 1000		
Item	Cash	Non-Cash	Total	Cash	Non-Cash	Total	Cash	Non-Cash	Total	Cash	Non-Cash	Total	Cash	Non-Cash	Total
Feed Costs	87.97	30.62	118.59	80.42	17.85	98.27	73.03	10.65	83.68	59.17	8.50	67.67	45.16	4.61	49.77
Production Costs	34.53	—	34.53	24.75	—	24.75	19.46	—	19.46	13.41	—	13.41	10.18	—	10.18
Direct Costs	18.50	2.35	20.85	18.55	1.25	19.80	19.96	.75	20.71	21.49	.45	21.94	21.42	.19	21.61
Ownership Costs	3.14	75.50	78.64	2.22	63.03	65.25	1.87	60.40	62.27	1.31	49.00	50.31	1.43	53.51	54.94
Indirect Costs	11.17	60.74	71.91	11.50	42.22	53.72	11.04	31.86	42.90	12.11	18.94	31.05	11.05	13.00	24.05
Total Costs	155.31	169.21	324.52	137.44	124.35	261.79	125.36	103.66	229.02	107.49	76.89	184.38	89.24	71.31	160.55

*Costs of producing feeder cattle in the United States — Final 1977, Preliminary 1978, and Projections for 1979. Prepared by the Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture for the Committee on Agriculture Nutrition, and Forestry, United States Senate August 6, 1979.

In looking at the 1977 replacement cost data, one can see building and facilities investments per cow declined with increases in cow-calf operation herd size except at the largest herd size of 1,000 or more cows. Unit investments are higher for smaller enterprises, primarily because the percentages of capacity use are lower. Investments per cow in the largest enterprises are greater, however, due to more expensive specialized facilities are often used to reduce labor requirements and to expand the number of animals that can be managed by the operator.

Machinery investments per cow declines as herd size increases. The capacity of the machinery is seriously under utilized in small herds. For example, the least expensive tractor powered manure loaders and spreaders available probably are adequate for the needs of the largest operators because the cattle themselves distribute a large percentage of the wastes on the pastures or ranges as they graze. An operator that has to practice confined or semi-confined winter feeding must have some kind of manure handling equipment even if only used one or two times per year.

The value of the increased investment in equipment and specializing is apparent in the total cost summary shown in Table 5.

As can be seen from Table 4 and Table 5 in all cases (except investment for over 1,000 herd size) the larger operators had a small investment and total costs on a per head basis. The reduced cost of the over 1,000 herd size compared to the 500 to 999 herd size was $23.83 per cow and the investment difference was $76.77 which the reduced costs would pay off in 3 to 4 years. From these figures Featherstone has determined the minimum herd size for a cow-calf operation in Alaska should be 500 head and the best size should be around 1,000 head. This range allows for the best utilization of investments and still allows the majority of the labor to be handled within a normal family unit. For averaging purposes Featherstone will use a herd size of 750 for the rest of this report, which means 27 herds will be needed to have a total herd size of 20,000 in Part A of this section.

2. Location of Herds

The best land economically for a cow-calf operation is land that can be used for little else than a cow-calf operation. There are two types of land needed — grazing land and forage land that can yield a winter feed roughage. Both types of land need minimum fertility and need to be adequately cleared to permit sunlight to reach the ground. Generally land that is cleared, and fertile enough to produce a small grain crop is too good. The Class III soils in the Nenana area if cleared properly could be used.

The weather restrictions on the location are rather lose as well. The longer the growing season the less winter feed has to be put up which means less costs. The lower the precipitation in the spring calving season, the healthier the calf will be. The land in southern Missouri and northern Arkansas generally has the ideal type of land and weather for cow-calf operations which is why it is the second largest area (Texas being first) in the Lower 48 in producing calves. The weather of this area and different points in Alaska are compared month by month in Table 6

The extreme cold of January and February in Fairbanks, Delta and Nenana prevent calving, but does not preclude the growing and maintaining of a cow or a feeder calf. Feed consumption per pound of gain will be poor in these months but generally the calves will make up the slack in the first few months of warm weather. The areas around Palmer and Homer seem to have no special problems for a cow-calf operation.

The amount of land required per cow-calf unit will be around four (4) acres depending on fertility and management of the land. The rational for four acres will be discussed in Part 3 of this section of the report. By multiplying the four acres times 20,000 cow-calf units, 80,000 acres of land are found to be needed for the cow-calf operations of Alaska. With the size of the operations varying between 500 and 1,000 units, the acreage per operation will be between 2,000 acres and 4,000 acres.

There are many areas in Alaska in which 80,000 acres could be cleared for cow-calf operations and made to be economically viable. Featherstone, however, feels that with the big investment needed in breeding stock, the risk of cold weather injury to the herd would be reduced if the herds were spread up and down the rail belt instead of grouped together. The following areas have the following quantities of land that could be used for cow-calf operations according to local sources:

Kenai*	50,000 to 100,000
Talkeetena	10,000
Matanuska Valley	45,000
Kodiak	50,000
Point McKinsey	15,000
Delta Creek	25,000 to 50,000
Delta Junction	50,000 to 60,000
Nenana	250,000 to 300,000

*(Kenai Includes Deep Creek area, Homer, and Fox River area. This area has requested a survey to be performed on this subject through the Kenai Peninsula Rural Development Council.)

TABLE 6 — Comparative Climatalogical Data

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
ST. JOSEPH, MO													
Extreme High	40	42	74	77	84	93	94	95	90	92	71	63	95
Extreme Low	– 18	– 23	17	24	37	42	55	54	39	25	21	2	– 23
FAYETTEVILLE, AR													
Extreme High	74	81	87	89	92	102	111	105	102	95	82	78	111
Extreme Low	– 10	– 8	2	18	28	41	48	46	34	18	5	– 10	– 10
SPRINGFIELD, MO													
Extreme High	44	66	73	82	87	91	93	94	91	92	76	69	94
Extreme Low	– 12	– 17	18	25	33	46	54	50	40	30	19	6	– 17
FAIRBANKS, AL													
Extreme High	47	43	51	74	89	96	94	90	84	65	46	42	96
Extreme Low	– 61	– 56	– 49	– 21	– 1	31	35	30	11	– 27	– 43	– 62	– 62
DELTA, AL													
Extreme High	48	51	53	71	90	92	91	86	79	66	50	48	92
Extreme Low	– 63	– 60	– 49	– 37	– 1	31	32	22	7	– 24	– 46	– 62	– 63
NENANA, AL													
Extreme High	45	54	55	71	88	98	94	90	79	64	54	61	98
Extreme Low	– 66	– 63	– 59	– 33	– 2	27	29	23	3	– 28	– 49	– 69	– 69
HOMER, AL													
Extreme High	51	51	53	63	69	80	78	78	68	64	52	50	80
Extreme Low	– 18	– 18	– 21	– 9	6	29	34	31	20	2	– 7	– 16	– 21
KODIAK, AL													
Extreme High	54	56	57	64	80	86	82	83	71	61	54	54	86
Extreme Low	– 8	– 12	– 6	7	20	30	37	36	26	10	0	– 1	– 12
PALMER, AL													
Extreme High	51	56	54	68	84	90	85	81	72	66	55	51	90
Extreme Low	– 35	– 33	– 26	– 17	3	33	38	29	17	– 6	– 18	– 31	– 35

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
ST. JOSEPH, MO													
Avg. Daily Max	21.2	26.9	49.1	58.2	71.8	82.1	83.6	85.4	82.0	70.9	50.5	45.2	60.6
Avg. Daily Low	.1	6.0	31.6	39.1	49.8	60.1	66.9	66.9	53.7	43.3	31.1	23.9	39.4
FAYETTEVILLE, AR													
Avg. Daily Max	48.0	52.2	59.1	70.8	77.9	85.5	90.1	89.8	83.2	73.1	59.2	50.7	70.0
Avg. Daily Low	25.9	29.7	36.2	47.4	55.2	63.7	67.6	65.5	58.9	48.0	36.7	29.6	47.0
SPRINGFIELD, MO													
Avg. Daily Max	26.7	38.2	56.4	65.3	73.8	81.5	85.1	86.7	82.6	74.2	54.0	52.4	64.7
Avg. Daily Low	8.4	16.0	34.2	41.8	50.8	59.4	65.0	64.5	54.8	47.5	33.4	30.2	42.2
FAIRBANKS, AL													
Avg. Daily Max	– 2.2	9.3	23.3	40.4	58.8	70.7	71.8	65.8	54.4	33.5	11.7	– 1.5	36.3
Avg. Daily Low	– 21.6	– 14.3	– 4.3	17.3	35.7	47.2	49.6	44.9	34.4	16.9	– 6.2	– 19.3	15.0
DELTA, AL													
Avg. Daily Max							Not Available						
Avg. Daily Low													
NENANA, AL													
Avg. Daily Max	.8	5.9	14.9	38.5	57.7	69.9	71.7	66.1	53.4	34.0	10.0	.7	35.3
Avg. Daily Low	– 18.4	– 11.4	– 4.8	15.7	34.5	45.3	48.2	44.3	33.7	17.7	– 3.3	– 10.8	15.4
HOMER, AL													
Avg. Daily Max	28.0	31.8	35.0	42.3	50.3	55.7	60.1	60.1	54.8	44.4	34.5	27.6	43.8
Avg. Daily Low	14.7	17.9	20.2	27.7	34.2	40.7	44.5	44.6	39.2	30.3	21.8	15.2	29.2
KODIAK, AL													
Avg. Daily Max	34.5	35.7	36.9	41.6	47.9	54.6	59.1	60.1	54.9	45.6	39.0	34.3	45.4
Avg. Daily Low	26.3	27.0	27.2	32.2	38.5	44.7	49.1	49.7	45.0	35.8	30.5	25.5	36.0
PALMER, AL													
Avg. Daily Max	21.5	27.6	34.1	46.3	58.2	65.6	67.3	64.6	56.9	42.4	25.1	20.2	44.4
Avg. Daily Low	6.4	11.2	15.4	26.8	36.1	43.8	47.3	45.6	38.9	27.4	14.3	6.1	25.6

Station	Jan.	Feb.	Mar,.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nev.	Dec.	Year
ST. JOSEPH, MO													
Normal Precipitation	2.07	0.55	3.44	2.47	2.53	3.21	7.91	2.06	0.80	3.81	2.35	0.02	31.22
FAYETTEVILLE, AR													
Normal Precipitation	1.90	2.62	3.08	4.63	5.34	4.36	3.74	3.57	3.91	3.52	3.12	2.62	42.41
SPRINGFIELD, MO													
Normal Precipitation	2.35	1.66	2.85	7.19	7.42	8.49	5.54	3.61	2.06	3.26	3.16	1.35	48.94
FAIRBANKS, AL													
Normal Precipitation	0.60	0.53	0.48	0.33	0.65	1.42	1.90	2.19	1.08	0.73	0.66	0.65	11.22
DELTA, AL													
Normal Precipitation						Not Available							
NENANA, AL													
Normal Precipitation	0.77	0.52	0.47	0.28	0.65	1.35	1.90	2.31	1.30	0.65	0.49	0.44	11.13
HOMER, AL													
Normal Precipitation	1.70	1.54	1.22	1.09	0.91	1.06	1.70	2.56	2.85	3.38	2.76	2.29	23.06
KODIAK, AL													
Normal Precipitation	5.01	4.89	3.85	3.81	4.35	4.12	3.54	4.30	6.11	6.29	5.41	5.03	56.71
PALMER, AL													
Normal Precipitation	1.01	0.65	0.58	0.54	0.69	1.61	2.36	3.20	2.65	1.37	0.94	0.90	16.50

As can be seen there is an abundance of land that has been identified as potential areas suitable for cow-calf operations. Featherstone only sees slight variation in the operation between these areas as will be discussed in the management part of this section. From a weather risk related standpoint Featherstone recommends no more than 25% of the herd be in any one part of the state. An allocation system through available state financing could be used to meet this recommendation.

3. Feedstuff for Herd

Feed for a cow-calf operation is obtained in two different operations. The first is in pasture operations during the summer grazing months. The second is stored feedstuffs that have been produced and stored for winter feeding months or periods when ground cover is inadequate. The pasture operation can be gleaning the stubble of row crop fields or grazing grasses from land that has too great a slope to be tilled properly. The harvested feedstuffs must be of the quality and quantity to supply the nutrient and energy needs of the cow-calf unit for the period of time the pasture land is not available. For the sake of simplicity Featherstone has assumed from the weather charts of the previous part that on an average Alaska's cow-calf operations will pasture their units for 3 months and feed them for 9 months. The length of the winter feeding period may be on the long side, but that builds a margin of safety into the estimates.

For proper growth all cattle feed must have the proper amount of T.D.N. (total digestible nutrients), the proper percent digestible protein, vitamins, minerals, and salt, and have an adequate quantity. If a properly balanced vitamin-mineral-salt pre-mix is made available to the cattle on a free choice basis, they will consume the proper amounts naturally. On a cow-calf operation the summer pasture grasses normally contain sufficient T.D.N. and percent Digestible Protein for proper growth of both the cow and the calf. A small amount of grain such as barley may be added to the vitamin pre-mix to stretch the available grasses in early spring and late fall to prevent over grazing. Featherstone estimates 1½-2 acres of pasture per cow-calf unit will be needed in summer.

During the winter feeding period the calf will be weaned (normally when the calf is 6 to 7 months old and weighs 400 to 500 lbs.) and the calf's nutritional needs are greater than a gestating cow. Thus having a feed material adequate for the calf is also adequate for the cow. Table #7 gives the nutrient needs and intake needs of growing heifers and steers:

TABLE 7 Digestible Protein and TDN Requirements

(Per Head Per Day)

Type of Animal	Desired Daily Gain	Digestible Protein %	Digestible Protein (lbs.)	TDN %	TDN (lbs.)	Ration DM as % Body Wt.	Ration DM Intake lbs.
Growing Steer 500 lbs	0.0	4.3	0.32	57	4.28	1.50	7.5
500 lbs	1.1	6.8	0.69	61	6.22	2.03	10.2
500 lbs	1.6	6.8	0.90	67	8.91	2.66	13.3
Growing Heifer 400 lbs	0.0	4.3	0.31	57	4.10	1.81	7.2
400 lbs.	1.0	6.8	0.58	61	5.25	2.14	8.6
400 lbs	1.4	7.1	0.62	67	5.90	2.21	8.8

(Values expressed on a dry matter basis and were adopted from the 1970 National Research Council - Nutrient Requirements of Beef Cattle).

TABLE 8 — Average Digestible Protein and TDN of Various Forage and Grain*

Item	Percent Digestible Protein			Percent TDN		
	Low	Average	High	Low	Average	High
Forage						
Alfalfa haylage	8 - 9	11 - 12	13 - 15	52 - 54	56 - 57	58 - 60
Cornlage	3 9 - 4 1	4 3 - 4 5	4 7 - 5 1	67 - 68	69 - 70	71 - 73
Oatlage	8 - 9	10 - 11	12 - 14	57 - 60	63 - 66	69 - 75
Wheatlage	8 - 9	10 - 11	12 - 13	55 - 58	59 - 62	63 - 67
Sudan-sorghum haylage	7 - 8	9 - 10	11 - 14	55 - 56	57 - 58	59 - 61
Coastal bermudagrass	4 - 5	6 - 7	8 - 10	50 - 51	52 - 53	54 - 56
Whole plant milo	3 - 4	5 - 6	7 - 8	50 - 51	52 - 54	54 - 57
Head chop milo	3 - 5	5 - 6	6 - 8	55 - 60	60 - 65	65 - 70
Corn stalklage	1 - 1 8	1 9 - 2 9	3 - 4	45 - 51	52 - 62	63 - 70
Corn husklage	1 - 1 9	2 - 3	3 1 - 4	48 - 54	55 - 65	66 - 73
Corn stover, dry	0 5 - 1 3	1 4 - 2 2	2 3 - 3 2	38 - 44	45 - 51	52 - 55
Milo stubble	1 1 - 2 0	2 1 - 3 1	3 2 - 4 1	45 - 51	52 - 62	63 - 70
Milo gleanings	1 5 - 2 9	3 - 4	4 1 - 4 6	48 - 54	55 - 65	66 - 73
Soybean stover	0 7 - 1 1	1 2 - 2 0	2 1 - 2 7	32 - 36	37 - 47	48 - 55
Sugar cane bagasse	—	—	—	33 - 38	39 - 50	51 - 57
Cotton stalks	0 9 - 1 4	1 5 - 2 0	2 1 - 2 6	33 - 38	39 - 45	46 - 51
Wheat straw	0 - 0 2	0 3 - 0 6	0 7 - 1 0	35 - 40	41 - 50	51 - 60
Oat straw	0 3 - 0 6	0 7 - 1 5	1 6 - 2 1	39 - 44	45 - 54	55 - 60
Rice straw	0 3 - 0 5	0 6 - 1 0	1 1 - 1 5	36 - 41	42 - 50	51 - 56
Rye straw	0 - 0 2	0 3 - 1 0	1 1 - 1 5	17 - 27	28 - 49	50 - 55
Barley straw	0 - 0 4	0 5 - 0 9	1 0 - 1 5	30 - 36	37 - 45	46 - 50
High Moisture Grains						
Corn	5 - 6	7 - 8	9 - 11	79 - 81	83 - 85	87 - 91
Milo	4 - 5	6 - 7	8 - 10	76 - 80	81 - 83	84 - 86
Ear Corn	5 7 - 5 9	6 2 - 6 3	6 4 - 6 8	78 - 79	80 - 81	82 - 84
Barley	6 - 7	8 - 9	10 - 12	83 - 84	85 - 86	87 - 89

*Values expressed on a dry matter basis and adapted from the following sources: Morrison's Feeds and Feeding; Soil Science Society of America; Penn State University Diagnostic Criteria for Soils and Plants; Ohio State University; Nu-Ag, Inc., Rochelle, Ill.; A & L Lab, Memphis, Tenn.; American Society of Agronomy and experimental observations for net energy made at University of California.

TABLE 9
Proper Stages of Maturity for Crop Cutting

	% Crude* Protein	% T.D.N.
Corn Silage		
Tassel	10 7	64 4
Milk	8 0	66 9
Glaze to early dent	8 0	71 0
Full dent	8 0	68 9
Alfalfa Silage		
Bud stage	22 1	61 7
1/10 to 1/3 bloom	20 4	63 4
1/2 to 3/4 bloom	16 2	58 9
Past bloom	12 3	49 6
Oat Silage		
Boot stage	15 3	65 8
Late milk to early dough	8 5	65 9
Late dough	8 3	63 5
Grass Silage		
Pre bloom	20 4	73 2
Spike	14 0	67 6
Milk	12 1	65 9
Dough	10 6	60 0
Mature	5 3	52 7
Wheat Silage		
Immature	24 0	63 5
Flower	16 0	63 0
Late dough	6 7	51 3

*Related but not the same as Digestible Protein

The above average figures are from various analysis tables such as "Feeds and Feeding" by Morrison. Your crops may vary from this due to difference in fertility, watering practices and rainfall, weeds, insect damage and other factors.

From Table 8 one can see a variety of different feedstuffs can supply the nutrient needs of our growing calves. The forages with "lage" on the end refer to the crop in a silage form. Crops available in Alaska that are shown to be adequate feed on the chart are barley, oatlage, wheatlage. Featherstone has conferred with nutritionists in the Lower 48 and have assured brome grass, timothy clover grass, green chop barley in silage form are nutritionally adequate for a cow-calf operation.

Featherstone is recommending a winter silage feeding program for Alaska's cow-calf operations because of the above data. Such a program is presently not being used widely in Alaska and is being tested on an experimental basis at the Homer Experimental Research Center. Feather stone believes from investigating operations in the Lower 48, that a silage form of feeding is the key to a successful economically viable cow-calf operation.

A silage system is basically cutting the crop before it matures, chopping it, and storing that product in an upright air-tight silo. This system maximizes the nutrient value of the crop and through multiple cuttings in one season maximizes production on a per acre basis.

Table 9 shows the value of cutting the crop at different stages of maturity.

Presently, Alaskans are growing limited quantities of silage in the Tanana Valley and the Matanuska Valley. Over the years of 1977 to 1979 the average yield per acre harvested was over 4.9 tons to the acre. A working figure for areas of less fertility in the state would be 4.0 tons per acre.

In Table 7 it was found that 10 to 13 lbs. per animal per day would be needed, or 20 to 30 lbs. per day per cow-calf unit. For an average Featherstone figures 30 lbs. per day per cow-calf unit will be needed for 9 months or 270 days which equals 8,100 lbs. or 4.05 tons per winter feeding season. At present production rates in Alaska one acre of silage can support one cow-calf unit during the winter feeding months. Featherstone, however, is recommending that 1½ to 2 acres per unit be put into silage to provide a safety margin during periods of drought or poor production. If the excess is not needed the final cutting can be put into hay which has a commercial value in excess of its cost to produce. The hay also can be used as bedding for new born calves and other general uses.

In the Appendix of this report Featherstone has included three articles that cover the management technique and systems involved in making and storing silage. The first article is concerning how to produce a forage crop, the second is on why and when the crop should be harvested, and third is on how to store the crop to produce good silage. (See Appendix A, B & C.)

Combining the summer pasture needs with the silage acreage needs a range of 3 to 4 acres per cow-calf unit is determined. An average of 4 acres was used to calculate the needs per unit in Part 2 of this section.

In the last few years a new supplement to cattle feed has been found that improves feed efficiency and reduces health problems. The supplement is an extract of the fermentation of the Aspergillus Oryzae organism. This material is a dried enzyme. Enzymes are proteins that act as catalysts in most biological processes in man and animal. By adding additional enzymes to the rumen of cattle, the digestion process requires less energy and the metabolism is more complete. The addition of this supplement to the calf's creep feed can allow the calf to be weaned at an earlier age and weight because the calf will start chewing their cuds sooner (a sign they are able to metabolize roughage material). The earlier weaning weights could be important to Alaskan cow-calf operators who may be short on feed and want to sell his calves off early before winter. For the cattleman who may read this report, Featherstone has put research test results and some supporting letters from users in the Lower 48 in the Appendix - see Appendix D.

4. Breeding and Development of Breed Stock

In general the few cattle that Featherstone's representatives have seen in Alaska appear to be lacking genetic quality. Undoubtedly over the years inbreeding and lack of new stock has caused this deficiency. If the total herd size in the state is expanded from the outside, this problem will be self correcting in time. A few pure bred breeders will emerge in time and they can bring in any new blood lines needed through artificial insemination in a grandparent stock.

The best recognized breeds for colder climates are the British breeds — Herefords, Angus, and the Short Horn Hereford. The crossing of these breeds also yield good cold climate animals with good quality factors for finishing in feed lots. To begin the herd, half of the animals needed can be sent and after four years of careful selection of the offspring, the full desired size herd can be created.

The first two calf crops will produce 50% heifers which can be saved back for breeding once they are two years old. If the initial herd of cows delivered from the Lower 48 are bred to different good bulls prior to shipment, the blood lines will be even more diverse. The first calf crop also can produce the needed bulls for the herd. After two years the bulls can be used for breeding to a limited degree, and full time the third year.

The initial herd also should be a mixture of ages two through four years. Young two year old cows often have problems with their first calf and a full herd of two years old would be difficult to manage by an experienced operator and impossible for a beginning operator. Three year olds are sometimes difficult to breed back immediately after their first calf. Four year olds are established producers and give the operator a solid foundation to fall back on. The same senario is true for bulls and likewise a mixture of ages are needed. Mathematically there should be one bull for every fifteen (15) cows initially. As the herd matures, this ratio may shift to one for every 20.

The breeding records, facilities, and techniques will separate the good operators from the bad ones quickly. The attention paid to breeding the right cow to the right bull can pay dividends and reduce the costs of bringing in outside blood lines for producing good quality animals. Culling of the breeding stock is also important to maintain quality. Cull cows and bulls will amount to

10% of the breed stock once the herd matures. Some animals will last longer but the poor producers, poor mothers, or weak animals should be culled as soon as identified and not used for breeding.

5. Routine management of herd

The most difficult part of running a cow-calf operation is the spring calving period which to operators in the Lower 48 would be mid-winter calving. While reviewing existing literature on cattle in Alaska, Featherstone found the reprint of a speech given by John Milne, a cattleman from Alberta, Canada to the 2nd Annual Alaskan Agricultural Symposium. A section of that speech is reproduced in Appendix E and gives the details of calving from a very practical standpoint.

The balance of the management required is good breeding techniques (previously discussed) and providing proper nutrition for the herd. The bulk of the nutritional needs is discussed in Part 3 of this section. Vitamin, minerals, and salt make up the balance of the nutritional needs. Salt should make up between 0.25% and 0.50% of the total intake. The vitamins and minerals will vary with different types of feed and with different soils used to produce that feed. Standard pre-mixes are available that cover the fall range of needs. As an operator becomes more experienced in his feed management, he should have his feed analyzed to find his true needs and buy accordingly.

The management of the pasture and producing silage will take most of the operators time during the summer months. Every 20 to 25 days in the summer with the Alaskan long days the forage crop will need to be cut, chopped and stored. Self-feeders will need to be filled with vitamin-mineral-salt mix on a weekly basis. The herd once on pasture in the summer should be checked visually two or three times a week for medical problems, water needs (depending on watering system), and eating habits. If pastures are being rotated depending on concentration of animals on the pasture, they should be rotated monthly.

During harvesting for the silage and calving time an operator of a 500 to 1,000 unit herd will need some additional hired labor. For the rest of the time, however, a husband and wife team should be able to manage the operation fairly easily.

6. Veterinarian Requirements

Of the three phases of the beef cattle industry, the cow-calf phase has the greatest veterinary need. Pregnant cows and new-born calves are more vulnerable to medical problems. These medical problems, however, are reduced with the experience of the operator. With proper nutrition, clean water, and good handling techniques many problems disappear. An experienced operator, who is familiar with antibiotics and other oral medicines, can solve even the majority of the remaining problems. The final line is however, a veterinarian near by still makes a cow-calf operator sleep better at night.

With the herd broken up into four areas, there will be 5,000 units in an area. As will be seen in the balance of this report, the rest of the cattle industry and swine industry will be dispersed up and down the rail belt. With the increase in animal numbers the number of veterinarians will increase as well. Many of the existing vets are trained in large animals and would prefer such a practice. It is very difficult to have a small animal (pets) practice and a large animal practice because the times of the day required by each are different. A lot of cattle and pigs are worked at night and early in the morning because of the normal farm schedule. The small animal practice is daytime work. As can be imagined, the two schedules always conflict and the vet has to give up one or the other. The large animal is generally not as profitable because the operator learns to do much for himself since he often cannot wait for the vet to arrive and he cannot take the time to take the animal to town.

Featherstone was told in the initial phases of this study that vets were in short supply in Alaska and particularly in the Fairbanks area. A telephone survey of the eight known vets in the Fairbanks area produced favorable responses from four vets for more large animal work. In fact all four indicated they presently were doing large animal work on a part-time basis. After talking to these vets, Featherstone feels veterinarians will be available in adequate supply as the herds grow in size. Veterinarians are profit motivated individuals. The more valuable the animal, the more a vet's services are worth. In Alaska animals will be worth more because of the added costs discussed in the economic sections of this report. The more vets services are worth and the animal numbers grow, the more vets will be practicing on large animals.

7. Investment requirements

The largest investment the cow-calf operator has to make is in his land. A 750 unit operation needs 3,000 acres of land. Currently the State of Alaska is selling land at $100. per acre and rough rule of thumb clearing costs have been estimated to be $200. per acre. His total land cost is $300. x 3,000, or $900,000 costing $1,200 per cow-

calf unit. Table 10 below shows an interesting comparison with various regions of the Lower 48.

TABLE 10*— Land Charge For Cow-Calf Enterprises, 1977

Acquisition date	Owned acres per cow (acres)	Land value per cow
All regions		
1942-76	5 80	$ 563
1972-76	5 80	1,273
1977	5 80	1,950
Southeast		
1942-76	3 67	578
1972-76	3 67	1,307
1977	3 67	2,002
Southwest		
1942-76	7 20	512
1972-76	7 20	1,157
1977	7 20	1,772
West		
1942-76	4 07	392
1972-76	4 07	887
1977	4 07	1,358
Great Plains		
1942-76	10 56	484
1972-76	10 56	1,094
1977	10 56	1,676
North Central		
1942-76	3 92	775
1972-76	3 92	1,753
1977	3 92	2,685

*Costs of producing feeder cattle in the United States — Final 1977, Preliminary 1978, and Projections for 1979. Prepared by the Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture for the Committee on Agriculture Nutrition, and Forestry, United States Senate. August 6, 1979.

In all regions, acquisition costs for land per cow-calf unit is greater than the projected $1,200 per unit in Alaska. The region supplying Alaska presently is the west region which had a cost of $1,358 per unit in 1977. Adding a 20% inflation factor to farm land prices for the four years since 1977, means a cost of $1,630 per unit in 1981 in the west region. The difference between this cost and the $1,200 in Alaska is $430 per unit less. Consequently the Alaskan operation will require $430 times 750 units or $322,500 less in land cost.

The next greatest cost is the initial animal cost. Starting with a purchase of half the herd size and raising the balance, the need is for 375 cows and 25 bulls. A good quality, bred cow presently costs $1,200/head and young good quality bulls cost $2,000 per head. The initial stocking cost is:

Cows - 375 x $1,200	=	$450,000
Bulls — 25 x $2,000	=	50,000
Animal Costs	=	$500,000
Est. Frt. Cost 400 @ $50/Hd.	=	20,000
Total Delvd. Costs	=	$520,000

The feed storage and handling equipment is the next highest cost. This equipment must be big enough to handle the 270 day winter feeding needs of 8,100 lbs. shown in Part 3 of this section. For 750 units this equals 6,075,000 lbs. or 3,037 tons of feed silage storage is needed. Three silage containers each with a 25 foot diameter and 88 foot height will handle this quantity. The silos with bottom discharge auger feed conveyors will cost $125,000 each or $375,000 per operation.

The balance of the equipment needed on the farm can be lumped together for this broad analysis. They would include a 100 HP tractor with manure spreader and attachments to plant and harvest a silage crop; a well and watering facilities, fencing, feed truck, barn and mechanical area, self-feeders for supplements, gasoline storage/facility, etc. Featherstone estimates these facilities and equipment will cost in the neighborhood of $300,000 to $400,000 for a 750 unit operation.

The following list summarizes the investment costs of a 750 unit operation:

Land	$900,000
Initial Stock	520,000
Feed Handling Equipment	375,000
General Facilities	350,000
Total Investment	$2,145,000

To supply 50% of the market demand 27 such operations need to be built for a total state-wide investment of $57,915,000. Of this figure $24,300,000 is for state owned land and the improvement of that land.

C. The Growing Operation

1. Types of Operations

Featherstone expects three types of cattle growing operations will develop in Alaska. The first will be the cow-calf operator vertically integrating his operation by pasturing his yearlings for an extra summer. The second will be the grain farmer who rotates his crop with a forage type product that can be harvested and fed easily. The third will be the feed lot operator desiring to insure his supply of cattle to finish. In the Lower 48 there are several other classifications but Featherstone doubts they will exist in Alaska to any significant degree. The growing operation takes the animal from a 400-500 lb. weight to 750-800 lb. weight and is the easiest weight gain to put on the animal. Normal, healthy animals require little attention and if the weather is above freezing, and they have adequate water and nutrition they will gain this weight in 3 to 4 months averaging 2.5 lbs. gain per day or better. This gain is the least expensive per pound and for that reason the operators on either end of the system usually integrate into this phase. Only when their facilities and resources are stretched to the limit do they permit others to enter this phase.

The *cow-calf operator* to extend his yearlings over has the simplest task he can use his present equipment in his pasture and separate the yearlings from the cow-calf units into different pastures. The self-feeders that are used for vitamin-mineral-salt supplements will need to have a small amount of grain (1 lb./hd./day) or protein supplement added to it. With this supplement and the roughage of 1 to 1½ acres the yearling will produce quite well. The cow-calf operator's only hazard is that he must not over graze his pastures and limit the nutritional intake from the pasture for his main operation — raising calves.

The *barley farmer* that uses a schedule of operations with ⅔ grain and ⅓ fallow in separated fields will find growing yearling cattle profitable. Using Lewis and Wooding's* scheduling for barley, the farmer could turn cattle out in the field that is to be fallow the following year in mid-September after combining. Yearling cattle would glean the field utilizing dropped grain and the straw left in the field. With a small amount of on farm grain storage and the barley straw for roughage, a grain farmer would have little trouble in September, October, and November of taking 500 lb. yearlings to 750 lbs. ready for the finishing lot. The only modifications he should make to his schedule would be to delay his September chisel plowing until the following year. These farmers should figure a yearling can gain the necessary weight from the gleaning of 2 to 3 acres of a barley field recently combined depending on how much straw is left in the field. The only additional expense will be the purchase of some self-feeders for supplement and some watering equipment.

The *feed lot operator* will find it necessary to grow out these yearlings when the others do not have the time or space to do it. All of the equipment he needs is already in place and basically the only change he has to make is to increase the roughage in the rations fed to his other stock.

By using too high a concentrated ration too soon he runs the risk of stunting their growth or making small, over fattened cattle. The feed lot operator should be the back-up market for these yearlings in order to assure his supply of cattle to be finished. By changing their feed, he can shorten up or lengthen out the time at which these cattle will ultimately be finished by as much as three months without too great an extra cost. This facility with a more uniform flow of cattle and making marketing beef by the processor more feasible.

2. Location and Size of Operations

Of the 18,000 to 19,000 head of yearlings annually produced, the feed lot operator will probably grow at least half of them out to be ready for finishing. The balance will be handled by cow-calf operators and barley farmers. This means the operations of this segment of the industry will be spread out up and down the rail belt and from Fairbanks down to Delta Junction. An additional 20,000 acres will be needed by cow-calf operators if they plan to grow the 9,000/9,500 head to a finishing weight. Most of this land can even be marginal land with little other value. For these reasons, Featherstone feels no definite areas should be set aside for this operation; feeling it will generally take care of itself.

3. Feed requirements

Beyond the roughage that is given to yearlings it is recommended 1 lb. of grain (barley) be given to each head per day in the supplement in the self-feeders. This extra shot of energy ration makes the yearling utilize the roughage more efficiently. This small amount of grain however will mount up. Each head will be at this stage an average of 140 days meaning each of the 19,000 head will consume 140 lbs. of grain or 1,330 tons of grain annually. The calcium and phosphorous supplement at this point in growing beef animals is critical and the operator should be sure his animals are getting their needs. By checking the amount consumed from the self-feeders on a regular basis and dividing by the number of animals having access to the feeder, the operator will know the amounts each gets.

4. Management requirements

As previously stated this phase is the easiest phase to manage. If an operator watches his self-feeders closely, watches to see their water is clean, and twice weekly inspects the animals for any disease problems, little else is needed. By following these three points and knowing what to look for, no problem should get out of hand.

5. Veterinarian requirements

Again this aspect is minimal compared to the rest of the cattle industry. Some shipping sickness can occur if any great distances are involved in transporting the cattle. A standard set of innoculations upon arrival usually ends this problem.

The one medical problem the operator will have to learn to combat in the Alaskan summers is the fly and mosquito problem. The marginal land often used in this phase may be wet lands that also breed mosquitos and flies. The sting of these insects can cause sickness, lack of weight

*"Barley Production in the Delta Clearwater Area of Interior Alaska" by Carol E. Lewis and Frank J. Wooding, Bul. 49, Ag. Experimental Station, Univ. of Alaska. April, 1978, p. 13.

gain and other stress type of problems. Warble flies have proven a problem with reindeer when they lay their eggs on reindeer and the larvae cause medical problems and also damage the reindeer hides. The same may happen with cattle. Prevention is the best remedy for this problem. The cattle should be in as dry an area as possible and if insects are around fumigation by dipping or spraying the whole animal regularly may be necessary. Cattle oilers with insect repellents can also be used. There are two types of oilers. One is a face oiler that hangs in front of the self-feeder and looks like a wet mop. As the animal puts his head in the feeder the mop crosses his face leaving an oily insect repellent on the head. This technique is especially good in preventing "pink eye". The second method of oiling is the use of a chain wrapped in canvass soaked with the oil solution and stretched between two gate posts leading to water. As the cattle are moving to the water they walk under the chain and the oil repellent is put on their backs. The veterinarian may be needed in extremely bad cases. The vets handling the cow-calf operator's problems and the feed lot operator's problems will have a little extra work from the growing operator but not enough to need a full time vet for them.

6. Investment requirements

The only investment for the growing phase is a few self-feeders, a water source, and pasture land. The only real cost is the land which at the most needed was determined as an additional 20,000 acres in Part 2.

If the value of this land cleared is $300 per acre, this would mean an investment of $6,000,000 would be needed. The other miscellaneous needs would be less than $100,000 for all 19,000 animals.

D. The Feed Lot Operation

1. Ownership, size and location of the feed lot operation

Throughout this report the reader will note Featherstone has recommended private Individual operations in the cattle industry and the same will be noted in the swine industry. The feed lot operation and the processing facilities however are being recommended to be owned by a cooperative. Both of these operations require a great deal of technical expertise, and a large amount of capital. The size of the market only dictates the need for two feed lots at the most and one processing facility if any efficiencies of scale are to be obtained. The small number of operations mean no real competition will ever exist and without these last two functions the rest of the industry will not develop in an orderly fashion. The risk of these operations failing and going out of business leaves the balance of the industry with a large capital investment that cannot be marketed. A cooperatively owned processing facility and feed lots for cattle seems to overcome this potential stumbling block that may restrict private capital investment in the industry. These cooperatively owned facilities can be operated directly by the members of the cooperative through a board of directors.

The size of the feed lot requirements will be difficult to gauge in the beginning of the industry. Approximately 18,200 head of cattle will be finished per year with each head requiring about 100 days. In the beginning part of the growing phase will be done in feed lots and each head will require 120 to 140 days and Featherstone has estimated the number may be as great as 9,500 head. In the long run however, Featherstone feels this growing operation will not be done in the feed lot. Young cull cows and bulls that do not produce satisfactorily will also be put into the feed lot for 30 to 60 days prior to slaughter since they gain economically in that short period. Dairy steer calves and cull heiferettes can be grown in the feed lot or if mature can be finished in 60 to 90 days to an economical degree for ground beef purposes. Dairy animals and cull beef animals initially will only supply half of the manufactured beef (or ground beef) needs of the plant.

The best feed lot size that can be used in Alaska is one that will hold 5,000 head. (This decision will be discussed more in following paragraphs. Such a sized lot can handle 1,620,000 head days with a normal 10% vacancy factor. The following is a list of the potential feed lot demands:

Type	No.		Acreage Days		Head Days
Finishing Cattle	18,200	x	100	=	1,820,000
Growing Cattle	9,500	x	130	=	1,235,000
Cull Cows and Bulls (Beef and Dairy)	750	x	45	=	33,750
Cull Dairy Steers and Heiferettes	2,500	x	75	=	187,500
Total Head Days					3,276,250

For the above indicated needs 2 feed lots with a capacity of 5,000 head each should be built. Recognizing that the growing phase may not ultimately take place in feed lots, the industry officials should see the extra 1,235,000 head day capacity as expansion capacity for when the industry is supplying more than 50% of the market. To maintain uniform feed efficiency and overall economy, Featherstone is recommending these feed lots have the capability of being enclosed (the layout of which will be discussed in Part 2 of this section.) To build an enclosed feed lot bigger than 5,000 head many problems are encountered. Presently Alaska is developing its grain base in the Delta area and

hopes to develop an area in Nenana even larger than Delta I and II into grain producing land. Because of the construction problems, the separated grain producing areas, the expansion needs of the future, and the potential mathematical head day needs, Featherstone is recommending two feed lots of a 5,000 head capacity to be constructed instead of one 10,000 head feed lot.

In the Lower 48, time has demonstrated that it is more economical to feed cattle close to the source of feed rather than feeding cattle near the consumer and shipping the feedstuffs to the cattle. The large livestock populations of Iowa, Nebraska, Kansas, Oklahoma, Colorado, Texas and Arizona prove this fact. The base economic reasons behind this trend is shipping costs. Cattle convert feed grains at a rate of 8 to 10 lbs. to make one pound of meat. Also to ship a 600 lb. carcass chilled or a 450 lb. fabricated carcass chilled is less expensive than a 1,000 live animal. The disposal of animal wastes on croplands is also an added economy. For these reasons, Featherstone is recommending the feed lots be located near the source of grain used to feed the cattle. One in the Delta area and one in the Nenana area appear to be the most logical.

2. Design of the feed lot operation

Featherstone reviewed a variety of feed lot systems before deciding on the enclosed system that is recommended. The decision stems from two economic considerations. The first consideration was the added land costs and feed and watering equipment needed for an open system. Because waste removal problems in winter months, open feed lots need at least ten times the square footage that an enclosed lot requires. This extra square footage requires more feed bunks, watering troughs, more fencing, and feed trucks must drive further. An enclosed system with a slotted floor with a continuous flushing system eliminates those added costs.

The second consideration was added cost of weight gain for the open system. Cattle in the finishing stages will stop gaining weight in the severe winter months of Alaska without protection. Those winter months may only be 4 to 8 weeks in duration but that is 8 to 16% of the year and represents an added cost of 8 to 16% for the industry. Table 11 shows a typical ration to finish cattle with barley in the lower 48 costing $138.50 per head making even an 8% increase in cost equal to $11.00 per head. The added cost of the enclosed feed lot was less than $5.00 per head.

The enclosed feed lot system being recommended by Featherstone is one designed by Corral Industries of Phoenix, Arizona. This system has a series of teardrop slats slip formed, in the concrete that have a continuous flow of water through the slats. The waste products are pushed into the slats by the animals and continuously flushing the slatted teardrop area removes that waste to nearby lagoons. The lagoon system should have two ponds with about 15 to 20 acre surface on both with a 25 to 30 foot average depth. The water on the top portion of the ponds will supply the continuous flushing system on an alternating week basis. By alternating the ponds, the sediment is allowed to settle more completely on a weekly basis. These ponds will need to be pumped in the spring and fall and the waste products can be used as fertilizer in fields of neighboring farms. Appendix F is a sales brochure from Corral Industries that shows how the waste system works and how the cattle are enclosed. A Featherstone represntative traveled to visit a 5,000 head feed lot constructed by Corral and found the system totally adaptable to Alaska. (For interested parties in Alaska a Corral System may be viewed in Calgary, Canada.) The nutrient recovery system discussed in Appendix F is not needed in the initial phases and should be viewed as a future addition to the feed lot system.

TABLE 11 — Beef Ration To Finish Cattle Using Barley

Item	Cost per lb.	% of Ration	100 day Consumption**	Total Cost
Barley*	0694 (a)	87 27	1745 00	$121 10
Roughage Hay	0660 (b)	9 09	182 00	12 01
Limestone	0135 (c)	1 14	23 00	0 31
Calcium Phosphate	1486 (c)	45	9 00	1 34
Tracel Mineralized Salt	05 (c)	45	9 00	0 45
Molasses	0715 (d)	1 59	32 00	2 29
Vitamin A 50 000 IV/Day/Hd	01 (c)		100 00	1 00
Total				$138 50

*Assumes 12% Protein Barley which will not need protein supplement Alaskan Barley in 1980 had a 12 6% D M Protein

**Feed from 750 lbs to 1000 lbs or 250 lbs times 8 0 conversion equals 2,000 lbs of ration

(a) Price Winnepeg Nov 25 1980

(b) Average price paid in Alaska in 1977 to 1979 for all hay June 1980 Alaska Ag statistics

(c) Prices furnished by Bio-zyme Industries 11-26-80

(d) Prices delivered Atchison Ks 11-26-80

The above average figures are from various analysis tables such as Feeds and Feeding by Morrison Your crops may vary from this due to difference in fertility, watering practices and rainfall weeds, insect damage and other factors

Although a lot of concrete is used in this system which is at a premium in Alaska, the structure is built with used oil field pipe which is reasonably priced in Alaska. The basic system can be built in 2 to 4 months depending on concrete and labor availability. The cost savings of using the Corral Teardrop System in the Lower 48 for a typical 12,000 head feed lot is summarized in Table 12.

TABLE 12 Dollar and Other Advantages of Teardrops Over Conventional Pens
March 1980
12,000 Head "Open" "Teardrop" Facility

	Consideration	1 Year	10 Years	20 Years
1. Value of Acres Saved Conventional Pens @ 350 Sq. Ft. = 100 acres TEARDROP Pens @ 35 Sq. Ft. = (10)acres 90 acres @ $1000	$ 90,000			
2. Tax Considerations Investment Tax Credit	140,000			
Energy Tax Credit @ 80% Applicability	112,000			
Depreciation on 8 year double declining basis	350,000			
3. Cost Savings of Caring for 10 Horse @ $150 per month x 12 months		$ 18,000	$ 180,000	$ 360,000
4. Save 4 men in comparison of operation @ 15,000 year		48,000	480,000	960,000
5. Estimated Savings on Operation of Feed Truck @ $117 per day savings = $20 day x 3 trucks		21,900	219,000	438,000
6. Cost of Removing Manure and Maintaining Pens in Conventional Feedlot 12,000 Head @ $0.3 per head per day = $360 day		131,400	1,314,000	2,628,000
7. Savings on Mud Conditions 12,000 Head x 25# gain x 90 Days = 270,000 pounds gain x $.52 Cost		140,000	1,404,000	2,808,000
	$692,000	$359,300	$3,597,000	$7,194,000

3. Feed mill requirements

One advantage of a 5,000 head feed lot not discussed previously is the size of the feed mill operation. This size lot can be fed with a minimum of two people on a single shift with very little equipment. Using a high moisture barley in an oxygen limiting silo with a bottom unloader, a hay or silage grinder, a front end loader, and a mixer truck with mounted load cells for a scale this size feed lot can be easily serviced. The advantages in producing and feeding high moisture barley is documented in Appendix G, H and I. From a feed mill standpoint the advantages are: 1) no grinder flaker is needed, 2) no rolling or steaming is needed, 3) mechanical problems are minimized. Considering the harsh winter elements of Alaska, the great distances the feed mill will probably be from population centers, and the fact cattle must eat daily, minimizing equipment problems insures better efficiency.

The operation of such a system is very simple. The feed truck has mounted on it a mixer with an auger discharge. The mixer is mounted on load cells connected to a digital readout scale. The truck is driven under the mouth of the discharge conveyor for the high moisture barley and is filled until the scale tells the operator the proper weight is in the mixer. Next, the truck is moved to the hay grinder and the same procedure is followed for the roughage part of the ration. Four or five stalls or small enclosures (about the size of a one car garage each) built together would house the dry additives. The operator would drive the front-end loader and get a scoop of each ingredient and pour the ingredient into the mixer again using the scale. Return the unused portion and repeat with each dry ingredient. Any micro trace vitamins like Vitamin A or antibiotics to be added would be done by hand from premeasured packages for standard pen sizes. The mixer on the truck would be running while it is being loaded and within a few minutes after the last ingredient is added, the ration is ready to be augered into the feed bunks. With two people this process will take less than 30 minutes and the feed would be discharged in less time than that. A 5,000 head lot will use about 50 tons of ration a day. It is best to feed cattle twice a day so each feeding will be 25 tons in a full lot. The trucks hold 10 to 15 tons of ration, so three trips per feeding time or 3 hours per feeding at the most will be needed.

The feed mill should have two high moisture barley storage silos that each will hold 30 to 40 days ration needs for a full lot. By using two, the proper curing time is insured and a bigger back-up allows the operator to get over delivery delays. The one draw back of using a high moisture barley is that unless a whole season's worth of feeding is contracted with farmers who have their own storage (which is unlikely), high moisture barley is only available during harvest

time. The balance of the season, dried barley must be reconstituted which is a slight inconvenience.

A feed supplement available in Alaska is crab meal. Featherstone was quite interested in the swine feeding tests using crab meal locally produced in Alaska done at the Agricultural Experiment Station at Fairbanks. Cattle do not need the high protein ration required by swine but have a similar calcium phosphorous requirement. A locally produced substitute for calcium phosphate would seem to have a lot of potential and would seem to warrant research into the use of it in cattle rations.

4. Management requirements

The primary requirement for the manager of a feed lot is to have an animal nutrition background. This requires being familiar with the mathematics to balance rations to optimize nutrients for the least cost. The use of small computers programmed for such calculations have become common place in many feed lots. The next requirement is to have that intangible ability of knowing when and how to buy the ingredients at the most economical price. The next requirement is to know which cattle should be fed which ration and when upon their arrival. By talking to whomever sent the cattle to the feed lot and by a visual inspection, the feed lot operator must decide what ration schedule would produce the most economical gain. Often cattle from the same producer have gained differently on the same pasture and a good feed lot operator will tag certain ones and separate the animals according to their feed needs.

The final requirement may be one of the most critical and the most intangible. Since the feed lot is to be cooperatively owned, the manager of the operation must be diplomatic. Owners of cattle are proud people who feel their animals are the best ever produced and the manager has to decide what they are really worth. Often these two values are judged differently. Some cattle will be placed in the feed lot on a cost of feed basis and again the proud owner will have a hard time understanding why his cattle did not gain any better than they did. For short, the operator must be someone that all the producers trust and respect.

As the reader can tell the management of a feed lot is a difficult job requiring a qualified person. If Featherstone's recommendation of two lots is followed, only one qualified person is really needed to run both lots. Having a common manager would permit reduced overhead and greater utilization of economics of scale in purchasing ingredients.

5. Veterinarian requirements

The medical needs of cattle in confined feed lots is different from cattle on pasture. The possibility of transmitting disease between animals is much greater. A good operator must keep a good watch out for sickly cattle upon arrival. Sick animals and ones that become sick after on feed a while should be separated into a special pen for treatment. Often all that is needed is antibiotics to overcome shipping fever or pneumonia (if caught early). A good operator will review his cattle daily, looking for ones "doing poorly" or just look sick. Segregation early of these animals and early treatment can prevent epidemic type problems. A monthly visit by a veterinarian is advised just to review the cattle. A visit also may be advisable when a string of cattle arrive from a producer who has never shipped to that feed lot. Good preventative measures for a feed lot cannot be stressed too strongly.

6. Investment requirements

There are three (3) areas of investment in the feed lot operation: (1) the enclosed confinement structure; (2) the feed mill equipment; and (3) the land and miscellaneous equipment.

Featherstone has worked with Corral Industries in trying to determine the cost of building one of their structures in Alaska. Using a price of $100 per cu. yd. for concrete, the price is estimated to be $1,750,000 for the building without land. In addition are the two lagoons and the piping will cost approximately $50,000 if a site location is chosen properly with the construction of the lagoons in mind. This makes the structure total cost become $1,800,000.

The feed mill has been estimated as follows:

1	2 Oxygen limiting silos 31 x 88 @ $150,000	= $300,000
2	Hay and silage grinder	= 15,000
3	Weed stalls for additives	= 10,000
4	Front end loader	= 70,000
5	2 Mixer trucks with load cells @ $30,000	= 60,000
	Total	$455,000

Featherstone has allowed for two trucks due to the critical nature of their function. If one truck is the only one and it fails the operation will stop. With two some labor can be saved but not enough to justify the purchase of the second unit. As a result, the second truck must be viewed as an insurance investment. The loader is critical but it will not receive the abuse that the trucks receive and should be relatively simple to maintain. Even if the loader is down, the trucks still could be loaded manually with shovels.

The land requirements for the feed lot and mill operations with lagoons should be 50 to 60 acres depending on the site location. Using $300. per acre for land, the cost is $18,000. Miscellaneous

equipment would include a maintenance barn, cattle scales, a shed in which the feed trucks are loaded and a pump house. These costs should be around $125,000.

The total of all the figures is $2,398,000 which needs to be doubled for the industry making a total investment of $4,796,000.

This figure looks high undoubtedly to many people reading this report. It looks high especially when one thinks all the facility is for is to put fat on the animal. In part and partial this is true but the ultimate market must be remembered. It will be tempting to by pass the feed lot and market cattle right off the pasture. The quality of cattle finished in this manner have a very limited market. Cattle finished properly in a feed lot are more marketable and the cost of finishing is readily paid by the market place.

E. Need for experimental facility and staff

While Featherstone personnel were in Alaska two Experimental Stations were visited, the one at Fairbanks and the one at Homer. Both of these facilities have competent and energetic people, but both are hamstrung for lack of facilities and funding. For the long term growth and development of a livestock industry in Alaska, a properly staffed and fully funded cattle research facility must be created. This report will give the applicable input to the industry that is available in the Lower 48. However, there undoubtedly are better ways to raise cattle in Alaska than have ever been tried in the Lower 48. The unique nature of Alaska requires many of the problems to be solved in Alaska. Without proper research facilities these solutions will be slow in materializing.

Such a facility should provide research for evaluating techniques developed in the Lower 48 when used in Alaska. The facility also should provide research on the use of local resources (like feeding crab meal) and can be used to train future livestockmen for an enlarged industry. As an educational tool, a "hands on" working herd of cattle for the students is the best method to teach students how to handle animals.

The facility that Featherstone thinks that the University needs is a pure bred cow-calf operation with a small feed lot attached. This pure bred herd should have 120 cows of each breed and Featherstone recommends that the herd should have a string of Angus, Herefords, Shorthorns, and Holsteins. With such a mixture in great enough numbers, cross breeding can be studied and a grandparent herd can be developed for each breed. By artificial insemination with semen from bulls in the Lower 48, new blood lines can be refined in Alaska with this herd of cows. The male and female offspring of this breeding should be sold to cow-calf operators round the state to improve their herds.

The inclusion of a dairy breed (Holsteins) was intentional. Such a dairy breed could help the dairy industry but also the meat industry. The cross breeding with these animals has become very popular especially since the lowering of the standards for the U.S.D.A. choice grade.

Although the number of animals at such a facility would be less than a normal 750 head cow-calf operation described in Section V, the cost of $2,145,000 is still applicable. The increased partitioning of pastures, the specialized breeding equipment, and the student facilities would add costs per head to the facility. Unlike the normal facility however more manpower would be needed to operate the facility to its fullest potential. Featherstone estimates two full time herdsmen, four part-time (student) herdsmen, a full time animal nutritionist, and a part-time animal genetics expert should be in the staff budget. To get accurate feed studies for example, hand feeding is necessary which requires a lot of extra personnel.

Another reason to build such a facility is that it will encourage private individuals to get into the industry. Knowing that a research facility is available that a cattleman can take his problem to, is very comforting when you are starting a herd in a different climate.

F. Time Schedule for Cattle Industry

Needless to say the grain industry has gotten a one or two year head start on the livestock industry. For this reason Featherstone has developed a very compact time schedule to put a cattle industry on stream in Alaska. The schedule has been developed on a calendar quarter basis. As long as each step is taken in order and the bred cows shipped to Alaska are due toward the end of the first quarter of each year, the schedule can be slipped back if found to be too compact.

Featherstone has made the assumption that if a processing unit is under construction, some of the presently cleared land will be converted to cow-calf production. The time schedue has labeled these potential operators as *primary* operations. The balance of the industry needed to make up the 20,000 head or 80,000 acres will be termed *secondary* operations. Further Featherstone has assumed that adequate financial incentives will be available to induce potential operations to develop as fully in size as possible as quickly as possible.

1. Second Quarter 1981

The primary inducement to prime the livestock pump in Alaska is the appropriation of money by the State to build a processing unit for cattle and swine. This appropriation must be made in this quarter and the site location and primary design must be approved.

The next crucial inducement is to appropriate money for the construction of a feed lot with a

feed mill as described. Knowing that a feed lot and processing facility are being built will induce cattlemen to buy quality stock that can finish out to make quality meat. Having such a facility will also induce cattlemen to market their cattle on an orderly economical basis. By trying to finish on their own, some economics will be lost and they will be less enthusiastic about expanding.

The last item that should be performed in this quarter is to start writing and publishing a capital financing program for the primary operators to start on presently cleared ground.

2. Third Quarter 1981

If all of the previous quarter's needs were accomplished, the first order of business for this quarter is to hire a feed lot manager. This person should be allowed input into design and location of the facility he will be responsible to operate. After the site location and design are done (in this quarter), the manager should function as an extension agent promoting the cattle industry and helping people just starting out in the cow-calf operation. This early public relations could pay some good dividends for when the feed lot opens in the fourth quarter of 1982.

The next hurdle in the time schedule is to select primary cow-calf operators. During this quarter the selected operators will be purchasing the extra equipment they will be needing, ordering stock to be delivered from the Lower 48 for the next quarter, and storing the needed silage and hay from their presently cleared ground. In the funding of these operators additional money should be available to start a livestock cooperative. This money can be used to pay the feed lot manager and the processing plant manager during this start up time.

In this third quarter the first tangible sign of real progress should be scheduled — ground should be broken for the processing plant. To meet this deadline much of the engineering and design will have to be done in the field on a fast track basis. The potential added costs of fast tracking is overshadowed by the psychological push it will give the fledgling industry and existing grain farmers. On a fast track schedule the plant should be finished in the third quarter of 1983. Nothing more on this schedule will be mentioned about the processing plant until it is completed but the various state agricultural publications should keep the public aware of the facility's progress. A quarterly update to the Alaskan Agricultural Action Council would serve this purpose well.

3. Fourth Quarter 1981

From this point forward progress moves rapidly. Delivery of the first cow herds for the primary operators should occur. These animals should all be pregnancy tested to give birth late in the first quarter of 1982.

To reinforce these new cow-calf operators the contract to build the feed lot should be awarded. With this contract announcement, the manager should be introduced publically at the same time.

By this quarter the number of people with cleared land and the number of beef cows potentially in the state will be known. Knowing these numbers, the state can determine where, how many, and what size they want in the secondary operations. In this quarter land should be identified to be cleared for this purpose.

4. First Quarter 1982

The only legislative action of this quarter is to write and advertise the grants available for the secondary operations. Featherstone imagines these grants will be similar to the Delta lotteries and can follow the same sequence. The lottery should be completed at the end of this quarter.

The feed lot building supplies should be arriving in this quarter to start work the next quarter when weather permits. Also arriving from the Lower 48 should be the first breeding bulls for the primary operations. These animals should be arriving in time for the cows on those operations to start calving. By using this schedule the bulls should be adjusted from the transportation in time for the first time the cows come into heat.

5. Second Quarter 1982

During this quarter the new cow-calf units are turned out on pasture and the cows should all be bred back for next year's calving. Construction will begin on the feed lot and accessory facilities. In this quarter also clearing should begin on the secondary operations.

6. Third Quarter 1982

This quarter will see nothing new started but will still be active. The construction of the feed lot should be finished as should the clearing of the land for the secondary operations. The calves from the primary operation will just about be ready for the growing stage on the operator's facilities or in the feed lot. By this time also the processing facility is less than a year away from completion.

7. Fourth Quarter 1982

The new operators on the secondary operations will order and be delivered their herd cows. Again these cows should all be pregnancy tested and bred to deliver late in the first quarter of 1983. The calves from the primary operations should all be weaned and on growing rations — some in the new feed lot facility.

8. First Quarter 1983

The first set of calves will still be on growing ration for part of this quarter and part on finishing rations. Both the primary and secondary herd cows will deliver late in this quarter. The bulls for the secondary operations should also be delivered in time to be ready for spring breeding.

9. Second Quarter 1983

By this period, all of the first set of calves from the primary herd should be in the feed lot on a finishing ration. The primary and secondary herd cows should all be bred to deliver in the early spring of 1984. The calves born this year also will be on pasture by this time.

10. Third Quarter 1983

If all is timed right as the first calves from the primary herd are ready in the feed lot, the processing facility should be ready to open. This event marks the culmination of the efforts to begin a livestock industry in Alaska. The work, efforts, and results of the new industry will be final in the market place for the consumer.

From this point on the schedule of the cattle will repeat itself generally. The time period in which the cattle are finished will be stretched and changed to meet market demands. Cows will come into heat late and a fall calf crop will start which soon will be recognized by some operators as a profitable time to calve if they have enough feed stored. The cull animals will arrive at the processing facility typically in the Third Quarter so they are not carried over the winter. The old ones will be slaughtered and the young one will be carried over for a few months in the feedlot. Dairy steers will also be on a separate schedule in the feedlot and will come out at different times. Within three years of opening the processing facility the marketing will be leveled out and by four years the industry should be fully developed producing the needed 18,000 head per year.

SECTION VI
DEVELOPMENT OF A SWINE INDUSTRY IN ALASKA

In section IV the swine industry was shown to be potentially economically viable due to confinement reducing the effects of the harsh winters of Alaska. The practice of confined farrowing and finishing of swine in the Lower 48 has grown in popularity to the point where between one-third and one-half of all pigs marketed come from some sort of confinement unit. As with the beef industry, the swine industry has moved so fast that the suppliers to the industry have the most current information. Featherstone feels that Sands Livestock Industries has ploneered the most ideas (for the longest period of time) in the swine confinement area. As a result they have built more confinement units than any other company and now those units produce over one million hogs per year. Although their data must again be tempered, the Sands, methods are well proven and applicable to Alaska. Swine feed conversion is consistant if the environment is properly controlled, and they are properly managed. Their environment can be properly controlled in Alaska, the feed is available, the management techniques can be learned, and as a result Featherstone feels swine can readily be raised in Alaska. Once a processing unit is available for swine, the capital required to build the needed number of confinement units should be the only restricted factor to the industry's growth.

A. Size and Location of the Industry

Where the American public eats 105 lbs. of beef, they consume 63 lbs. of pork per capita per year again on a carcass basis. Similarly Featherstone feels 50% of the local market can be obtained by a local processing unit. With pork (as will be discussed in Section VIII), the market penetration should be easier and the processing unit and the confinement unit should be planned for easy expansion.

Using the same population figures as the beef section the following mathematics gives the resulting size of the industry.

Population	300,000
Per Capita Consumption	63 per year
Total Annual Consumption	18,900,000
50% of Market	9,450,000
Carcass wt per head	÷ 135
Head slaughtered per year	70,000
Days worked per year	÷ 260
Head slaughtered per day	270

Using Scott Goldsmith's figure again of 422,000 projected population in the Railbelt by the year 2000 the slaughter figure increased to 378 head per day. Featherstone as a result feels the plant should be built to process 270 head per day now, with the capability of being easily increased to 380 head per day.

The swine industry does not have a market similar to the manufactured beef market in the cattle industry. The cull breeding animals are processed as required with only a relatively small discount if done at the proper time. The resulting cuts usually are absorbed by the market with few problems. Consequently, the industry must be sized for the confinement units to produce 70,000 head per year initially.

After due research on the size of the confinement units, Featherstone has determined that a 144 sow unit made by Sands is the most feasible size for Alaska. It is generally agreed that in a confinement system, each pig sold will require one man hour. A 144 sow unit will produce about 2500 pigs per year which means 2500 man hours will be needed. This amount of labor can be performed by one man with the occasional help of his wife. Such a "Mom and Pop" operation in the rural sections of Alaska seems wise considering the lack of hired hands available in these areas. If labor becomes available these units can be easily doubled in size to a 280 sow unit.

A 144 sow unit however, must be dependent on an outside feedmill since it is not large enough to support its own. Only the large units with 1000 sows or more can actually justify their own mill. To capture some efficiency in the milling operation Featherstone is recommending twelve (12) of these 144 sow units be grouped together in the Nenana area, another 12 in the Delta area and another four near Fairbanks. If each unit produces 2500 pigs per year, the 28 units will produce the needed 70,000 head annually. The four units near Fairbanks will not make the mill in that area economical but the other animal feeding needs of the area should provide enough business to make it viable. The 28 units were put in the grain producing areas of the state for the same reason the beef feedlots are put in those areas: Transportation of carcasses is cheaper than transporting the grain needed to feed the animals.

B. Description of the Swine Confinement System

To make a confinement system economically viable certain problems must be addressed and overcome. The unit must have high sanitation levels for the animals and for the people operating the unit. Sanitation in confinement is critical because swine communicate diseases rapidly in confinement. Labor and feeding efficiency is the next critical area for obvious reasons. Ventilation at proper levels is also critical. Waste products of the animals have a high ammonia content which can cause lung damage if breathed for prolonged periods. Such lung damage leads to many respiratory problems including pneumonia. The last problem is waste removal itself. The previously mentioned ammonia problem is one reason for the problem but also the unit must meet E.P.A. standards. By properly handling animal waste in some of the more modern system, it can add to the income of the system and economically justify the mechanization that may be required.

The Sands system that Featherstone is recommending has a six building complex in which the problem are handled as efficiently as presently known. The first building is an office complex and workroom area. The office area has room only for a desk and the filing system for the necessary records. The rest of the office area is dressing rooms, shower facilities and laundry. Before the manager or any visitor enters any other area of the complex, they should shower and shampoo their hair and put on sanitized coveralls. By paying such attention to sanitation of personnel many foreign disease problems can be avoided. The workroom is used for minor repairs of equipment and on site storage of supplies and equipment.

The first production building is the breeding and gestation area. This building for a 144 sow unit is 41 ft. x 86 ft. Each sow is individually handled and moved into this area and put in a separate stall for breeding. Throughout the 84 day gestation period the sows are fed by hand to insure proper fetal growth. This practice of separate stalls and hand feeding eliminates the stress of fighting and wasteful overfeeding. A slatted floor designed with an automatic flushing system reduces labor and keeps odors to a minimum. Because of the size and density of the animals in this area, this area of the unit has in-wall fans and water misters to maintain proper ventilation and proper conditioning of the air.

The next building connected to the Breeding Gestation Area by a covered walkway is the Farrow Facility. This room is 28 ft. x 60 ft. and is designed to keep baby pigs warm, dry, and free of drafts. Each sow is placed in a special farrowing crate just prior to delivery that provides adequate room for the sow to nurse the babies without the hazards of crushing or crowding them. The floor in this area has an inplace hot water heating system and a special surface to keep the babies warm without causing skinned up knees or scrapes.

Once the pigs become 13 to 15 lbs. they are weaned and moved to the Nursery Area (24 ft. x 40 ft.). The sows are returned to the breeding and gestation area. The Nursery is an environmental controlled area to eliminate weaning stress and promote early growth. The stalls in this area are designed with automatic feed filling equipment and automatic nipple waterers.

Next the pigs at 50 to 60 lbs. are moved to the Growing Area. For a 144 sow unit this area is 26 ft. x 52 ft. and each pen in this area holds a weeks production. The feeding in this area is totally automated to promote rapid gains at the time when swine have the most efficient feed conversion.

The final area is the Finishing Area where again a weeks production is moved in on an all-in all-out basis. This area is 24 ft. x 216 ft. and has an automatic feeding system. In each of these five production areas, there is a separate tank for the feed needed at each stage of development. In Alaska these tanks should be oversized to ensure sufficient feed during winter months when deliveries may be difficult.

The waste removal system under these areas is designed to use the optimum amount of water needed for each area and still reduce odors. The siphon flush system introduces water at the perimeter of the production areas flushing wastes into a center pit and out of the building. The system flushes when the tank is full so the rate of fill dictates how often each area flushes. This system has a minimum of moving parts and if it malfunctions, repair is simple.

In confined swine systems there are four ways to handle the waste products after they leave the buildings. The traditional way is to flush it to a lagoon where the waste settles to the bottom and the top water is recycled. In the Spring and Fall such lagoons can be pumped to irrigation systems to fertilize nearby fields. The second system is the use of storage pits where the wastes are disposed and the water is recycled. This system is like the lagoon system only the bacterial breakdown is retarded which can reduce the fertilizer value of the wastes. A third system is to screen the waste products for removing the solids which can be pressed, treated chemically, and recycled as feed for swine in the finished area. The fourth system drains the excess water from the waste (the water is recycled) and the residue is chemically treated mixed with grain silage and allowed to ferment, then feed to the growing and finishing animals. These last two systems are relatively new and still have a variety of problems to be worked out and

then proven, outside of test conditions, before they should be tried in Alaska. Featherstone recommends either of the first two systems depending on the proximity of the unit to crop land that will use the product for fertilizer. The closer the field is, the unit manager should tend to use the storage system. The farther away the field is the larger lagoon system should be used.

The labor of a modern confinement unit has been greatly reduced, improving efficiency many fold. The management system is designed for weekly continuous production which lends itself to scheduled labor activities. The following weekly schedule is typical of what must be done in a complete farrow to finishing operation.

Monday
1. Start breeding the sows that were weaned the previous Thursday.
2. Market the pen of animals that are ready in the finishing unit and clean that area making it ready to receive the next group of pigs from the grower on Tuesday.
3. Work up newborn litters that are four days old. This work up includes cutting tails, castrating, cutting needle teeth, and giving iron shots.

Tuesday
1. Continue breeding newly weaned sows.
2. Move pigs from grower area to the cleaned pen in the finishing area and clean their pen to receive pigs from the nursery on Wednesday.
3. Work up newborn litters that are four days old.
4. Perform any needed maintenance.

Wednesday
1. Continue breeding newly weaned sows.
2. Move pigs from nursery to the cleaned pen in the growing area and clean their pens to receive pigs from the farrowing area on Thursday.
3. Work up newborn litters that are four days old.
4. Perform any needed maintenance.

Thursday
1. Continue breeding until adequate number of sows are bred.
2. Wean one weeks worth of litters and move to nursery and clean their area to receive new group of sows.
3. Move newly weaned sows from farrowing area to breeding area.
4. Cull sows which are not adequately producing.
5. Work up any newborn litters that are four days old.

Friday
1. Continue breeding until adequate number of sows are bred.
2. Move new group of sows into farrowing rooms that have been cleaned.
3. Work up any newborn litters that are four days old.

Saturday and Sunday include checking on feed supplies and checking all animals. Breeding should also continue if needed. At daily feedings and at the close of the day, as is true with all livestock handling, the animals should be observed to detect any sickness or deviation from normal and proper preventive measures should be taken.

The added investment in the fixed cost of a confined swine unit has many advantages not available in an open feed lot that are obvious. In Alaska however, some are almost critical to the viability of the industry. Those advantages are:
1. Minimization of weather effects.
2. Increased sow productivity.
3. Improved labor efficiency (especially in waste removal).
4. Cost control management is practical.

C. Nutritional Needs of Swine

As compared to cattle, swine have a very complex nutritional need. Because they are monogastric animals and nonruminanting, they cannot synthesize many amino acids. Therefore the per cent protein in their feed is only one consideration in their protein needs. All 10 basic amino acids must be in balance. Fortunately for the animal nutritionist the value of most small grain and forage crops have a sufficient percentage of 8 of the 10 basic amino acids. Only Lysine and Tryptophan are the most likely to be deficient. In normal circumstances if these two are satisfied in the ration the other 8 are present in adequate quantities. Swine however do have one advantage over ruminates, they can utilize high energy low roughage materials such as the carbohydrates in starch and the lipids of fats. The total energy requirement of the ratior must be considered but generally the added energy that might be needed can generally be supplied inexpensively.

The mineral requirements of swine are similar to the needs of cattle but roughages generally supply a great percent of cattle's mineral needs. Swine are fast growing animals and require a lot of calcium and phosphorus for bone formation and these minerals generally must be supplied from their supplements. Other minerals are required for proper growth but are needed only in trace amounts. The rest of the swines needs are vitamins, salt, and water. These items can be supplied fairly simply.

To understand what feed sources in Alaska would best supply these nutritional needs, a chart of the energy and amino acid (and protein) requirements would be helpful. The following is such a chart:

TABLE 13 - Amino Acid and Energy Requirements for Swine on a Dry Matter Basis*

Weight Range	Avg. Days Fed	Avg. Daily Gain (lbs.)	Avg. Daily Feed (lbs.)	Energy Kcal./lbs.	Lysine %	Tryptophan %	Protein %
15 - 30)	42	0.75	1.5	1740	1.01	.16	21
30 - 50		1.10	2.2	1740	.87	.13	19
50 - 75)	56	1.30	3.3	1635	.87	.13	19
75 - 125)		1.60	4.5	1635	.87	.13	19
125 - 175)	56	1.80	5.8	1635	.70	.08	16.5
175 - mkt)		2.00	7.4	1635	.70	.08	16.5
Gestation	84	0.70	3.5	1635	.54	.08	14
Lactation	28 - 56	—	7.2	1635	.70	.14	16

*Based on National Research Council, seventh revised edition 1973 adjusted to dry matter basis

The balance of these requirements come normally from a grain source and a protein supplement. Both grains and different supplements have varying levels of these requirements as shown in Table 14.

Featherstone also suggests with swine the use of high moisture grain as a base for their feed. Some advantages will be discussed later in this part of the report and again in part D on Feed Mills

TABLE 14 Nutrient Values for Certain Feedstuffs in Diets for Swine[1] (Dry Matter Basis)

Feedstuff	kcal/lb ME	%	Tryptophan
Barley, ground	1510	60	20
Corn, ground	1750	27	11
Milo, ground	1730	28	11
Oats, ground	1320	41	21
Oats, rolled	1740	51	20
Wheat, ground	1720	31	12
Alfalfa	680	82	50
Wheat bran	1200	64	30
Corn gluten feed	1190	67	11
Distillers dried grains with solubles	1710	88	22
Linseed meal	1070	1.22	53
Cottonseed meal	1150	1.94	52
Fish meal			
Menhaden	1410	5.02	78
Herring	1450	5.55	61
Meat and bonemeal	800	3.19	37
Rapeseed meal	1320	2.30	50
Soybean meal			
49% crude protein	1830	[illegible]	78
44% crude protein	1800	[illegible]	70
Linkage	1060	4.35	71

[1]These values were selected on the basis of a compilation of results from several different determinations and estimates

for Swine. A standard table mixing high moisture grain with soybean meal used in the Lower 48 is shown in Table 15 below:

As can be seen in Table 14, barley has the highest percentage of Lysine and Tryptophan of any of the grain products. Featherstone feels if barley is used in Table 15 the amount of supplement needed will be reduced. Featherstone did not make these calculations due to their complexity and time consuming nature with only a short time to prepare this report. Besides for Alaska having the advantage of using barley, there is also abundant supplies of fishmeal available in Alaska which is a better protein supplement than 49% soybean meal. The use of fishmeal however may have to be restricted to 5 or 6 % of the total ration because of the palatability of the ration and of potential off-flavors it imports to the meat. Barley is a natural feed for swine and should be thoroughly researched with a variety of supplements. The barley itself should also be thoroughly tested, however because the feed value of barley varies depending upon the fiber content of the crop which varies on a regional basis. The feed value of barley in the midwest is about 85% the value of corn, while in the northwest the values of corn and barley are similar. The fiber content and available nutrients of Alaskan barley should be researched in depth.

As an addendum to Table 15 Featherstone would like to insert at this point the concentration needed in the TM Salt (trace mineral salt) in Table 16 and the vitamin mix needed in Table 17.

One last nutrient requirement for swine that needs special discussion is iron. The sow's milk is deficient in iron and within a few days after birth, baby pigs can become anemic if held in confinement. If the baby pigs have access to dirt, they will

TABLE 15 Typical Rations Using Soybean Meal and Vitamin Mix

Weight Class	Rate Of Gain	Feed[1] Intake	High-Moisture Grain		Soybean Meal		Limestone	Dicalcium Phosphate	TM Salt	Vitamin Mix
			Daily	% Feed	Daily	In Feed				
lb	lb	lb	lb	%	lb	%	%	%	%	%
15 - 30	.75	2.0	1.5	76.6	0.45	20.5	1.0	1.5	0.3	0.1
30 - 50	1.1	2.9	2.4	81.05	0.45	16.8	0.8	1.0	0.3	0.05
50 - 75	1.3	4.4	3.6	81.05	0.7	16.8	0.8	1.0	0.3	0.05
75 - 125	1.6	6.0	4.9	81.05	1.0	16.8	0.8	1.0	0.3	0.05
125 - 175	1.8	7.7	6.6	86.15	1.0	11.7	0.8	1.0	0.3	0.05
175 - mkt	2.0	9.9	8.5	86.15	1.2	11.7	0.8	1.0	0.3	0.05
Gestation	0.7	4.7	4.3	90.55	0.3	7.3	0.8	1.0	0.3	0.05
Lactation	—	10.6	8.6	81.05	1.8	16.8	0.8	1.0	0.3	0.05

[1]Calculations made assuming 72.5% dry matter in grain and 85% dry matter in soybean meal

TABLE 16 — Composition of a Trace Mineral Mixture That Will Meet the Needs of All Ages of Swine

Trace Mineral	Requirement PPM	Amount Added To Diet	Conc.[1] In Salt
		(ppm)	(%)
Copper	6.	6.	0.20
Iodine	.22	.4	.012
Iron[2]	70.	80.	2.7
Manganese	20.	20.	.67
Zinc	50.	80.	2.7
Selenium[3]	.1	.1	.003

[1]Assume trace mineral salt will constitute 0.3% of the diet.

[2]Iron in ferrous sulfate, ferrous fumarate and ferric ammonium citrite preparations is quite efficiently utilized. The availability of iron from various ferrous carbonates is variable, but usually very low. The iron in ferrous or ferric oxide has essentially no nutritional value for swine.

[3]Added selenium must be in the form of sodium selenite or sodium selenate.

TABLE 17 — Suggested Vitamin Mixture to Meet the Needs of Swine

Vitamin	Amount Per lb. of Premix[2]
Riboflavin	1 gram
Pantothenic acid	5 grams
Niacin	15 grams
Choline chloride	100 grams
B_{12}	16 grams
A	3,000,000 IU
D	300,000 IU
E[1]	5,000 IU
K	2 grams

[1]If minerals or salt do not contain added selenium, vitamin E level should be doubled.

[2]Two pounds per ton should be added to the starter diet with one pound per ton in all other diets.

get the needed iron, but dirt is a source of disease in a confined unit and should not be used. The alternative is to give the baby pigs supplemental iron until they are on a grain ration. The iron supplement can be put in their drinking water and adjusted as they grow and begin to eat grain. The simplest method is to give a one time shot of 200 mgs. of iron in the neck muscle at four days after birth. This single treatment will provide adequate protection until the animal is eating grain.

For total consumption of feed the swine producer should figure from weaning to 50 lbs. the pigs will consume about 80 lbs. of feed. From 50 lbs. to market weight the animal will consume 560 lbs. of feed making the total consumption of a 210 to 220 lbs. animal 640 lbs. or about 3 to 1 feed conversion.

The boars which normally number 10% of the sow numbers have the same nutrient and quantity needs of a bred gilt. A bred gilt requires about 5 lbs. of feed per day while a sow requires about 4.5 lbs. per day for the 84 day gestation period. A gilt will gain 95 to 100 lbs. where a sow will gain 65 to 70 lbs. During late gestation and early lactation sows and gilts should be fed a high fiber laxative diet like oats. This prevents their stomachs from shrinking and a variety of problems at farrowing time. During lactation the sow should get 4.5 lbs. of feed per day plus 0.75 lbs. per day for each pig nursing. This amount can equal between 10 and 11 lbs. per day for the 28 to 56 day period during lactation.

An average figure for a total of all these consumption figures used by many producers is four pounds of feed is needed for every pound of finished pig marketed. The pig will need 3 pounds and the extra pound with his litter mates will support the boar and sow. Using this 4 to 1 figure for the 2500 head of 210 lbs. pigs marketed per 144 sow unit, the operator will need 2,100,000 lbs. of ration per year. On an average the ration will have 85% grain in it, meaning he will need 1,785,000 lbs. or 892.5 tons of grain per year. The total industry of 28 units will then require approximately 24,990 tons per year.

D. Feed Mill Requirements for the Swine Industry

The complexity of swine rations demonstrated in the previous section, has led Featherstone to recommend for the state of Alaska to efficiently feed swine, a central feed mill should be built to supply groups of 144 sow units. For a single unit operator to be able to efficiently and accurately mix the eight different rations needed, seems virtually impossible. A centrally owned cooperative feed mill could mix on an optimum cost basis each ration and deliver it to a group of member operators on a routine basis. If the tanks on each area designed to hold a month's worth of rations they would vary from 8.5 tons to 13.0 tons in capacity. In the warm summer months only one or two weeks of feed should be carried to prevent moldy rations from being fed. In the winter however, bigger quantities can be carried safely and can prevent shortages during periods of bad weather when feed could not be delivered.

Earlier in this report Featherstone recommended the swine units be concentrated in the two new grain producing areas of Alaska - Nenana and Delta with twelve in each area and leaving four in the halfway point, Fairbanks. If each area has identical feed mills each must produce 10,710 tons per year or 206 tons per week or 41.2 tons per work day. This feedmill capacity is relatively small and (like in the cattle industry recommendation) should not be over mechanized when a simple system will still only require minimal labor. The system outlined in the cattle industry, however, is not practical in the swine industry because of the potential number of different items that may be needed to produce an optimum cost ration.

By using high moisture grain for swine, the only treatment the barley will require is grinding or rolling. The flaking and steaming that is eliminated with high moisture grain eliminates costly equipment that has high maintenance costs. To handle 12 units the feedmill will need two (2) silo each 31 ft. in diameter and 89 ft. high with bottom discharges. Each tank will hold a month's supply of

grain permitting the second tank to ferment the next month's addition of reconstituted barley or newly harvested barley when possible. The discharge auger from these silos should go to a central load out area that will be serviced by six overhead tanks. The silo and overhead tanks will discharge into a mixer on a batch scale which will dump into the delivery truck. An adjacent warehouse of 40 ft. x 40 ft. will be needed to store miscellaneous supplies. The majority of the system will operate using gravity and two people can easily receive all needed ingredients and ship out 60 tons daily. Such a capacity gives a 50% expansion factor to the industry before more sophisticated equipment will be needed.

E. Development of Swine Breeding Stock

In confined swine operations the breeding stock becomes very critical due to the intensity of use put on the animals. A gilt will produce her first litter before she is one year old and will be normally culled out by the time she is four years old. In that time frame she will produce about 10 litters of 8 to 9 babies each which, when all are grown out will weight a total of over 18,500 lbs. By comparison a cow will produce between 8 and 10 calves, which when grown out will weight a total of only 10,000 lbs. As a result of these figures, one can understand why the quality of sows and boars are so important. Good quality breeding stock in confined systems with the high fixed overhead becomes a must.

Because of the emphasis put on breeding stock in the Lower 48, it is rare that a confined swine operation produces their own breeding stock. Occasionally a large operator will create a small breeding herd within his larger herd. Normally breedstock is purchased from specialized breeders such as DeKalb or Pig Improvement Co. in the Lower 48. Such operations use the same 144 sow unit described in part B of this section and require nearly the same nutritional needs. The difference in these operations (which are referred to as grandparent herds) is that the sows usually are artificially inseminated and about one half of the gilts are selected for breeding and about 5% of the boars are selected for breeding. The animals selected for breeding are fed to heavier weights with a slighty higher protein ration. The selected sows can be sold to the individual operators either bred or not bred. The ones not bred are routinely put in the sow herd as culls are removed. The bred ones, however, may be treated as grandparents for the individual operator if he wants to take the time. The pigs from these sows first litters have totally new genetic material for the local operator. Good strong, healthy gilts that show the proper traits from these first litters can be used for breeding stock if the operator's boar has no common genetic heritage. The pigs from the second litter of replacement sows however, have a good chance (if used for breeding) of producing half sisters to themselves and this practice can cause problems. By producing as many as possible of his own sows, an operator will reduce his herd's exposure to outside contamination which reduces medical problems.

To reduce the genetic problems of confined operations Featherstone recommends on the initial operations started in Alaska that all 144 sows and 15 boars needed for each unit be purchased in the Lower 48 and shipped to Alaska. What seems like an added expense in transportation will pay off in making operations easier to start up and give the State a good base stock of animals with a good variety of genetic material. Once the State's herd is established and good records are kept, the specialized breeding companies can purchase baby boars in one part of the state and use them in another part through a good artificial insemination program.

Of the 28 confine operations needed in Alaska, Featherstone recommends at least two (2) should be of this specialized variety. The remaining 22 units of 144 will turn their sows over every 3 years, so in an average year the industry will need 1156. Each specialized unit will produce 2500 pigs per year of which 625 will be breedable gilts, so two will produce 1250 or 106 more than needed. In dealing with animals which are all different, having these specialized units so tightly scheduled could cause problems. Featherstone would see nothing wrong with a third specialized operation started if the management skills and capital were available. The pigs not chosen for breeding in these units are fed just as in a normal unit and sold for slaughter. Consequently, when the culls sold for slaughter are considered, these specialized units are counted as regular units in making up the total number of animals needed to be marketed per year in the State.

The two or three specialized units should be placed in close proximity to the halfway point of Nenana and Delta, and they should be close to an airport for when frozen semen or new sows are flow in from the Lower 48. It appears obvious to Featherstone that these units should be in the Fairbanks area. In part, this thinking is why Featherstone recommended four confined units be in the Fairbanks area.

F. Veterinarian Requirements for the Swine Industry

As the reader can tell from the narrative concerning the operations of a confined unit in section B of this report, the swine industry has reached a very highly technical point in the state of art. Good operators can predict the day that each sow will farrow as well as the weight progress for each litter. If

sanitation, good ventilation, and proper waste removal are handled properly, an operator has little need of a veterinarian. In the Lower 48 experienced operators normally have a vet on the project for a half a day per year just to review the operations and make recommendations concerning new developments in the industry.

A swine specialist with extensive training in confined operations should be hired by the cooperative to help get new operations started. Such a specialist besides working with new operators can review older operations to keep them updated. This practice by the Co-op will also relieve alot of the need for a veterinarian. Featherstone recommends, however, that a veterinarian be kept on retainer by the cooperative to make annual visits to member operations and disseminate any appropriate technical information. Such a veterinarian undoubtly already is in the State.

G. Research Facilities Required in the Swine Industry

The best research facility that Alaska could invest in would be one of the confined units recommended for the industry. This unit could be owned by the University of Alaska in Fairbanks becoming the fourth unit in that area. Such a unit, after initially financed, would be self supporting because of the revenue derived from the animal sales. The unit would have three major functions; training new owner-operators, giving "hands-on" experience to animal husbandry students, and testing new research ideas developed in the Lower 48 and in Alaska.

The new owner operator in Alaska has probably never operated a confined swine operation prior to his loan application. By having a state owned facility, a three or four week short course could be offered on management of a confined unit. This course being successfully completed could become a condition for receiving the loan. By having such a restriction the potential new operator would learn the management skills needed to begin operating the unit and whether he really even likes the business before he has to commit to a sizeable investment.

The animal husbandry students of the State represent the future expansion and continuation of the livestock industry in Alaska. By having a practical working operation to augment their academic work, these students are more likely to go into the private sector of the industry as opposed to the public sector. Also having such a facility with the cow calf operation would give the University of Alaska a livestock program that few state universities could match. By having such facilities qualified teachers in the subject would be more inclined to move to Alaska and students would see that the livestock is taken seriously in the State.

As discussed in the cattle section on research facilities, conditions in Alaska are different than in the Lower 48, and animals are going to respond differently to those conditions. The feeds are different, the amount of sunlight is different, the protein supplements are different, and the list can go on. Even though the animals are in a controlled environment which eliminates practically all of the weather related animal problems, the conditions will still be different than the Lower 48. Unforeseen problems will undoubtly occur that a research facility will be the prime entity for solutions. New techniques from the Lower 48 should also be tested before widely used in the State to prevent problems or wasted money and effort. Many ideas from the Lower 48 may just not work in Alaska and a State owned facility would be a natural place to find out if the ideas do work.

Without a doubt if the State invested in such a facility and properly staffed it, Alaska could have a facility that could be self-supporting for many years to come. Ten to twenty years down the road when the industry has matured in Alaska, this facility will be responsible for more of that growth than any other facet.

H. Investment Needs of the Swine Industry

Featherstone has been in contact with Sands Livestock Systems Inc., feedmill contractors, pure bred swine producers, and the manufacturers of high moisture grain silos to determine the costs of starting a livestock industry in Alaska. Prices used were from the beginning of 1981 and Alaska materials and prices used were feasible. Transportation and labor rates were estimated to the best of Featherstone's ability.

The confinement units are estimated to cost $450,000 apiece to build and 28 are needed making a total investment of $12,600,000. This price from Sands includes the use of one of their foreman directing local labor in the building of these units. They assumed that one foreman could oversee three job sites at one time. Time of construction would be seven months if all materials were previously delivered and adequate labor was available. Breeding stock could be introduced into the unit after 5 months of construction, to reduce construction interest if desired.

The sows needed for all 28 of the 144 sows units equal 4032 and will cost $400 apiece delivered on today's market. Fifteen boars in each of the units will make a total of 420 needed and each will cost $600 delivered on today's market. The sows will cost a total of $1,612,800 and the boars $252,000 making the breeding stock cost $1,864,800.

The feedmill designed as indicated in section D with the two high moisture grain silos are estimated to cost $632,000 each and each unit will

need a $60,000 specially equipped delivery truck. A total of three operations should be built for an investment of $2,076,000.

The following is a summary of the total investment needed in the swine industry:

28 confined units	$12,600,000
Breeding stock	1,864,800
Feedmill and equipment	2,076,000
Total	$16,540,800

This figure will permit the industry to produce 9,450,000 lbs. per year on an on going basis. The total investment in the industry will only cost $1.75 for each pound sold in the store in its first full year of production. This figure seems relatively low when one considers that fresh pork is being shipped to Alaska for anywhere between $0.15 to $0.36 per pound.

I. Time Schedule Required for the Industry

The swine industry in Alaska should be timed to come on stream with finished animals at the same time as the processing plant is completed. If the readers will review the time schedule for the beef industry they will see the processing plant is scheduled to start up the Third Quarter of 1983. To meet this schedule sows should be bred in the confined units in the Fourth Quarter of 1982 and the Feedmill must be completed in order to feed those sows. Featherstone has derived the following schedule to meet these criterium:

2nd Quarter 1981 — Legislative action is taken to permit the funding of the industry through the Alaska Agricultural Action Council. This funding should be for 12 confined units in Delta, for the clearing of land in Nenana, for the start of barley farms in Nenana, for 12 confines units in Nenana, and for feedmill operations in Delta and Nenana.

3rd Quarter 1981 — Proposals should be solicited from people interested in owning confines units in Nenana, and Delta and in operating the feedmills (they will be cooperatively owned). The feedmill proposal for the Delta feedmill should have the shortest response time since it needs to be completed the earliest.

4th Quarter 1981 — In this quarter the three lotteries should be conducted, one for the confined units in Delta, one for the grain farms in Nenana and one for the two feedmills. The feedmill, since it will be a cooperative operation, may not be a lottery but rather a selection of operators by the cooperative or the Ag Action Council. Again, the feedmill is the most time restrictive schedule and should be given the highest priority.

1st Quarter 1982 — The operators that were drawn in the lottery for Delta swine units should be placing their equipment on order as should the feedmill operators. In Nenana the farms should be surveyed and made ready to clear the following quarter. Paper work and initial work up for the lottery for swine units in Nenana can start in this quarter.

2nd Quarter 1982 — For the Delta site and the feedmills this quarter will be spent waiting on materials to be delivered. Some very initial site work can be started. The storage shed for the feedmills can be built with local supplies and the lagoons for the swine units can be started. In Nenana the land clearing for grain farms should be put into high gear. Also, the lottery for the Nenana swine unit should be advertised.

3rd Quarter 1982 — The swine units in Delta should now be started and the initial breeding stock should be placed on order. The feedmills should also be under construction in this quarter. In Nenana the barley farms should be cleared as well as the land to be used for the swine units. The lottery for the Nenana swine units should be conducted in this quarter.

4th Quarter 1982 — With good timing the feedmill should be completed early enough to receive grain directly from the harvested fields. The balance of their supplies should arrive in this quarter and the feedmill operations should begin because the gestation section of the Delta swine unit will be ready and the breeding stock will need to be fed. In the last month of this quarter the Delta swine units will be completed. In Nenana the cleared barley farms should be readied for next Spring's planting and the operators selected to operate swine units should place their equipment orders.

1st Quarter 1983 — Delta swine units should farrow their first litters and they should reach the nursery before the quarter is over. The feedmills should now be fully functional and on line. The equipment for the Nenana swine units should be delivered in this quarter.

2nd Quarter 1983 — The Delta swine units should have animals in the grower unit this quarter and some possibly just entering the finishing areas. The first barley crop should be planted in Nenana and the swine units should be put under construction. The breeding stock for Nenana will have to be put on order this quarter.

3rd Quarter 1983 — The processing plant is now finished and so is the first litters from the Delta swine units. Another first will be the barley crop in Nenana which can be directly sold to the feedmill because the Nenana swine units will have gestation units ready and breeding stock delivered.

4th Quarter 1983 — The Nenana swine units will farrow their first litters in this quarter and will progress as the Delta units did having slaughter weight animals ready in the second quarter of 1984. The remaining swine units for breeding stock production and the research facility can be scheduled to start anytime in 1983. The real demand for second generation breeding stock will not start until 1985, so there is adequate time to find experienced operators for these units.

As stated with the Cattle Industry, this swine time schedule can be slipped back a quarter or two if legislative or construction time schedules cannot be met. The only real loss will be the processing facility overhead costs due to a lack of animals to slaughter The few animals presently in Alaska that are ready to be slaughtered can be handled on a training basis for employees, but until a sizable number of confined units producing finished pigs is on stream, the processing unit will not be economical. This fact should not cause a lot of concern if only for a short period. The processing unit will be the least expensive segment of the industry and for it to have idle capacity is better than have livestock ready for market and no processing plant available.

SECTION VII

DEVELOPMENT OF AN ALASKAN SLAUGHTER AND PROCESSING PLANT

A. Introduction

Upon arrival in Alaska one of the first comments that Featherstone representatives heard was that if a proper processing facility was available the state's livestock industry would take off on its own. By the time the reader has reached this point in this report, he should realize that a lot of work and capital is going to be needed to have a properly sized industry that is economically viable and that will perpetuate itself. It is very doubtful a processing plant alone will make the industry develop properly without a lot of planning on the producing side of the industry.

However, the idea that the processing facility is vitally necessary to get the industry started is probably a true statement. The present "chicken and egg" dilema of which comes first the live animals or the processing facility must be solved. To build a processing facility is the least expensive and will show the potential livestock producers the State is seriously behind them. The cost of underutilizing the processing facility, while the animal production is being built up, is not very expensive when compared to the cost of carry-over livestock waiting for a processing facility.

Alaska's livestock industry has another problem facing the processing plant that has been alluded in this report. The annual swine slaughter needs to be 70,000 head and the cattle slaughter 26,000 head. The total slaughter translates to only 369 head per day which, in the Industry's terms, is a small plant which is normally uneconomical. In order to have any economies of scale both species of livestock should be processed in the same plant. In the Lower 48 this practice was out of date by the mid 1960's with only specialized single species high volume plants being constructed. Featherstone however, feels that by combining facilities for by-product recovery, sharing welfare facilities, and producing pork sausage and hamburger in the same area, the inefficient aspects of the two small kill floors can be overcome. If the marketing scope of this plant is enlarged to encompass wholesaling other shipped-in meat products, the inefficiencies of the delivery system of small plants can also be overcome.

During the start-up years in the industry, having the two small kill floors together will probably ease the labor training problems that are inherent in the beginning. The even flow of animals available in the Lower 48 will take some time to develop in Alaska and the pool of trained people will take time to develop. By having the two floors together personnel can be cross-trained in both species allowing surges of animals to be handled more easily.

Another consideration favoring a dual species plant is when the time comes that a larger facility is needed for either species, the new plant can be built at a new location and the old plant can have room to expand with the other species. The equipment for slaughtering either species can be easily moved to a new facility and the space left behind will meet the requirements of expanding the kill floor of the remaining species.

In summary, Featherstone feels comfortable in recommending that Alaska break with the tradition of the Lower 48 and build a tandem kill floor plant to handle both cattle and hogs. The plant should be able to process 100 head of cattle per day and 270 head of hogs per day. In addition, the plant should process the resulting carcasses, the carcass animal cuts, the hides, and the remaining by-products to as full a degree as possible. The completeness of the facility will allow it to maximize its profit potential to overcome its inherent inefficiencies in size.

B. Ownership and Location of the Processing Facility

The form of ownership that the processing facility takes will have an impact upon its costs for several years. The quicker the plant can reach an optimum production level, the start up costs will be reduced.Besides the owners of the facility, the people who have the most to gain or lose from the facility being in existence are the livestock producers. If the livestock producers and the owners were the same people in the form of cooperative venture, maximum effort would be made to reach the optimum level of production. The producers would also feel more confident in increasing their production when they own the plant. They might be reluctant if an outsider owned the plant realizing if

that owner did not make a profit the plant could be shut down. The closing of the plant could mean financial disaster to the livestock producer who had built up a large investment in animals and equipment. For the above reasons Featherstone feels a cooperative venture of livestock producers should own the plant.

Finding the right location for the processing plant is also a difficult problem to solve. Wherever the plant is located, the local economy will be enhanced and as a result the site location can become quite political. Featherstone will not address these issues but will give its ideas on where the plant should be located on a general basis. The criteria for the specific location will also be given for a basis to start a site location study if one is desired.

It is felt the best location for the processing plant is close to the production of the animals and the animals should be close to the source of feed. The two potentially biggest grain producing areas in the State are Nenana and Delta. These two areas are less than 200 miles apart and have a good highway system between them and into the major population center of the State, Anchorage. In the Lower 48 it has been found that a processing plant cannot reach out more than 300 miles for a source of animals and remain profitable. The economics of shipping a live animal greater than that distance and the cost of sending livestock buyers that distance are prohibitive. For these reasons, Featherstone feels the plant should be located somewhere between Nenana and Delta on the highway system.

Over the years that Featherstone has done consulting work, they have boiled the final selection for a processing plant down to five areas. The economics of each area needs to be determined to give a guideline to their relative importance. Often the costs of one aspect in one location is restrictive while in another area a different aspect is cost restrictive. The degree of the restriction in the two different areas must be compared to make the final decision.

The five areas and the key points of each are as follows:

1. Labor
- a. Available supply.
- b. Hourly rates.
- c. Quality available.

2. Utilities
- a. Energy source for power and steam production.
- b. Water purity and availability.
- c. Sewage disposal and availability.
- d. Related environmental consideration.

3. Transportation
- a. Access to major highways.
- b. Availability of a rail spur.
- c. Freight rate differentials for finished product.

4. Land topography
- a. Proximity to a flood plain.
- b. Elevation for proper sewage discharge.

5. Community support
- a. Compliance with local planning.
- b. Ownership and zoning problems.

Due to the critical need for a processing plant to get the livestock industry started in Alaska as quickly as possible, the political expedient decision may dictat foregoing the analysis of some of these areas. The potential procrastination of making the decision could cause more damage in ways which cannot be put in dollar terms than the error in selection could cause.

C. Description of Cattle Slaughtering Facility

The cattle slaughtering facility should be designed to slaughter 100 cattle per day and have room at least double in capacity. A corral area outside the slaughter floor is the beginning point for any slaughtering facility. This corral area should be simple built with a shell covering and positioned so little of the noise from the plant can be heard by the cattle. The Alaskan facility should have a capacity of 300 cattle and have heated watering facilities but no feeding bunks. Cattle can fast for 24 hours before slaughter with no harmful effects.

From the corral area is a chute leading to the kill floor which can hold six or seven head rather snug. One at a time the animals will be led into the plant, stunned, shackled, lifted up onto a bleeding rail, and the main throat artery cut, making the animal bleed to death in a stunned condition. Once the animal is finished bleeding. The head is removed and tagged with a number as is the carcass for the government inspector to be sure the carcass he is looking at down the line is matched with the proper head. Once the head has been inspected, a worker will remove the tongue, and cheek and head meat plus any glands that may be used locally for pharmaceutical purposes. The balance of the head is put into a bone grinder and put into rendering.

The carcass with head removed is moved on the rail system through a series of stations from which operators remove the hide from around the four legs and belly area. In a system operating at 100 head per day, the rail system used moves the carcass by gravity or is a manual system. (On kill floor of over 200 head per day this rail system can be mechanized to move the carcass at a predetermined rate.) The loose portions of the hide are attached by chains to a wench that pulls the hide up off the back of the carcass. The hide will weigh

7% of the live animal weight on an average and is the most valuable by-product. In good operations the hide is removed in one piece and has no cuts or scores. Once removed the hide is placed on a table and excess fat is cut off and loose ends are trimmed off.

The hides then go to a brine solution for curing. After curing they are drained, lightly salted, folded and stored.

The carcass without the hide is now opened up and eviscerated. These internal organs are kept with the carcass until they both have been inspected with the head. Before being inspected however, the carcass is split into halves using a large power saw to cut down the backbone. The carcass is then inspected with all the other parts and the carcass is washed and shrouded. The shrouding process is wrapping each half carcass with a bleached white muslin cloth. The cloth is used to pull up or pull in certain areas of the carcass and then pinned in place with skewers. By using shrouds the surface blood vessels on the carcass are bleached out to give the carcass fat a clean white appearance and by holding certain muscles in the proper position during chilling the carcass cuts out better. The shrouded side of beef is then pushed into a cooler.

The carcass is chilled for 18 to 24 hours. The shroud is removed and the carcass is ready to be graded. If the carcass is to be graded a cut is made along the seventh rib bone exposing the eye of the rib for the grader. The carcass is now ready to be sold to retailers, wholesalers or to be partially deboned in the fabricating and/or institution cuts area described in Part F.

On the kill floor, the carcass was inspected for sanitation and wholesomeness. This inspection must be done in accordance with Federal guide lines as set down by the Department of Agriculture (U.S.D.A.) Such inspection may be done by the U.S.D.A., or it can be done by U.S.D.A. approved local veterinarians supplied by a State inspection service. The standards and rules for this inspection are set out in the Wholesome Meat Act of 1968 and subsequent amendments. Featherstone strongly recommends the plant be under the inspection services presently offered by the State if for no other reason than to be able to sell the 10% plus of the Alaskan population in the military.

D. Description of Swine Slaughter Facility

The process that Featherstone recommends to use for slaughtering hogs is identical to the process used for cattle. Swine being smaller animals and easier to eviscerate should be kept on a gravity rail system instead of a mechanized rate even though the initial kill rate will be 270 per day. The stunning area will be slightly different in that two or three animals may enter the plant together to be stunned and bled at the same time. Another change is after evisceration the carcass is inspected whole, the leaf lard is pulled out of the carcass cavity, and the carcass is rolled into the chill coolers whole and without a shroud.

It has only been in the last few years that swine slaughterers have skinned the animals like cattle. Prior to that time the carcass was scalded and dehaired leaving the processor, retailer, or ultimate consumer to remove the skin. The hides from swine however can be brined and salted just like beef hides. The market for these hides is quickly growing. Appendix J is an article comparing the traditional method and the new method of handling hides from swine. The energy related factors in this article have led Featherstone to recommend skinning swine carcasses. The only real drawback is if it is desired to sell the cuts from the carcass to other packers which have traditionally dealt with skin on product. Since the Alaskan plant will handle all of its own cuts to the retail level that disadvantage does not exist.

Once the carcasses are chilled, the following day they are taken to a cutting area. Pork carcasses are not graded as a general rule. In the Lower 48, 90-95% of all pork carcasses are cut into their primal cuts by the same plant that slaughtered the animal. This pork cutting operation wil be discussed in Part F.

E. Development of the By-Product Recovery System

As stated earlier the hides are the most valuable by-product. In a separate room off the kill floor these hides have been pickled in brine solution, salted, and tied in bundles. From here most plants this size would ship these hides to tanners who further process the hides into leather. This option is open to the Alaskan facility and all that is needed is storage area to hold the hides until an appropriate quantity can be shipped. The Japanese and Koreans are relatively close and both have facilities to handle both cattle and swine hides. Featherstone, however, has learned some tanning facilities were built into the Reindeer Herders Association processing facilities at Nome. A Featherstone representative contacted Virgil Severns, the Co-Operative Extension agent for this operation. Virgil said that B.I.A. owns some tanning facilities but they have never been used or even set up for operation and he was not sure if they had all the equipment needed to make a finished product. Featherstone recommends that whoever operates the cattle and swine processing unit should learn what equipment is in Nome for the possibility of starting a joint venture with the Reindeer Herders Association. The added hides for the new facilities may make the set up and utilization of this equipment feasible.

The viscera saved on the kill floor represents the next biggest source of revenue from by-products recovery. The normal organ products like the heart, tongue, and liver will be washed, packed, and frozen. A local market for such products should be readily available to the plant. The remaining offal products like the brain, stomach, lungs, spleens, intestines etc. have no real retail market. These products are normally ground and cooked in large, steam heated vessles called melters. The results of this cooking produce tallows (or greases) and dried meat scrapes or tankage. The two are separated by a screening process and sold separately for soaps and animal feed respectively. The blood and bones produced from the kill floor and boning areas can be added to this cooking process. Cattle will normally produce 150 lbs. per head of products for cooking or rendering and swine will produce 35 lbs. per head. Featherstone recommends a standard 12' x 5' cooker that has a 5000 lb. capacity to handle the product. If all of the day's product is cooked, this piece of equipment will reload five times a day. This schedule is tight, but possible. Room for a second cooker for expansion should definitely be made.

During Featherstone's visits to Alaska, it was learned the state has a very large dog population, which is fed dog food shipped from the Lower 48 as well as fish and a variety of products. Besides for the bones and blood, the raw products that are normally cooked, could be ground or hashed in their raw state, bagged, frozen, and sold as dog food. If such a product could be sold for enough extra money to cover this expense, the energy saved from not having to cook the product and the relieving of the tight time schedule, would make the expense very worth while. If the plant were able to have time in its cookers to save all the blood for one extended cook, the dried blood meal has valuable markets as a specialty fertilizer and feed supplement. The plant will also need a specialized cooker to make lard from parts of the pork carcasses.

The final by-product recovery comes from the sewer system in the plant. During the carcass cleaning process on the kill floor and the various daily clean up processes a fairly large quantity of fats material get washed down the sewer. All washdown sewer lines in the plant should leave the plant through a series of baffels in a pit. The fat will rise to the top of the pit and can be skimmed off and cooked into tallows and greases. Besides creating a saleable product, this practice greatly reduces the sewage problems associated with a processing facility.

The amount of time describing the by-product recovery systems needed may have seemed a waste of time to most readers. Featherstone has gone into this detail to show its relative simplicity. This by-product recovery is very important and can significantly affect the bottom line of the processing facility if done properly. In the Lower 48 as a general rule of thumb, the cost of the live animal is returned in the sale of the carcass. All of the operating expenses, overhead, and profit are created from the sale of offal products. It's hoped this rule of thumb will make the reader appreciate the value of by-products.

F. Development of Processing Facilities

Prior to the by-product recovery section, the processing description had stopped with chilled carcass ready for cutting. Each specie will be described separately and then the potential processed meat (hamburger and lunchmeat type products) will be described.

1. **Beef processing** — upon entering the cutting room the cut made at the seventh rib is completed and the half carcass is cut in two making a forequarter and a hindquarter. In the Lower 48 a sizable percentage of the total beef carcasses are shipped in this form to retail stores and between beef processing plants.

   The next set of cuts usually performed on the quarters is to break out the primal cuts — brisket, rib, navel, flank, loin, round and shanks. These cuts are also sent to retail stores in the Lower 48. However, the largest percentage of carcass from finished cattle in the Lower 48 are being fabricated. Fabricating is the process of taking primal cuts and removing most of the bones and all excess fat, then placing the remaining pieces of meat in heavy plastic bags which are vacuumized and sealed. The U.S.D.A. reported in 1979 that 800,000,000 lbs. of fabricated boxed beef were produced from 11,900,000 steers and heifer carcasses, representing 46% of the total federally inspected steer and heifer slaughter.[1]

   Fabricated, boxed meat has been shipped to Alaska for years. The reduced weight with the high transportation costs have made fabricating beef shipped to Alaska almost a necessity. Featherstone's calculation of transportation costs to Alaska for beef was figured on an average 450 lbs. fabricated carcass instead of the conventional 600 lb. full carcass.

   In the Lower 48 fabricating has become popular for two reasons — reduced store labor and ease of working with the product at the store

[1]Preliminary data based on special reports received as of July 1, 1980 from all slaughters/fabricators of boxed beef except food chains boxing beef for their own stores as reported in National Provisioner December 13, 1980, p. 53-54.

level. The reduced store labor is done with more labor at the processing facility which can be more specialized and efficient on a factory assembly line basis. When the product reaches the store level it is in boxes that are easily handled when compared to carcass beef that must be hung on hooks from an overhead rail system. By being in a vacuumized bag the product has an extra two or three weeks of storage life in the store if properly refrigerated. This storage capability permits store owners to order more freely during advertized sales and not having as big a worry if the sale is not successful. Product left over in the bags can be carried for regular business in the following weeks.

Two cuts from the carcass are usually not fabricated. They are the navel and flank. These two cuts are normally ground up and mixed with lean ground cow meat to make hamburger. Normally the carcasses of cull breeding animals and dairy animals do not have enough finish or quality in the meat to be sold as cuts in retail stores. These carcasses are usually completely boned and ground up for the manufacture of hamburger or lunchmeat. If hamburger is being made, the flank and navel cuts from fabricated carcasses are used to adjust the fat level up in cow meat to give the desired eating quality in the hamburger.

Another marketing innovation of recent years is for the central processing facility to make a coarse ground hamburger mix and put it in large 10 lbs. bags for the retail stores. This product again has a longer storage life than normal ground beef at the store level. The central plant can adjust the fat level on more economical quantity basis. The resulting product is then reground in the retail store to the normal hamburger grind size and packaged for sale.

Due to the demographic nature of Alaska's population a disproportionately large percentage of the food business is done in by hotel, restaurant and institutions (the H.R.I. trade). Some of the reasons for this large percentage will be discussed in section G. The H.R.I. trade requires some very special handling which includes portion control cutting of meat. In the Lower 48 the central processor will often make primal cuts specially for the needs of this H.R.I. trade. The actual portion control cutting is normally done by a different operator close to the market being served. Alaska has a few relatively small H.R.I. meat cutting operations. Most of the H.R.I. trade is being supplied by cutting facilities in Seattle. Featherstone believes this market is relatively easy to enter as will be discussed in section G and if the present Alaskan H.R.I. operators show no inclination to enlarge, the central processing facility should have the space and equipment needed to supply this market. This operation is also recommended for pork processing. The central plant should be capable of taking a halved carcass down to individual H.R.I. cuts or anywhere inbetween if necessary.

2. **Pork processing** — the pork carcass is handled completely different from beef. Upon entering the cutting area the sides are cut into the shoulder (butt and picnic) jowls, belly, loin, spareribs, and ham. All of these cuts can be sold at retail but normally only the loin, spareribs and butt portion of the shoulder are seen in grocery stores.

   The picnic portion of shoulder, the jowl, belly, and ham are often injected with a curing solution and smoked making cured pork products that carry a long shelf life. Cured and smoked pork bellies become bacon. This process can be done in line with the cutting table and requires only the injection machine and the smoking units. The added profit from producing cured pork products more than offsets the costs of this equipment. The market for these cuts on an uncured basis is rather limited even in the Lower 48 which makes this investment almost a necessity.

   During the cutting operation some small pieces like the neck bones and backbones are trimmed of any usable meat. This product is mixed with the boneless product of any other pork cut, ground, and mixed with salt and cured to make fresh pork sausage. Often the jowl and pork shoulder are boned for this purpose if the retail market is slow on these products. The equipment used to make pork sausage is the same used to make hamburger that has the fat level adjusted.

3. **Lunchmeat processing** — an alternate use for the coarse ground beef trimmings and boneless pork cuts is to make various lunchmeats. The only extra machinery that would be needed is a cutter, a stuffer with a built-in linking device, and appropriate packaging equipment if consumer size packages are desired as opposed to bulk packs (which would use the fabricating vacuumizing equipment). To produce lunchmeat some specialized expertise is needed and some extra space. The profit margins in this area, however, are the largest in the industry making the investment in the equipment and space usually worthwhile.

   Another advantage to processing lunchmeat is the potential for using by-products that otherwise would be rendered. Some common examples of such uses are pork livers to make

braunschweiger, beef hearts to make chili, and pork snouts and pork hearts to make souse.

The distribution of such products as well as bologna, wieners, and salami are natural with fresh carcass meat. If the funds are not immediately available for this operation, Featherstone recommends that at least space be built to house the operation in the future.

G. Development of the Marketing Systems

The marketing needs of an Alaskan processing facility will be different from the needs of a plant in the Lower 48. The size of the population is small, the single population percentage is high, the military population percentage is high, and retailers are presently being served from warehouses putting vans together in Seattle. To Featherstone all of these factors point to the plant servicing as wide a segment of the market as possible. If the plant is to effectively sell local stores in the State, as many of the meat products as possible should be offered. By doing so, more tonnage is delivered on each stop of the delivery vehicle which can reduce delivery cost by as much as $0.05 per pound. To be viable and competitive in the market the plant must keep its sales and delivery costs as low as possible. By having both species of fresh meat available with smoked, cured pork items and lunchmeat, the plant has a good chance of having reduced delivery and sales costs. If the plant were to handle other products from the Lower 48, however, those costs could be reduced even further. Featherstone recommends the plant should investigate compatible products like chickens, canned hams, specialty sausage items not made locally and other chilled non competitive items sold in the meat department of a retail store.

The large percentage of single people in Alaska generally means more restaurant business. The military population is fed on an institutionalized basis. Both of these markets account for as much as 40 to 45% of the total meat consumption in the State. For this reason having H.R.I. meat products available becomes very important if the plant is to capture 50% of the market. Military bases have been directed to buy locally when at all possible if the price is competitive. The restaurant business is quality and price conscious and not label conscious like the retail market. To get all of the military business in beef and pork should be possible within a few years. The plant should get 75% of the restaurant business in the same time period. The retail market will have to be penetrated and the plant will have to get 22% in order to have 50% of the total market. To get this percentage will require a good product that is consistant, and priced at or below the present market, and sold by knowledgable salesmen. A retail butcher will resist adding a new supplier because of the added paperwork involved. A good salesman is needed to convince him that the local plant will be beneficial. Once the retail butcher in the store is convinced, the general manager or supervisor who makes the final decision is easier to sell. Besides resisting a new supplier, the salesman will have to compete with the Seattle suppliers who will not easily relinquish the business they have profited from for years. To obtain 22% of the retail market, however, is not an insurmountable goal and can be done with good management.

One of the first marketing decisions that the operator will have to make will be on whether or not the beef will be U.S.D.A. graded. Beef graded U.S.D.A. Choice is a standard in the industry and if supplied would eliminate many objections received by the salesman. The market in Alaska is also very familiar with Choice graded beef and only recently has Market Basket, Proctor, D & A, and Safeway introduced ungraded beef in a limited way. The cost of grading beef by the normal means as in the Lower 48 is almost prohibitive. Graders from the U.S.D.A. cost $20.20 per hour and must be guaranteed 40 hours per week. This means a cost of $808 per week must be paid by the 70% of the weekly kill that are feedlot finished cattle or 350 head. The cost would be $2.31 per head.

An average grader can grade 50 head per hour without a moving rail which means he will only have seven hours per week of work at the plant.

Featherstone contacted the grading service of the U.S.D.A. in Washington to find solutions to reducing this cost. Featherstone learned it takes two years to train a grader (if he has the proper background) which also became an obstacle. However, it was learned that several graders have requested transfers to Alaska if an opening should occur. The costs of training a designated person would be eliminated if such a grader was used. To relieve the cost burden the grading service has a 60-40 time sharing program that is used in Hawaii, Nevada, Virginia, and North Carolina. In these states the state government pays the graders actual wages and 60% of the normal overhead costs associated with providing the service. The federal government is paid the other 40% to provide supervisory personnel. This grader can then be used by the state in whatever capacity it sees fit and can charge whatever they want to the recipients of the grader's services. Besides grading cattle, the grader will also be qualified as a weights and measures inspector, be able to certify food products for state and federal purchases, provide a market news service, and grade a variety of dairy and poultry products. The operator of the plant and the division of Agriculture in Alaska will have to work out this program if grading service is desired.

H. The Size and Cost of Plant and Equipment

Without actually designing the plant, Featherstone has estimated the number of square feet needed in each section of the plant and the equipment needs. From the square footage in each section taking into account needed ceiling heights and possible insulation requirements, a cost on a square foot basis was determined. A manufacturers price list of equipment was obtained and the prices in it were marked up 30% to cover inflation until 1983. Areas that have the same general requirements are added together to reduce the number of repetitious calculations.

1. **Kill Floors** — both pork and beef and includes hide area and room to work up by-products prior to rendering.

Square footage	6250	
Cost per sq.ft.	$102	
Cost for building		$637,500
Equipment costs		179,400
Total for Kill Floors		$816,900

2. **Rendering Area** — includes mechanical shop

Square footage	2500	
Cost per sq.ft.	$ 82	
Cost for building		$205,000
Equipment costs		348,400
Total for Rendering		$553,400

3. **Cooler Areas** — includes area to chill carcasses, all boning operations, refrigerated warehousing area, curing and smoking area, and shipping facilities.

Square footage	12,700	
Cost per sq.ft.	$ 85	
Cost of building		$1,079,500
Equipment Costs		343,600
Total for Cooler Areas		$1,423,100

4. **Employee Welfare and Offices** — includes dry storage and laboratory.

Square footage	6200	
Cost per sq.ft.	$ 55	
Cost of building		$341,000
Equipment Cost		12,000
Total Welfare and Office		$353,000

5. **Lunchmeat Production Area** — equipment includes added refrigeration equipment.

Square footage	1900	
Cost per sq.ft.	$ 85	
Cost of building		$161,500
Equipment Cost		169,100
Total for Lunchmeat Production		$330,600

6. **Miscellaneous equipment and supplies** $41,000

Grand totals	
Building costs	$2,424,500
Equipment costs	1,093,400
Combined	$3,517,900

These costs are estimates and the individual components will not cost out on a separate basis. Common walls and floors permit certain economies in construction. The concrete price used was $120 per cubic yard and construction labor wages were priced at $21.00 per hour. These two costs increase the price $24.00 per square footage on 29,550 or $709,200.

Featherstone in these figures has not allowed for any steam producing boilers (assuming outside steam can be purchased) and no sewage disposal facilities. Presently in the Lower 48 many slaughtering plants are closed and their equipment is for sale. From such plants used equipment can often be purchased at a fraction of the normal costs. This practice should only be done by an experienced person in such procedures or the equipment on a delivered installed, overhauled basis can cost more than original equipment purchased and delivered new.

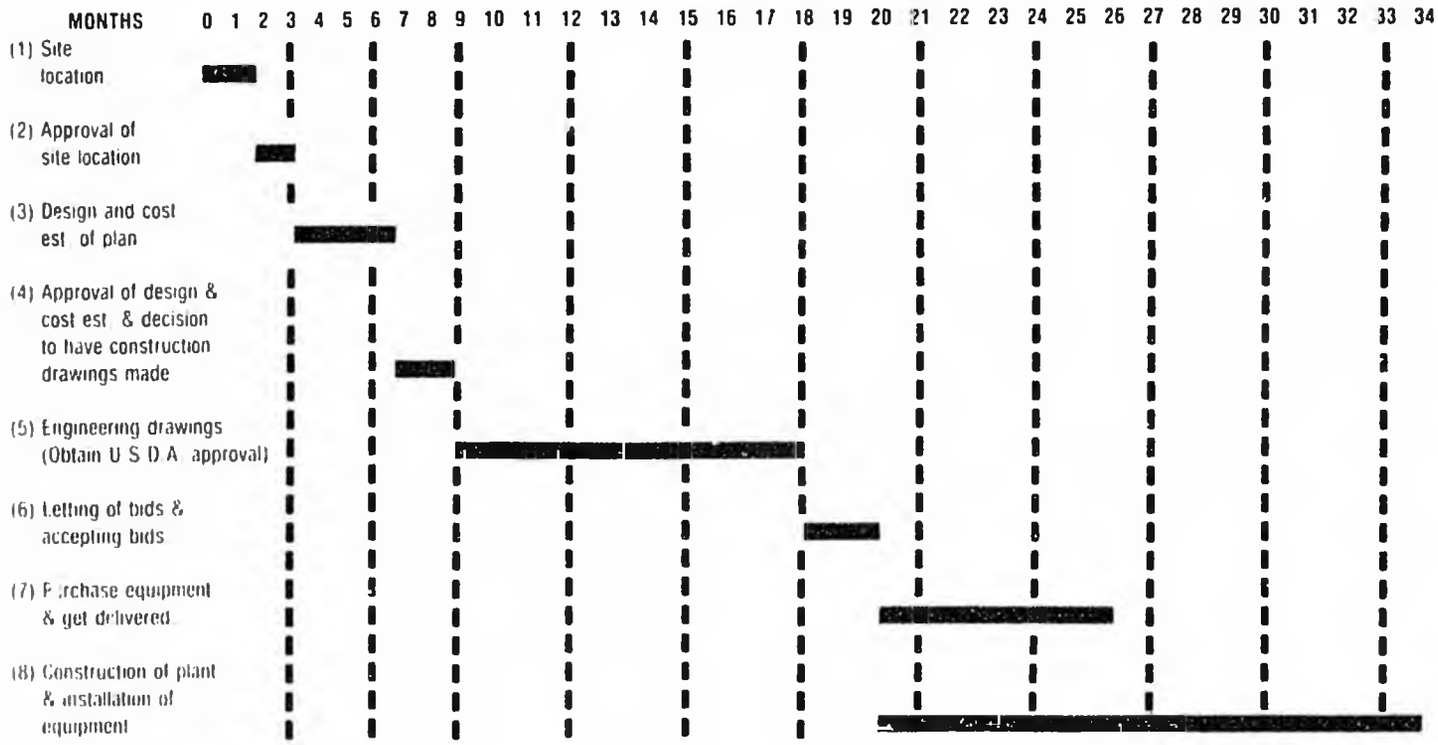
I. Design and Construction of the Processing Plant

Two methods of designing and constructing the processing plant can be used, a conventional method, and a fast-track method. The conventional method proceeds through each step of the process one at a time and has frequent decision points where changes can be made. The fast-track method provides for functions in the project to overlap reducing total time to build the plant. The fast-track method, however, precludes many decision points and normal construction bidding procedures must be greatly modified.

The following two tables (18 & 19) show the time frame involved with each method:

Featherstone is aware many people in Alaska, and especially people presently owning livestock want a processing facility built as soon as possible. The fast-track method will expedite the completion of the facility. Featherstone has had experience with both schedules and believes both can produce good functional plants. However, the fast-track method will increase the cost of the building 10 to 15% normally because competitive bidding is greatly restricted and overtime in designing is necessary. In reviewing the other areas of the industry Featherstone also sees the added time of the conventional method relieving the time pressures of building confined animal units, feedmills and the like. This decision, however, is in the hands of the legislature of Alaska, the funding body for such a project. Such a design and construction schedule decision should be carefully weighed.

TABLE 18
CONVENTIONAL CONSTRUCTION FLOW

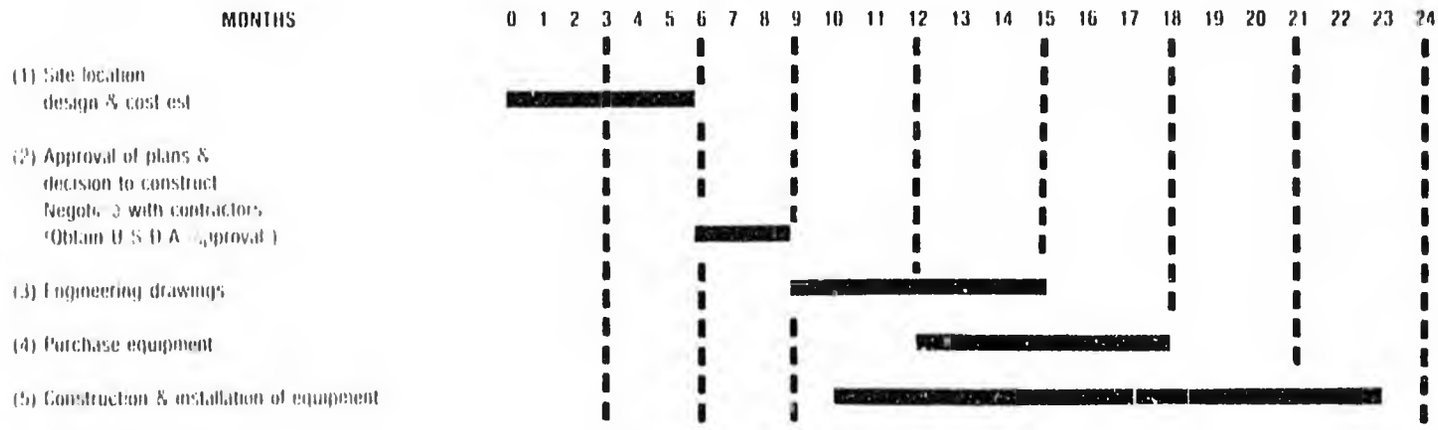


TOTAL 34 MONTHS

*Approval points or decision points

All market development, shipping requirements, and contract negotiations for sales can be done in last 12 months of construction

TABLE 19
FAST-TRACK CONSTRUCTION PLAN



TOTAL 23 MONTHS

*Decision point

All market development, shipping requirements, and contract negotiations for sales can be done in last 12 months of construction

This construction schedule has only one decision point and relys heavily on designers, engineers, and contractors to work as a team instead of separate entities. Bidding of project is normally only a guarantee not to exceed with time and materials priced on a cost plus mark up basis

SECTION VIII

NECESSARY INFRASTRUCTURAL NEEDS OF THE LIVESTOCK INDUSTRY

When Featherstone was first contacted about doing this report, there was considerable concern about having the needed infrastructure in Alaska to support a livestock industry. Hopefully this section will relieve that concern. The infrastructural needs of the livestock industry are very few in number and can be easily met. These needs can be separated into two classes; those needs which must be supplied to the industry, and those items which need to be sold by the industry to become viable.

The needs which must be supplied to the industry fall into two categories; those required by the animals and those required by the equipment. The animal needs are all medical and nutritional in nature. The medical needs must be supplied by a veterinarian. If a cooperative is formed in the livestock industry one of the first services it should supply is the use of a veterinarian. By hiring one veterinarian the needs of the 27 cow-calf operations, two feed lots, and 28 confined swine units could be supplied 90% of the time. The remaining 10% of the time the emergencies that occur when the coop vet is in the other part of the State — local vets could fill in with little problem. The desire of vets in the North Star Borough when interviewed to have a large animal or livestock practice was quite positive. The coop could probably hire one of these vets on a retainer basis initially until the industry was fully developed and then that vet could be hired on a full time basis.

The supplies that the vet will need are already being supplied to the State. The inventory of those supplies will have to be increased. If more information is desired on availability and lead time for veterinarian supplies, the reader can contact Jerry Rudisill in Anchorage at J.R. Distributing.

The nutritional needs of the animals are for feed grains, forage, supplements, vitamins, and minerals. The feed grains and forages are presently being grown in Alaska and the technology to expand that production is already available. The supplement needs of the animals are greatly reduced when barley is the prime crop fed, which is the case in Alaska. Two supplements are available from the fishing industry in Alaska — fish meal and crab meal. Both are presently available in abundant supply. Another potential supplement is meat and bone meal produced by the processing plant from its rendering operations. Presently, the Alaska Mill and Feed Co. owned by Don Donotello has a rendering operation in Anchorage which can initially supply meat and bone meal if the livestock producers want it. The last potential type of supplement is from rape seed which is used in Canada. Presently, this product is not permitted to be used in the United States by Food and Drug Administration. This restriction is presently being appealed and within a few years could be released for use which would be a practical protein supplement source that could be grown in Alaska.

The vitamins and mineral needs of the animals must be supplied with product supplied by the Lower 48. These materials are used in relatively small quantities and must be produced in large quantities to reduce costs. The shelf life of these products often is limited which precludes the possibility of their manufacture in Alaska. To obtain quantity purchase discounts and reduced transportation charges, the cooperative could purchase these materials for resale to members. The availability of vitamins and minerals on a pre-mix basis from the Lower 48 is not a problem.

The needs of the equipment in the livestock industry are in the livestock handling area and the processing plant area of the livestock. After the initial equipment for handling livestock is purchased, the maintenance and replacement needs are minimal. The problems with trucks in Alaska has been overcome in other industries and will be no different in the livestock industry. The confinement equipment requires only a few spare pieces and an electric arc welder. For the most part good farmers can maintain their own equipment fairly well. The parts that need replacing like motors and bearings are not exotic and can be replaced locally in most cases.

The maintenance and replacement needs for the processing plant however is different. The machine shop in the processing plant should have good lathe and lathe operator, with plenty of metal stock and manuals for all the equipment in the plant. Spare motors, bearings, rings, valves, etc. should be kept on hand for the refrigeration equipment. Supplies like ammonia (or freon), clean up soaps and sanitizing agents, knives, saw blades and the numerous miscellaneous items needed in a processing facility must be kept in adequate quantity to allow for delivery time from the Lower 48 if necessary. Many items used in the plant are warehoused in Alaska now but the larger items should be inventoried.

The items which need to be sold by the industry to make it viable primarily are produced by the processing facility. As mentioned in the by-product recovery section Part IX the sales of by-products are very important to the profitability of the plant. A market must be developed for the meat, blood and bone meal, various organ meats, and various glandular products. The meat, blood and bone meal as discussed above can be sold as a lievestock protein feed supplement. This product can be used by all livestock not just cattle and swine. Manufacturers of hard dog food, horse feed, chicken feed, and other animals can all use this product. The protein level of the meal will vary between 55 and 65% depending on the amount of blood meal use. Consequently, for all these different feeds, such a meal can be a cheap source of protein.

The various organ meats like tongues, hearts, spleen, lungs, etc. can be packed, frozen and sold in some cases. The labor to prepare these products is great and often the price received is not enough to justify the labor. The items which do not sell readily and profitability can be coarse ground, bagged and frozen for use as dog food to the many dog mushers in the state. What quantity cannot be sold in this manner can be put into the melters to make meat meal and tallow.

The remaining by-products that must be sold is the hides which have been brine cured and salted. As mentioned in Section VII the facilities in Nome may be an outlet for these hides. If these facilities are not available the hides can be stored almost Indefinitely and when a sufficient quantity is available a railroad car can be loaded and the hides sold on a world market basis. These hides are quoted daily and brokerage firms sell hides daily for packers. Although transportation must be paid to sell these hides in this manner, the value returned from them is more than worthwhile.

Featherstone hopes the reader can now understand how the industry is fairly self reliant and needs little infrastructure. The majority of what is needed is already in Alaska and does not have to be imported. The few outside suppliers and outside markets that are needed will probably develop rapidly once the industry begins to take on the size indicated in this report. The industry in the Lower 48 is in a mature point in the industrial growth cycle which means few facets of it are expanding and many are consolidating and contracting in size. As a result the suppliers and buyers in the industry are looking for areas like Alaska that are just starting a livestock industry. These people often are willing to put very attractive packages together for the industry if new accounts can be created. Alaska without a doubt will be taken seriously by these sellers and buyers because the world is very conscious of Alaska's need to invest their oil revenues. With a conducive atmosphere for the industry's needed infrastructure and the availability of money in Alaska, Featherstone sees little problem in developing those needs on an economically viable basis.

SECTION IX

THE TOTAL NECESSARY FUNDS NEEDED FOR THE LIVESTOCK INDUSTRY

This section is a summation of the cost estimates contained in Sections VII, VIII and IX. At the end of the listing is what is not included and a discussion of why it is not included.

TABLE 20
TOTAL INDUSTRY COSTS

	Per Unit	For Industry
Cattle Industry		
1. Cow-Calf Operation		
a. Land 3000 Ac./27 Units	$ 900,000	$24,300,000
b. Breed Stk. 375 Cows) 25 Bulls)	520,000	14,040,000
c. Feeding Equipment	375,000	10,125,000
d. General Equipment	350,000	9,450,000
Sub-Total	$2,145,000	$57,915,000
2. Growing Operation		6,100,000
3. Feed Mill - 2 units	455,000	910,000
4. Confined Feed Lots		
a. Building - 2 Units	1,800,000	3,600,000
b. Land - 60 Ac.	18,000	36,000
c. Miscellaneous Equipment	125,000	36,000
Sub-Total	$1,943,000	$ 3,886,000
Total	$4,543,000	$68,811,000
Swine Industry		
1. Confined Units - 28 Units	$ 450,00	$12,600,000
2. Breeding Stock 144 Sows) 15 Boars)	66 C00	1,864,000
3. Feed Mill - 3 units	692,000	2,076,000
Total	$1,208,600	$16,540,800

Processing Plant	**Building**	**Equipment**	**Total**
1. Kill Floors	$ 637,500	$ 179,400	$ 816,900
2. Rendering-By-Products	205,000	348,400	553,400
3. Coolers-Chill, Cut,Smoke, Ship	1,079,500	343,600	1,423,100
4. Office and Welfare	341,000	343,600	1,423,100
5. Lunch Meat Production	161,500	169,000	330,500
6. Miscellaneous Supplies		41,000	41,000
Total	$2,424,500	$1,093,400	$ 3,517,900
Total of Cattle, Swine and Processing			$89,869,700
Total Without Land			$59,533,700

There are some very pertinent cost areas that have been omitted from these figures that should be discussed. Featherstone considers these costs as double entering investments made in other sections of agriculture in Alaska. The first cost area is the feed supply for both the cattle and swine. The total grain that needs to be stored and that is needed to raise that animal have been omitted since the grain farmer has been loaned money or has invested his money in that crop previously . When the livestockman pays for the feed the investment in the grain farmer's working capital account is reduced until he reinvests that money the following year. This investment in agriculture should only be shown once.

Similarly the stock of animals in the growing stage, in the confined units and held in the processing unit, have not been shown. The price paid to the cow-calf operator would again be recorded as an investment two or three times and now in the same industry.

The land costs have been left out of the swine industry and processing plant because they are relativley small compared to the cattle industry. The land costs were subtracted out of the final industry total so the reader can see what is invested in animals, equipment, and buildings in the industry. The land is presently owned by the state or has already been purchased from the state. Featherstone feels for the state to consider the land and cost to clear that land the same as investment in an industrial building is wrong. An investment by definition is the act of committing funds or assets for business purposes with the expectation of making a profit. The state by funding land purchases and the cost to clear that land should not expect the profit from that land that the farmer makes by using it. From a political standpoint the state lands are owned by the people and the purchase is a method of redistributing that land back to the people on a valued basis. If the land were to be used for a state wildlife park, the state would consider the buildings and other assets on the land as an investment but the land itself would not be included in that investment.

The final cost that has been left out is the cost of supplying electrical power, steam power, and sewage facilities to the processing plant and the livestock producing units. Contained in the livestock units are lagoons but the cost of pumping and spreading the sludge are not and should be borne by the recipient of the fertilization material. The processing facility will need all three utilities and can be purchased from municipal utilities or the plant can build their own systems. The municipal utilities have adequate back-up systems in case of failures which would be expensive and wasteful for the processing plant to build. Featherstone definitely recommends as many of these three utilities be purchased from local municipalities and not be invested in by the industry.

SECTION X

RECOMMENDED LEGISLATIVE AREAS FOR DEVELOPING A LIVESTOCK INDUSTRY

The state of Alaska in August of 1978 sold about 60,000 acres of state lands in a lottery. Since then, lotteries have been set up for the Point MacKinsey project and Delta II project. The lotteries were detailed in accordance with the provisions of AS38.05 from chapter number 176 of the 1978 session and chapter number 85 of the 1979 session. A study was made in 1977 by Hanson Associates called "Financial Assessment of The Delta-Clearwater Barley Project-Phase III: How to Meet Financing Needs Report." In this study is a review of all possible financing methods and recommendations on how and where to get what kind of financing. Featherstone has reviewed all of these documents and feels the methods and expertise to start the livestock industry in Alaska legislatively and financially is already in existence. An outside consultant would be hard pressed to improve on techniques that have been reviewed and modified which function as well as the lottery system already in use. A few of the financing techniques Hanson described have changed but more will change in 1981 and new methods will be devised with the change of Administrations in Washington this year.

Featherstone, however, does want to make some recommendations in some different legislative areas. Livestock production and agriculture in general is difficult in Alaska and people with the needed expertise and investment capabilities have a tendency to write off Alaska and look elsewhere. If agriculture in general is to survive in Alaska, it must be supported and be in an atmosphere conducive to long term development. The initial shove or push, given by the present Legislature and Governor are just a start and more base or ground work must be built. To create this base Featherstone has three recommendations that need to be implemented as quickly as possible.

The first recommendation is to extend price supports for locally produced barley and dairy products until prices received on the open market at least equal costs to produce. The present barley price support is due to expire soon and the dairy industry has only two years of help. The livestock industry will need a price support system for hogs, feeder cattle, and finished cattle. By putting a set time at which the supoorts are removed is to assume that market conditions have generally been profitable and new operations anywhere could have succeeded. Market conditions in agriculture, however, are not always profitable and loss conditions can exist for years. In the Lower 48 the good established farmers are stable enough to weather these bad periods and poor farmers or new farmers usually go bankrupt in these periods. For the legislature to assume they can predict when these profitable periods will be in advance and then have the industry start during that period is a very questionable assumption. If a well established stable base in agriculture is really desired, a review of the present price supports and price supports for other products like livestock should be made. A system tied to profitability rather than time would appear to be more realistic.

The second recommendation has been alluded to in the main descriptive body of this report. The livestock industry deals with live animals that have unique characteristics and they change with their environment. How livestock will change in the Alaskan environment cannot be predicted when raised on a mass scale as developed in this report. A research and development facility must be created for the industry. The natural insititution to direct the needed facilities is the University of Alaska. The facilities must be realistically sized to simulate commercial conditions in order to deal with problems livestock producers will encounter. The present facilities at Fairbanks, and Homer are badly understaffed and under financed serving little real purpose. Featherstone recommends that the legislature purchase a confined swine operation and cow-calf operation (with small feed lot capabilities) and give them to the University. These operations must be specially equipped for teaching needs and research needs. Class rooms must be available in them and enlarged animal shelters for students to observe and handle the animals. Special stall for controlled breeding and feeding are needed in order to give valid research data. Well trained students in animal husbandry capable of putting research data into practical applications represent the real future in livestock production in Alaska. A mass infusion of funds into the industry now will give it a good start but the students of tomorrow must keep it going after the money runs out.

The third recommendation is an administrative one on the state level. Agriculture should be promoted to a full department with its own commissioner as found in all state governments in the Lower 48 that have any

agricultural base at all. The present situation with the Division of Agriculture having a director that is under the Department of Natural Resources is burdensome. The farmers, who are struggling to get started in the state, should feel they have a person in the state capitol who has the Governor's attention, and the respect of the legislature, and whose primary concern is agriculture. Such an elevation to department status would tell the people of the State and farmers that everyone in government is behind agriculture and for the long term. The department should be adequately funded and staffed to direct and promote agriculture in the state fully. This would involve from securing funding for special developmental projects to conducting state fairs.

All of these recommendations are long term in nature and supportive of an agricultural base in Alaska. The overall benefits of these moves may never be fully appreciated and someday will be taken for granted. If they are done however, in twenty years from now the people in agriculture and the state legislators in the know will wonder how agriculture could have existed in the 1980's without price supports, research facilities, and a Department of Agriculture. The price supports may go by the wayside but the last two will become indispensable institutions.

SECTION XI
CONCLUSION

This report has shown how a livestock industry can be made to function in Alaska. In the process, it has been shown how the local industry will be able to more economically supply the Alaskan market than the industry in the Lower 48. As the local industry is described, an investment of between $60,000,000 and $90,000,000 (depending on your viewpoint on land) will be needed to get the industry started. This concluding section will show what benefits economically will be derived by the state as a whole and then, through an example of how the Nenana area can be developed, will show how individual areas of the state can become prosperous, economic assets for the entire state.

The primary benefit that will have the biggest economic impact on the entire state is the number of jobs created by the livestock industry. As described in the report, there will be 27 cow-calf operations, two feed lots for cattle, 28 confined swine units, and three swine feed mills. Each of these operations are designed in size to be handled by a husband and wife family unit with some part-time help needed during peak times. Consequently, 60 family units or 120 people will be employed from just the producing side of the industry. The processing facility when operating at optimum production levels will employ another 65 people on a full time basis. On a regular part-time basis the industry will also require truck drivers to transport animals, suppliers of animal health care products, veterinarians, livestock auctioneers, and commodity traders. The full time employees by the industry will total 125 people or families. If the average income from the North Star Borough of $11,252 is used times 60 for the livestock producing units, the annual payroll will be $675,120. For the 65 jobs in the processing plant the average hourly rate union rate would be $17.94 which on an annual basis would be $37,315 or an industry total of $2,425,488 per year. The producing segment of the industry will provide few, if any, susequent jobs in the economy due to the independent nature of the operations. The processing plant will have an employment multiplier effect similar to the fish processing industry of Alaska which has a recognized multiplier of 6.03.[1] The projected table shows the potential effect of the industry.

Livestock Producing Units	60	
Average Income	x $11,252	
Sub-Total	$675,120	
Multiplier	1.0	
Total for Producing Units		$675,120
Processing Plant Units	65	
Average Income	x $37,315	
Sub-Total	$2,425,475	
Multiplier	6.03	
Total for Processing Unit		$14,625,614
Total for Industry		$15,300,734

[1]Charles L. Logsdon, *A Structural Analysis of the Alaska-Washington Trade: An Input-Output Study*, Unpublished Master of Arts Thesis, Department of Agricultural Economics, Washington State University, Pullman, Washington, 1975.

The next economic impact to be looked at is the gross sales of the industry which will now stay in the state. The industry will be sized to generate 26,000,000 lbs. of live cattle presently worth $65.00 per cwt. and 15,400,000 lbs. of live swine presently worth $50.00 per cwt. These figures give a gross sales figure in the state of $24,700,000 annually. In addition to the value of the live animals the state is also paying $15.00 per cwt. shipping costs on the fresh meat of 21,150,000 lbs. which amounts to $3,172,500. The total value lost by the state is $27,872,500 in gross sales at today's livestock prices and shipping costs.

In order to demonstrate the economic impact of these large figures (especially the freight figure) on the individual consumer, Featherstone has found these comparative figures from the same day's newspapers for Safeway stores advertised sales:

Item Dec. 10, 1980	Seattle Post-Intell	Anchorage Daily News
Choice Bnls. Chuck Roast	$1.99/Lb	$2.09/Lb
Bnls. Pork Butt Shldr	1.39/Lb	1.79/Lb
Smoke-A-Roma Sliced Bcn	1.49/Lb	1.89/Lb
Scotch Buy Bologna	1.49/Lb	1.89/Lb
Lean Ground Beef	1.99/Lb	1.79/Lb

The local industry will still have higher costs than in the Lower 48, however the added costs as well as the base cost will all stay in the state's economy and will not be shipped to Seattle. There is one last figure that

Featherstone learned about Alaska's meat industry that the average consumer should be aware of, that he can relate to easily. The state has an inventory of only four (4) days of red meat in the retail stores. A breakdown in shipping products to Alaska for even a short period will quickly change consumer buying patterns within the state. For this reason alone the investment in a livestock industry becomes a type of insurance to protect present life styles.

The livestock industry will be able to have a large impact on small rural communities in Alaska where the actual production will occur. Villages and areas in the grain producing sections of the state and in areas that have good soils for pasturing cattle will be able to gain an industry that will stabilize their economy. Rural communities have little chance of supplying the big utility needs of a manufacturing concern and as a result are passed over during site location work for new expansions. Livestock production however is well suited to these areas and can produce a long term solid economic base to such areas.

One such area in Alaska that from a soils standpoint could take advantage of the livestock industry is Nenana. This local community has identified two connected townships containing all Class II and Class III soils and the townships have been patented by the state making them eligible for lotteries under the laws governing disposal of state lands for agricultural purposes. The two townships from the Fairbanks Base Line and Fairbanks Meridian Line are T4S, R11W, and T4S, R10W, the east border of which is within ten (10) miles of Nenana. The two townships represent 46,080 acres of land. Featherstone has determined that this parcel of land could be made to support seven (7) cow-calf operations (25% of the industry) twelve (12) confined swine units (of the 28 needed), one (1) confined feed lot for 5,000 head of cattle (of the 2 needed), and all of the grain needed for these operations.

The cow-calf operations were sized at 750 cow units per operation and each operation would need 3,000 acres to produce enough forage for winter feeding. The seven cow-calf operations together would need 21,000 acres.

The confined swine units will need forty (40) acres maximum for their operations. Each unit will need 935 tons of barley per year and if one acre produces one ton, then each unit will need barley farms in the area of 935 acres. Multiplying this figure times twelve the hog operations and supporting barley farms will need 11,700 acres.

The confined cattle feeding operation itself will require 100 acres with proper waste disposal. If the lot is turned twice a year with only finishing cattle (each consuming 1,745 lbs. of barley), the 10,000 head of cattle will consume 8,725 tons of barley which again will need 8,725 acres of barley farms.

The following totals the acreage needs for the Nenana operations:

Cow-Calf operations (7)	21,000 Acres
Confined Swine Units (12)	480 Acres
Feed for Swine (935/unit)	11,220 Acres
Confined Cattle Feed Lot	100 Acres
Feed for Cattle Feed Lot	8,725 Acres
Total	41,525 Acres

By using 41,525 acres of the two townships, 4,555 acres (or 10% of the total) are left for roadways, houses, and miscellaneous uses like the growing phase of cattle. If the 19,945 acres of barley farms were in 2,400 to 2,500 acre farms there would be 8 operations. Then if the cattle feed lot was operated by one family, this agricultural base would provide jobs for 28 families plus a variety of part-time jobs throughout the year. Part-time help would be needed during calving season, during the planting and harvesting seasons, while the confined swine unit operators are away from their operations, and, of course, for transporting product to market.

To Nenana and the Totchaket area this primary level of activity would greatly spur the local economy and create the need for a secondary level of supply for the industry. Such secondary supply needs are wholesale implement and supply dealers. and maintenance and repair functions. If the proper atmosphere is created by Nenana, this secondary level could be economically as important as the primary level. Local communities that supply agriculture in the Lower 48 have a lower level of unemployment, lower cost of living, and smaller fluctuations in their general economy than their neighboring or regional metropolitan area.

These same general comments are true of whole states in the Lower 48 which have a strong agricultural base. In the full potential of Alaska's agriculture is realized, the state's economy would be greatly enhanced. The industry described in this report is small by many standards but is sized to handle 50% of the market of the rail belt. Other states with larger operations in the industry however, developed over a long period of time. What the state of Alaska is proposing to do has never been done anywhere in the Lower 48 or any part of the free world that is known to Featherstone. The complexity of the project and the large sum of capital to start such a project would be impossible for any other state.

Featherstone commends the state of Alaska in its effort and forethoughts, and is proud to be able to be part of the initial planning.

SECTION XII
APPENDICES

APPENDIX A

Establishing A Quality Forage Crop

—How To Put All The Pieces Together

by Dr. William F. Hueg, Jr.

A successful forage program does not come about by chance. It develops from careful planning. These plans include the right specie and variety, adequate lime and fertilizer, and appropriate use of herbicides and insecticides. Properly put together and with a helping hand from nature, these individual items assure success. Leave out a single one and you flirt with failure and disappointment.

The establishment of a successful forage stand can be compared to a jig-saw puzzle. If any piece is missing, the puzzle cannot be completed. Let's look at the puzzle pieces and see whether you will complete the picture — establishing a quality forage crop.

1. The soil is a vast reservoir of nutrient elements, organic matter and microorganisms when supplemented by good water if irrigation is planned. One cannot tell what reserves of nutrient elements are in the soil just by looking at it. A soil test is the best tool to determine the level of soil nutrients present and what additions are needed. Similarly, available water should be tested to ascertain its chemical content with respect to both irrigation and animal consumption.

2. The soil is an important part of the growing plant's environment. To assure good stands, prepare and plant in a good seed bed. A good seed bed for forage grasses and legumes is well pulverized, smooth and firm.

Lime and fertilize by soil test. The soil test should serve as a guide. Good legume establishment cannot be expected if soil acidity is below pH 6.0. Alfalfa does best on soils of pH of 6.5 to 7.0. The nodule-forming bacteria work more efficiently in soil where the pH is near the neutral point, pH 7.0. In addition, phosphorus and potassium are more available within the range of pH 6.0 to 7.0.

About the author . . .
WILLIAM F. HUEG, JR. is professor of agronomy and plant genetics, deputy vice president and dean of the Institute of Agriculture, Forestry and Home Economics at the University of Minnesota. He served as director of the University of Minnesota Agricultural Experiment Station from 1966 until June, 1974. His specialization in forage physiology and seed production resulted in a management system for improved forage harvesting

3. It is preferable to apply lime one year ahead of seeding. Mix it well with the surface soil. Additions of lime should increase forage yields.

Legumes respond to fertilizer treatment at seeding time. Phosphorus is needed for early root development; potash for thrifty plants; and nitrogen boosts grass seedlings, and may benefit legume seedlings, especially on sandy soils. The proper placement of fertilizer aids establishment. Band seeding assures good forage stands due to efficient seed and fertilizer use.

4. Use high quality seed. Most state experiment stations and extension services provide information based on their evaluation of a wide range of forage species and varieties now available from public and private research programs. Purchase the highest quality seed — germination, varietal purity, disease resistence — of the specie desired. Select the specie that when grown in mixture, will have similar maturity stages. Also, for mixtures, select species that will not compete too vigorously with one another.

5. Nitrogen-fixing bacteria are essential for good forage legume establishment. These bacteria are in most soils but may not be the right type or in sufficient quantity to assure good nodulation. Two methods of inoculation are commonly used: (1) fresh treatment of seed immediately before planting, or (2) use of pre-inoculated seed. With possible shortages and higher prices for nitrogen fertilizer, the combination of legumes and grasses can provide part of the nitrogen for the grass species in the mixture.

6. Several methods are available: broadcast, drilled, cultipacker or band seeding. Do not plant more than one-half inch deep for best results on fine textured soils (clays and silts), and one inch deep on coarse textured soils (sand). Grain drills can be modified for or can be purchased with band seeding equipment. The important thing is to have the small forage seeds drop behind disk openers in order to avoid deep planting. The cultipacker seeder assures good forage stands by placing seed close to the surface and in a firm seed bed.

7. Good management of the companion grain crop is important. Small grain crops compete with the forage seedings for light, moisture and nutrients. Reduced seeding rates often reduce this competition. Removal of the grain crop as haylage gives the new

seedings a better chance and results in more feed production per acre than if harvested as grain only. If the companion crop is harvested as grain, cut the remaining stubble and remove after harvest. This reduces competition from weeds during the year of seeding and the year after.

8. To have thrifty productive stands of forage, weeds must be controlled. This can be done either at seeding time or at early growth stages of the forage stand. Other management practices, such as removal of the companion crop as haylage, serve as a useful weed control method. If chemicals are used, check with the state extension service and other agricultural field services for recommendations on the chemical to be used, its rate and time of application.

9. Forage seedings can be made either in the spring or in the fall, depending on environmental conditions and your management plan. Spring seedings are usually made with a companion crop although some report good results with herbicides in the seeding year. Fall seedings are generally made in those areas where moisture is assured from rainfall or through irrigation. Fall seeding can spread the labor load and reduce weed problems. It also provides the opportunity to manage the forage seeding as one crop as compared with planting a companion crop where management for two crops must be considered.

10. You must manage your forage stand for yearly maintenance and high forage production. Once the stand is established, it must be managed to maintain it for the desired number of years. Time of cutting in the spring and fall and fertilizer additons through the year are important factors to consider.

(A) Harvesting the first crop in the bud to earliest bloom results in a higher proportion of protein and energy (TDN) in the forage. Utilizing the forage as haylage assures getting as much of those nutrients into storage as possible.

(B) Allowing the second or third crop to reach ¼ to ½ bloom each year helps to maintain the stand in a more thrifty condition.

(C) Additions to potash fertilizers after the first cutting or in the fall will assure a more thrifty stand.

(D) Planning the harvest program to have all desired cuttings made before killing frost also aids in stand survival. The number of cuttings will vary by the location in the country and the availability of good water supplies. However, at some point prior to cold weather, the forage stand should have an opportunity to build root reserves to carry through the non-growing season.

Forage crops are an economic crop and if managed appropriately they can give high returns to livestock farmers. The methods described above to assure good forage stand establishment are the beginning of a profitable forage (haylage) program.

When all of these management practices are used, the chances of completing the puzzle successfully are improved. Leave one of them out and you will have difficulty knowing which "piece" is missing.

APPENDIX B

Harvest Forages For Profit And Convenience

by Dr. Robert Suter

"Make hay while the sun shines" is a well-known adage. It is more than that — it's a basic rule of successful operation. Rainy, cloudy or cool weather has frequently made it necessary to put off haying until the crop is too mature and the hay is of poor quality.

Also, between the time of harvesting and feeding, 25 to 30% of the feed value can be lost due to: (1) harvesting at a late stage of maturity, (2) permitting hay to dry too long in the field, (3) rain, and other inclement weather, and (4) handling in and out of storage.

Putting hay crops up as haylage in an oxygen-limiting storage system allows farmers to harvest and store their various crops not just when the weather permits, but at their *very best stage of maturity*. Also, with an oxygen-limiting system hay and other feedstuffs may be reconstituted in the off-season.

A major challenge to farmers has been to reduce the high level of moisture of the freshly cut hay to a safe level for storage in as short a period as possible. Haylage solves this problem. It consists of any legume, grass, or cereal grain that is (1) harvested at the peak nutritional stage of maturity, (2) wilted to 40 to 55% moisture and chopped with a ¼-inch cut or as fine as possible, and (3) processed through an oxygen-limiting storage system.

Hence, haylage contains more moisture than dry hay, yet considerably less than grass silage. For this reason, it has overcome the problems inherent in both.

Haylage can be cut, wilted, chopped, and put into storage in 10 to 15 hours as contrasted to 30 to 50 hours of drying time normally required in many areas for field cured hay.

The greatest change in producing alfalfa, for example, has been in harvesting. Earlier cutting, wilting the crop, and chopping and storing at 40% to 55% moisture have led to many efficiencies.

Farmers now like to cut their alfalfa in the *bud stage* when there are not blossoms (maybe one or two) showing in the entire field. They may let the crop wilt one full day. Or, when a conditioner is used, this time may be reduced to four or five hours, depending on the day.

They chop the crop as short as possible (¼-inch or less). This requires maximum chopping speeds, and with a heavy windrow (sometimes several are rowed together), slow travel. The fine cut increases storage capacity and reduces the amount refused by cattle.

Earlier cutting with haylage

Haylage makes the earlier cutting of alfalfa easier. The crop can be cut, chopped, and in storage in one or two days, as compared to three, four, sometimes five days or more when it is baled. For this reason, first-cutting haylage is typically cut 10 to 12 days before first-cutting hay. This early cutting allows a quicker recovery of the alfalfa plant. The second cutting or crop gets more of the early June moisture and grows during a longer daylight period. Hence, farmers who harvest their alfalfa crop as haylage not only tend to cut earlier, but they reduce the interval between cuttings from 45 down to 35 days. They thus obtain three, sometimes four, cuttings.

Approximate dates	Haylage	Hay
Second cutting	July 3-5	July 24-28
Third cutting	Aug. 7-9	Sept. 7-11
Fourth cutting	Sept. 11-13	
Cutting interval	35 days	45 days
Number of cuttings	3 or 4	2 or 3

The dates, of course, vary from year to year depending largely on the growing season, and the amount of moisture available. They also vary from area to area.

About the author . . .
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