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Carol E. Lewis
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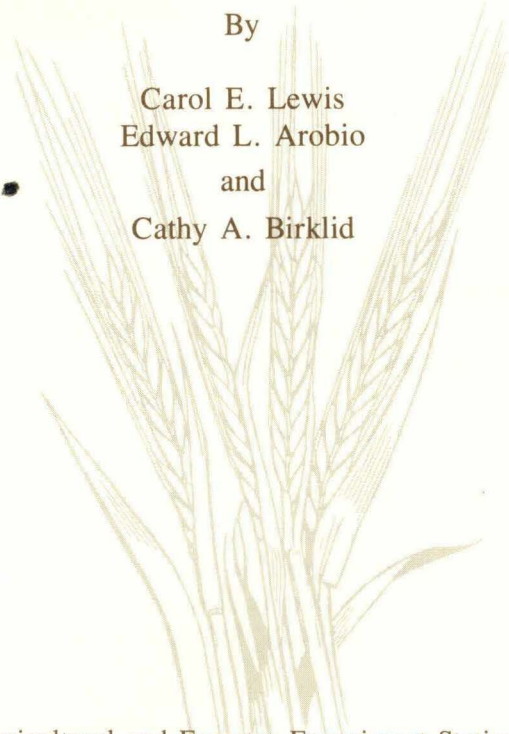

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Introduction

The discovery of oil at Prudhoe Bay on the north slope of Alaska and the subsequent initial lease sale for rights to drill for oil on state land marked the beginning of a new era in the economy of the state. Construction of the trans-Alaska pipeline to carry oil 860 miles from the northern coast to the port of Valdez brought jobs to the state and increased personal income for many residents. When oil began to flow, the state began to receive revenues from royalty oil sales.

Wealth from oil revenues made it possible for the state to support the development of Alaska's renewable resources. One of the resources considered was land which had been classified as having potential for production of agricultural products. There had been attempts in the past by the Federal and state governments to increase substantially agricultural production in Alaska, but none were completely successful (Stone 1950, Burton 1971, Snodgrass et al. 1982, Lewis et al. 1987).

***Associate Professor of Resource Management, Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.**

****Agricultural Economist, Alaska Department of Natural Resources, Division of Agriculture.**

*****Research Assistant, Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.**

In 1976, a new state policy for agricultural development began to take form (Thomas 1977). State administrators and agricultural professionals in the public sector, interested members of the state legislature, and farmers began to build a case for development of a grain-based agriculture, emphasizing both in-state and international markets (Thomas et al. 1977).

Subsequently, a number of reports were issued addressing development of an agricultural industry based on barley production. The first suggested the size of a potential agricultural project necessary to provide sufficient amounts of grain to make marketing and transportation to markets cost effective (Faris and Hildreth 1977). Others explored potential international markets (Thomas and Carney 1978) and estimated costs of producing barley on farms sized to be economically viable (Lewis and Wooding 1978). Potential financial support for farmers, land cost, and cost of clearing native vegetation to prepare land for production were also addressed (Thomas et al. 1977, Lewis et al. 1979).

A large, contiguous block of state-owned land appropriate for agricultural development was located near Delta Junction, a community in Alaska's interior. Delta had a small agricultural sector and was located on a major road leading to a railhead. In 1978, the state sold 64,000 acres of land within this contiguous block having the potential for producing small grains, primarily barley (Thomas and Lewis 1981, Lewis and Thomas 1982, Thomas et al. 1983). Twenty-two tracts averaging 2600 acres each were sold by lottery to persons in the private sector. The area was referred to as the "Delta Agricultural Project" (Delta I). Since that date, 23,000 additional acres adjacent to the first project have been sold in tracts averaging 1400 acres in size (Delta II).

Barley production on a few farms on the Delta Agricultural Project began in 1979. The highest number of acres in production was reached in 1984 when 16,000 acres of barley were planted (Alaska Crop and Livestock Reporting Service 1987). Acreage planted to barley in Delta I and II has since dropped to 12,000 acres in 1985 and 6,500 acres in 1986.

Weaknesses in the world grain markets and subsequent declines in grain prices worldwide have contributed to the reduction in acreage in production. The project has been beset with other problems not foreseen by planners, including lagging completion of a transportation and grain-handling system for the state (Kallis et al. 1983), a changing philosophy in the state concerning a strategy for development (Englebrecht and Thomas 1987), problems in both clearing land and constructing farm buildings while at the same time producing a crop (Thomas et al. 1983), and the slow growth

in both numbers of livestock and facilities for processing livestock and livestock products (Fugelstad et al. 1985, Costello et al. 1987).

Despite the problems, farmers continue to produce barley for in-state markets. A key to the continuation of this production will be the relationship of production costs to crop revenues. Because barley is an important part of the feed base of an expanded livestock industry in Alaska, state decision makers (who must consider such things as development schedules, loans, future land sales, and general expansion of the state's infrastructure) and individual farmers (who must consider the enterprise mix of their own farms) are interested in production costs.

Objectives

This project was a research initiative to establish a production cost data base for barley in the interior of Alaska. Production costs from the years 1983, 1984, and 1985, for farmers in the Delta Agricultural Project, are summarized. Our objectives are: 1) to provide information on costs of production for barley, 2) to determine types of equipment and management systems being used in barley production, and 3) to provide a historical record of production and production techniques.

Methods

Surveys and Survey Techniques

Surveys requesting information pertaining to farm management from Delta Agricultural Project farmers were begun in 1980 by the Cooperative Extension Service of the University of Alaska (Harker 1981). This work was continued in 1983 by the University of Alaska Agricultural and Forestry Experiment Station and the State Division of Agriculture (Lewis 1984). In that year, seventeen farmers on the project seeded barley. Ten of those farmers (58 percent) responded to the surveys. In 1984, ten of fifteen farmers (67 percent) completed the surveys and in 1985, seven of twelve (58 percent) were returned.

The survey instrument consisted of two parts. In both, farmers were asked for information concerning production methods and practices. The first part of the survey was sent to farmers shortly after they finished

planting. Information requested included number of acres seeded, rates and dates of seeding, varieties seeded, tillage management practices, fertilizer blends and amounts, times required for all operations, and labor utilized. Farmers were asked to list all equipment owned, leased, or borrowed by year and make, and all buildings and storage facilities on the farm in the year they began participating in the survey. In following years, farmers were asked to update the list based on the previous year's information. Along with the spring questionnaire, farmers were sent their individual production costs for barley estimated from the previous years' responses as well as the average of all responses. The second part of the survey was sent to farmers after harvest. Information requested on the harvest questionnaire included weed control used during the growing season, dates and acreage swathed then combined, dates and acreage straight-combined, the amounts of time required and labor and machinery used for these operations, and the amount of grain dried and fuel used for drying. They were also asked if any new structures were built during the year, and if drying and storage capacity were increased.

Calculation of Costs of Production

One of the major objectives of the farm surveys was to determine annual costs of production. Production costs are comprised of two categories. The first are operating costs. In this report, operating costs are subdivided into cash operating costs which include purchase of production inputs and cash overhead costs of repair, maintenance, and insurance. Operating costs were calculated from farmer responses to questions concerning management practices. The second category of costs is ownership or fixed costs. These include costs associated with investment in equipment, grain storage, buildings, and land. These investments were estimated from updates on the survey questionnaires and state records of land ownership.

Operating Costs

Operating costs per acre were calculated for each farmer based on the number of acres used for production of barley. These costs were based on the number of acres seeded to barley, except when a cost was related to a specific harvest operation, for example, fuel for swathing. In those cases, the per acre cost was based on acres harvested.

In addition to calculating individual farmer costs, an average cost of production for all farmers was estimated. For each cost category, a weighted average was used. These categories were then summed to arrive at the average cost. Not all farmers incurred all categories of costs. In those instances, the average cost was based only on the acreage for those who did incur the cost.

Cash Operating Costs: Fertilizer prices were based on those of the Alaska Farmers Cooperative in Delta. In 1983, a few farmers purchased fertilizer elsewhere. By 1985, most were purchasing custom blends from the cooperative. Most farmers in the Delta Project applied the fertilizer elements nitrogen (N) as urea and phosphorus (P) as P_2O_5. Some have used ammonium nitrate as an N source but this number is decreasing because urea is manufactured in the state and is lower priced. Not all farmers applied potassium (K) and sulfur (S) in all years. Those who did used the fertilizer forms K_2O and ammonium sulfate.

The chemicals used by farmers in the survey were largely herbicides used to control annual broadleaf weeds. The most common was 2, 4-D. Other herbicides have been used but on a very limited acreage. Most others are generally more costly and do not provide a control sufficient to warrant the cost. Ground application was used primarily until 1985 when an aerial applicator began providing dependable service in the area. It was not necessary to use insecticides during the years of the survey.

A number of different varieties of barley, both developed in Alaska and from outside the state, were used in 1983, and seed prices varied considerably. By 1985, almost all farmers used the three Alaskan varieties Otal, Datal, and Thual. In 1984 and 1985, farmers generally used locally produced seed.

Fuel usage for those operations requiring the use of tractors (cultivation, fertilization, seeding, and baling and raking straw) were based on Nebraska Tractor Test estimates (Hefflinger and Gordon 1984). Fuel costs for combines and swathers were calculated from usage data supplied by farmers based on 9 gallons per hour for combines and 3.5 gallons per hour for swathers (Andruchow 1982). Costs per gallon for diesel fuel and gas were $1.30 in 1983. In 1984 and 1985, diesel was $1.06 per gallon and gas $1.25 (Delta Chevron, 1984-1986). Fuel for grain trucks was estimated for all farms based on a standard of 180 hours of use for each truck per year for 900 acres of harvested grain. Lubrication costs for all equipment were calculated at 15 percent of fuel costs (Doane-Western, Inc. 1982).

Labor categories included seeding labor, seasonal and year-round labor, and labor used during harvest. Seasonal labor was defined as miscellaneous labor not associated with a specific production task and hired during the period from June 1 to September 30. Year-round labor was based on annual employment of 1800 hours. Hours worked per day and wage rates were obtained directly from survey questionnaires. All farms in the survey were in the process of completing building construction and readying newly-cleared lands for production. No farmers differentiated labor used for production and that used for farm development in the seasonal and year-round categories. Therefore, all hired labor reported on the surveys was included in labor costs which included, in some cases, farm construction labor.

Farmers dried their crops in their own drying systems, leased systems, or at the Alaska Farmers Cooperative. The cost of drying in farmer-owned systems was obtained from survey information and included fuel, lubrication, and electricity. Very few farmers leased drying systems. Information provided by those who did was incomplete, and it was difficult to discern whether transactions were in cash or in trade for commodities or services. As a result, costs for drying grain using leased dryers were calculated from prices charged by the Alaska Farmers Cooperative for drying grain 10 moisture points (from 22 to 12 percent moisture). When grain was taken to the Alaska Farmers Cooperative for processing, drying and handling costs were obtained from the cooperative.

There are no businesses in the Delta area providing custom services, and few farmers do custom work. It is also not a common practice to lease equipment. In 1983, there were no farmers participating in the survey who leased equipment or hired custom operators. Some equipment was leased by farmers in 1984 and 1985. In 1985, some farmers hired custom operators. Information provided by farmers concerning these transactions was incomplete and, as in the case of grain dryers, it was difficult to discern whether transactions were in cash or in trade. Therefore, costs incurred were not included as an explicit category but were included in other categories as if the farmers had used their own labor and equipment. In 1985, the lease price for a packer was $9 per acre, swathers $6 per acre, and combines $25 per acre. In 1984, the price for leasing disks was $4 per acre, swathers $5 per acre, and combines $10 per acre.

All farmers participating in the survey received operating capital from the Alaska Agricultural Revolving Loan Fund (ARLF), a state-operated loan fund within the Department of Natural Resources. The annual interest rate charged by the ARLF is 8 percent. It was assumed farmers would hold these loans for 6 months.

Cash Overhead Costs: Repair and maintenance for equipment other than trucks, wagons, trailers and dryers was calculated using:

$$RM = \frac{C(PUR)(HRS)}{100}$$

where

RM = repair and maintenance cost ($)
C = constant multiplier for each type of equipment
PUR = purchase price ($)
HRS = hours of annual use (hrs)

For example, if C = .08 for a drill, PUR = $15,350, and HRS = 200 for 1,250 acres, then RM = $2,450. The cost per acre would be $2,450 divided by 1,250 or $1.96 per acre. The constant multiplier varies for each type of machinery and is based on tests compiled in 1962 by R.A. Kepner of the University of California, Davis (Hunt 1983). The constants are percentages of purchase price per 100 hours of use. The percentages are constant over the life of the machine. Annual repair and maintenance for trucks, wagons, trailers, and dryers was based on 5 percent of purchase price. Repair and maintenance for buildings and storage was 2 percent of the original cost. Repair and maintenance for small equipment (shop tools) was considered essentially a replacement cost and was based on 2 percent of original cost.

The Delta area is outside an organized borough. The state does not levy a personal or real property tax. Therefore, there are no costs incurred for taxes. All farmers surveyed carried insurance on equipment and buildings and general liability insurance. Costs were estimated using appropriate rates for each year of the survey and equipment and building lists provided by farmers (Butch Stein Insurance Agency 1983-1985). Crop insurance is not generally carried by small-grain farmers in Alaska because of its cost and limits imposed on the time frame for seeding.

Ownership Costs

Ownership costs include depreciation on buildings, grain storage, and equipment, and interest on buildings, grain storage, equipment and land. Depreciation was based on the straight-line method and calculated using the formula:

$$DEP = \frac{COST - SAL}{LIFE}$$

where

DEP = annual depreciation ($)
COST = original cost + freight ($)
SAL = salvage value ($)
LIFE = wear-out life (yrs)

Equipment life used was 12 years for combines, 15 years for tractors, dryers, and implements; and 20 years for wagons and grain trailers. A life of 20 years was assumed for buildings and grain storage. A 10 percent salvage value was assumed for equipment and 20 percent for buildings and grain storage. Investment cost interest was charged using the formula:

$$INV = \frac{COST + SAL}{2}(i)$$

where

INV = average annual interest on investment ($)
i = interest rate (% ÷ 100)

This formula results in charging interest against an asset's average value over its life. Assets depreciate and have lessor value over time; thus, the rationale of dividing by two to determine an average value.

The value used for the interest rate (4.3 percent) is the average 20-year rate of return for farm assets as calculated by the U. S. Department of Agriculture (USDA) and is the rate used by USDA in calculating production costs (Farm Costs and Returns Section 1986). Both depreciation and interest were spread over the total number of acres seeded to all crops.

The land being farmed is being, or has been, purchased from the state of Alaska and was sold at various prices. However, because of the difficulties farmers are having in Alaska as well as elsewhere, the state legislature has passed legislation allowing land debt to be restructured. As a result, most cleared land is currently being appraised at a value of $50 to $70 per acre. The appraised value will vary with such things as land improvements, field conditions, and classification of soils. The long-run rate of return to farm assets (4.3 percent) was charged against current land value. Assuming a value of $60 per acre resulted in an annual land cost of $2.58 per acre.

Results

Farming Systems

The basic production techniques used by producers of barley in Alaska are similar to those used by dryland farmers elsewhere. Fields are tilled in fall and/or spring to prepare the seed bed. A portion of the fertilizer requirement is broadcast applied prior to tillage and the remainder is applied during the seeding operation. Some farmers swath their grain prior to harvest but most straight cut. When possible, loose straw is baled and removed from the fields for sale. This practice also speeds soil warming the following spring.

There are several major difficulties which farmers in Alaska encounter in the early years of production on newly cleared lands.

Debris in fields

Lands used for production have been cleared for only a few years. No clearing operation has been found which removes all debris such as sticks and roots from the fields. This narrows the choice of tillage and seeding implements available to the farmer. As an example, hoe-type cultivators and seeders will clog until fields are cleaned. As a result, the two-way disk is the most popular tillage implement and grain planters with double-disk openers are most often used for seeding. Some farmers use the primary tillage operation for removing sticks and roots and include the operation of a root-rake prior to seeding as a part of cultivation costs.

Berm piles

Another problem farmers face is the existence of berm piles at 150- to 300-foot intervals in their fields, containing debris from clearing. The berm piles can eventually be removed by burning, but this is only accomplished over several years. In the meantime, the farmer faces the dilemma of having to plant large areas as efficiently as possible in a short time frame (2 to 3 weeks from entry into the field to completion of seeding by May 25). The berm piles hold snow, delaying entry into some fields, thus precluding the use of large implements. Most farmers compromise by using smaller implement widths, compatible with the narrow fields, but not necessarily smaller tractors since larger tractors are necessary for powering breaking disks and root rakes. This results in lowering efficiency and speed and raising costs. These two problem areas have contributed to the choice

farmers have made in equipment used in production and the type of farming system used. As lands are developed, farmers will more than likely adopt systems using less tillage and will be able to more effectively match equipment to the acreage being farmed.

Acreage Farmed

The operating costs for each participant in the 1983, 1984, and 1985 surveys were based on the number of acres cropped to feed barley in each year. This acreage varied (table 1) ranging from 320 acres in 1983 to 1540 acres in 1984 among those surveyed. The average number of acres farmed in each year, however, remained relatively constant: 712 acres per farm in 1983, 911 in 1984, and 860 in 1985. This is not necessarily indicative of the total acreage in production which may exceed 1000 acres for farmers producing other annual crops such as oats for grain and hay and grass, oats, and barley for seed. Nor is it indicative of acreage available for production on each farm. Farm size averages 2600 acres for land sold in 1978 and 1400 acres for land sold in 1981.

Table 1. Range and average number of acres per farm for production of barley on the Delta Agricultural Project in 1983, 1984 and 1985.

	Acreage		
Year	High	Low	Average
	(acres)		
1983	1240	320	712
1984	1540	670	911
1985	1200	600	860

Operating Costs

The average operating costs for all farmers in the survey were calculated for 1983, 1984, and 1985. See Appendix for unit costs. These costs and the average for the three years are shown in Table 2. The range in operating costs varied considerably among farmers and among years (table 3). It should be emphasized that the high and low columns in Table 3 indicate the high and low costs of an entire farming system, not highs and lows in each cost category.

Table 2. Costs for production of barley on the Delta Agricultural Project in 1983, 1984, 1985, and the three-year average.

Cost categories	Costs			
	1983	1984	1985	Average
	($/acre)			
Cash costs				
Operating				
Fertilizer	47.81	42.76	42.33	44.30
Chemicals and application	1.53	3.18	6.68	3.80
Seed	13.00	12.50	12.50	12.67
Fuel and lubrication				
Cultivate	2.83	1.25	1.71	1.93
Fertilize	0.38	0.99	0.69	0.69
Seed	1.60	1.36	1.30	1.42
Swath	0.29	1.11	0.72	0.71
Combine	1.80	1.20	1.55	1.52
Operate trucks	3.20	3.05	3.49	3.25
Miscellaneous	0.63	1.44	2.37	1.48
Total fuel and lubrication	10.73	10.40	11.83	10.99
Hired labor	25.05	9.18	17.59	17.27
Crop drying	10.02	5.67	21.83	12.51
Interest	4.33	3.35	4.51	4.06
Total operating costs	112.47	87.04	117.27	105.59
Overhead				
Repair and maintenance	13.31	12.35	10.06	11.91
Insurance	3.94	3.03	5.84	4.27
Total overhead costs	17.25	15.38	15.90	16.18
Total cash costs	129.72	102.42	133.17	121.77
Ownership costs				
Buildings and equipment				
Depreciation	30.75	18.83	22.31	23.96
Investment interest	12.86	7.88	9.70	10.15
Land	2.58	2.58	2.58	2.58
Total ownership costs	46.19	29.99	34.59	36.69
Total costs	175.91	131.71	167.76	158.46

Table 3. High and low costs[1] for production of barley on the Delta Agricultural Project in 1983, 1984, and 1985.

Cost categories	Costs					
	1983		1984		1985	
	Low	High	Low	High	Low	High
	($/acre)					
Cash Costs						
Operating						
Fertilizer	25.89	35.99	32.46	49.91	36.80	34.64
Chemicals and application	1.85	0.00	0.00	8.20	4.25	4.90
Seed	14.69	13.00	12.50	13.50	12.50	24.20
Fuel and lubrication						
Cultivate	2.32	2.08	1.01	4.20	1.17	0.96
Fertilize	0.00	0.00	1.01	1.41	0.69	0.00
Seed	1.84	2.38	1.74	1.74	1.22	1.88
Swath	0.41	0.26	0.09	0.43	0.63	1.01
Combine	1.69	1.35	1.37	1.37	2.02	1.65
Operate trucks	5.04	8.66	3.86	5.79	1.97	4.60
Miscellaneous	0.00	0.98	1.33	0.00	2.37	0.00
Total fuel and lubrication	11.30	15.71	10.41	14.94	10.07	10.10
Hired labor	14.90	40.55	3.34	14.28	0.00	36.68
Crop drying	8.08	8.14	4.07	5.40	15.92	19.18
Interest	3.07	4.54	2.51	4.25	3.18	5.19
Total operating costs	79.78	117.93	65.29	110.48	82.72	134.89
Overhead						
Repair and maintenance	10.72	18.79	10.77	13.31	8.04	10.16
Insurance	2.47	8.70	2.60	2.40	3.29	7.05
Total overhead costs	13.19	27.49	13.37	15.71	11.33	17.21
Total cash costs	92.97	145.42	78.66	126.19	94.05	152.10
Ownership costs						
Buildings and equipment						
Depreciation	26.93	79.55	16.26	18.29	15.28	28.29
Investment interest	10.50	32.11	7.48	7.16	6.45	12.03
Land	2.58	2.58	2.58	2.58	2.58	2.58
Total ownership costs	40.01	114.24	26.32	28.03	24.31	42.90
Total costs	132.98	259.66	104.98	154.22	118.36	195.00

[1]Based on an entire farming system, not high and low per category.

Ownership Costs

Ownership costs for equipment, buildings, and land for 1983-1985 are also provided in Tables 2 and 3. The equipment, grain storage, and building portion of the ownership costs was developed using information provided by survey participants. Equipment complements, buildings and grain storage, and drying facilities varied for each farm.

A typical equipment complement included two tractors; a disk and/or cultivator of some type equipped with harrows; a fertilizer spreader, a set of conventional grain drills (usually the double-disk opener, press-wheel type), several trucks, two combines, a swather, and a baler. Most farmers had at least one building used exclusively for equipment repair and winter storage. With few exceptions, buildings were constructed by the farmer and were of pole construction. In 1983, most farms could store grain on site. Flat storage was typical. Few farms had dryers. By 1985, the average grain storage capacity per farm was 1000 tons, silo storage was more typical than flat, and all farms could store grain. All but a few had grain dryers. Table 4 shows the cost of a typical equipment complement. The high and

Table 4. Typical capital investment in equipment, storage, and buildings.

Equipment Year	Complement	Size	Purchase Price ($)[1]
	Equipment		
1980	Tractor	4WD 225 hp	77,179
1977	Tractor	125 hp	22,610
—	Disk	30 foot	11,618
1978	Grain drill (press-wheel)	30 foot	16,800
—	Harrow	30 foot	1,231
1979	Self-propelled swather	21 foot	10,200
1979	Self-propelled combine	21 foot	73,728
1972	Tractor-pulled combine	21 foot	17,090
1979	Truck w/16' box	2 ton	14,060
1970	Truck w/22' box	2 ton	8,500
1979	Wagon	450 bu	3,500
1981	Round baler		9,872
1980	Fertilizer spreader	6-8 ton	1,112
1980	Grain dryer	500 bu/hr	28,000
	Total equipment		295,500
	Grain Storage	60,000 bu	60,000
	Buildings	50' × 100'	60,000
	Total		415,500

[1]Includes freight to Delta.

low capital investment in equipment, grain storage, and buildings for 1983, 1984, and 1985 is shown in Table 5.

A return for owner labor and management has not been included. Any residual remaining after other costs have been subtracted from revenues would be a return to these factors of production.

Table 5. Investment range[1] in equipment, storage, and buildings in 1983, 1984, and 1985.

	Total Investment ($)					
	1983		1984		1985	
	High	Low	High	Low	High	Low
Equipment	446,693	245,953	397,899	209,700	368,571	201,260
Grain storage and buildings	120,000	38,400	142,000	50,000	148,000	53,000
Total	566,693	284,353	539,899	259,700	516,571	254,260

[1]Equipment and grain storage and buildings categories are not necessarily from the same farming operation.

Costs and Revenues

The farmer is most concerned with annual operating costs and their relationship to revenues in the short term. These costs require payment in the crop year and it is important that revenues at least are sufficient to cover them. If this is the case, the farmer will continue to operate in the short-run even if no contributions are made to ownership costs. However, to continue to operate in the long-run all costs must be covered.

The effect of yield and crop prices on the farmer's ability to make a profit is provided in Table 6. Four levels of yield and farmgate barley prices were used. The average cost of production was assumed. Barley yields in Table 6 range from .5 ton per acre to 1.25 ton per acre. Yields on the Delta Project have averaged about .9 ton per acre in recent years based on farmer responses (weighted average based on farm size). Yields statewide have averaged approximately .75 tons per acre (Alaska Crop and Livestock Reporting Service 1987).

During the years farmers were surveyed, farmgate prices for barley have been as high as $135 to as low as $125 per ton. In early 1987, barley was selling for as low as $100 per ton in Delta.

Table 6. Price sensitivity analysis using yields from .5 and 1.25 tons per acre.

	Price per ton			
	$120	$125	$130	$135
	($/acre)			
Yield of .5 tons per acre:				
Revenue	60.00	62.50	65.00	67.50
Less: Cash costs	121.77	121.77	121.77	121.77
Return above cash costs	−61.77	−59.27	−56.77	−54.27
Less: Ownership cost	36.69	36.69	36.69	36.69
Return above cash and ownership costs	−98.46	−95.96	−93.46	−90.96
Yield of .75 tons per acre:				
Revenue	90.00	93.75	97.50	101.25
Less: Cash cost	121.77	121.77	121.77	121.77
Return above cash costs	−31.77	−28.02	−24.27	−20.52
Less: Ownership cost	36.69	36.69	36.69	36.69
Return above cash and ownership costs	−68.46	−64.71	−60.96	−57.21
Yield of 1.0 tons per acre:				
Revenue	120.00	125.00	130.00	135.00
Less: Cash cost	121.77	121.77	121.77	121.77
Return above cash costs	−1.77	3.23	8.23	13.23
Less: Ownership cost	36.69	36.69	36.69	36.69
Return above cash and ownership costs	−38.46	−33.46	−28.46	−23.46
Yield of 1.25 tons per acre:				
Revenue	150.00	156.25	162.50	168.75
Less: Cash cost	121.77	121.77	121.77	121.77
Return above cash costs	28.23	34.48	40.73	46.98
Less: Ownership cost	36.69	36.69	36.69	36.69
Return above cash and ownership costs	−8.46	−2.21	4.04	10.29

As noted previously, the annual planting decision is based on the anticipation that revenue from sales will be greater than operating costs. As seen in Table 6, this occurs at a yield of 1.0 ton per acre and a price of $125 per ton and greater. In order to stay in production over the long run, revenue must exceed all costs, ownership as well as operating, and implicit as well as explicit. This occurrs at 1.25 tons per acre and $130 per ton.

This anaylsis was based on the average cost of production as developed in Table 2. The actual situation varies from farmer to farmer. As noted in Table 3, the low and high cost of production varied greatly. Thus the ability to profit from barley production may also vary widely.

Concluding Remarks

In recent years, grain production in the U.S. has been plagued by prices that have allowed only low or negative returns to farmers. Surpluses have kept prices down. As can be seen in this analysis, Alaska farmers are also being challenged to make a profit from barley production. A key question is whether increased efficiencies, and thereby greater potential viability, are possible for barley production at Delta Junction.

For viability to improve, either costs need to decrease without a corresponding decrease in yields, yields must increase relative to costs, farmgate prices must increase, or a combination of the above must occur. As noted in Table 2, average costs of production total $158.46. Of the total, $121.77, 77 percent, are operating costs and 23 percent are ownership costs. This cost could be reduced by cropping more acres and spreading ownership costs over more acres. Land is available. However, a limited harvest period and acreage restrictions due to Federal farm programs may limit per farm planting as a cost-efficiency technique.

Reductions in operating costs or increases in yields, or both, may be possible over time. The Agricultural and Forestry Experiment Station, University of Alaska Fairbanks has several research efforts underway that may prove beneficial in decreasing costs or improving yields (Agricultural and Forestry Experiment Station 1986). These include research in the areas of conservation tillage, cereal breeding and production, germplasm evaluation, weed control, and fertilizer use. Without increased efficiency, a better financial outlook for Alaska grain producers as well as U.S. grain farmers as a whole will be premised largely on higher prices. Higher prices would require either increased use of grains throughout the world or a decrease in stocks. The latter would likely have the greater effect and surpluses may well decrease, leading to higher prices. However, significantly higher prices are not forecast for the next few years.

One should also keep in mind that many Delta farmers are participating in federal farm programs that are helping to increase cash flows. Among these are price stabilization programs and the new conservation reserve program. However, these programs are not without cost. Farmers involved must meet annual production requirements and the associated costs.

The local production of grains is important to support livestock production in Alaska. For the interior of Alaska, increased livestock production will be based on locally produced grains, since imported grains are a more costly alternative.

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Appendix: Unit Cost of Inputs

Inputs	Unit of measure	Cost Per Unit		
		1983	1984	1985
		($)		
Fertilizer				
46-0-0	ton	247.00	234.00	234.00
11-51-0	ton	360.00	385.00	350.00
21-0-0-24	ton	295.00	305.00	305.00
0-0-60	ton	255.00	285.00	250.00
Seed[1]	cwt	13.00	12.50	12.50
Herbicide				
2,4-D	gallon	12.20	11.00	10.00
Fuel				
Diesel	gallon	1.30	1.06	1.06
Gas	gallon	1.30	1.25	1.25
Propane	gallon	--	1.15	1.15
Labor[2]	hour	7.00	8.00	8.00
Drying and handling at Co-op	bushel	.44	.44	.52
Drying on farm	bushel	.25	.12	.46[3]
Insurance				
Equipment	per $100 value	.50	.50	.50
Buildings	per $100 value	1.25	1.25	3.50
General liability	per year	100.00	100.00	100.00

[1]Prices range from $9.00-$25.00 per cwt, depending on variety and quality.
[2]Per hour wages may include some benefits such as room and board.
[3]Range of on-farm drying costs for the 3 years was $.40-.51/bu.

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