Comparing Barley Production Costs: Idaho, Saskatchewan and Alberta

by

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Introduction

Regional trade agreements expand local markets by eliminating trade barriers between member states. As new trade patterns develop, market share can shift to the more competitive state, province, or region, impacting on both producer incomes and economies. Cost of production studies are often conducted to evaluate the relative competitiveness of rival producers, especially in the production of agricultural commodities. While production competitiveness establishes the foundation of trade, there are a number of other factors which also affect overall competitiveness. These factors, particularly those associated with either explicit or implicit governmental policies are often the basis for conflict and trade disputes.

With the implementation of regional trade agreements such as the Canadian/ United States Free Trade Agreement, the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT), North America is developing into a single large market for grains. Canada and the United States are rival producers of many small grains such as wheat and barley. This study was conducted to compare production costs between Idaho and Western Canadian (Alberta and Saskatchewan) barley producers. The objectives are

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1) to set up standards for comparing production costs between Canadian and Idaho barley producers,

2) to identify, define and classify costs, to make them comparable for Canadian and Idaho producers.

3) to determine average barley production costs for each state or province and

4) to identify possible advantages and barriers to production of barley in each of the regions.

Procedure

Farmers were surveyed in the provinces of Alberta and Saskatchewan, Canada in the spring/summer of 1995. Alberta data are based on farmer interviews and data collected by Alberta Agriculture. Cost of production data for Alberta barley growers were compiled by the Production Economics Branch of the Alberta Food and Rural Development Division (Jetter, Lewis, and Harry, 1995) for Region 1, which is southeast of Calgary. This is the region of the province where most of Alberta's dryland grain is produced. Saskatchewan data are based on whole farm data collected by the Top Management project, University of Saskatchewan. A total of 49 barley producers were included in the Saskatchewan data set. Because these were the larger data set, the cost assumptions associated this data set were used as the base for constructing the Idaho survey in order to provide as much consistency as possible. The resulting Idaho questionnaire requested 1994 data on farm size, acres of barley planted and harvested, amounts and costs of purchased inputs, tillage operations and equipment, income and expenses for the whole farm, and paid and unpaid labor requirements.

Cost Definitions

Costs of production from the questionnaires are grouped under the traditional categories of variable and fixed costs.

Variable Costs of Production

Variable costs are costs the farmer incurs by producing barley, as opposed to some other crop, as a part of the farming operation. These costs are divided into direct variable cash costs, other variable cash costs and non-cash variable costs.

Direct Variable Cash Costs. Direct cash variable costs include the costs of purchased inputs directly used in barley production: seed, fertilizer, chemicals, hired labor, and custom services. These costs were listed explicitly on the questionnaire by each respondent. Cost of hired labor attributable to barley production was also allocated on a percentage basis, according to barley's contribution to whole farm gross revenue.

Other Variable Cash Costs. Crop insurance and government programs premiums are omitted as income from these programs are also omitted. While machinery repair and power, and paid labor are sometimes included in direct cash variable costs, here they are listed separately in order to facilitate subsequent comparisons. Respondents were first asked to provide whole farm machinery repair and power costs[2] and then to estimate the share of these costs attributable to barley production.[3] A final

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[2] Power costs includes electricity, machine fuel and lube .

[3] The per acre cost for these items was calculated using the respondent's allocation, or if unavailable, on a percentage of whole farm gross revenue basis. For example, if barley accounted for 20% of whole farm gross revenue, then in lieu of more accurate information, 20% of whole farm repair costs was allocated to barley production. This procedure is in sharp contrast to the procedure used in Saskatchewan where these costs are based on actual machines used in barley production.

variable cash cost is paid labor. These costs are based on total paid wages attributable to barley.

Non-cash Variable Costs. Non-cash variable costs are "costs" that can be directly related to barley production, but in most cases, do not represent a direct cash outlay. These "costs" include the use of family or other non-paid labor in the production of barley, and the "cost" of using available cash to purchase inputs. Non-cash variable costs includes the value of unpaid (operator and family) labor and the opportunity cost of the cash investment in direct production inputs.

Idaho respondents were asked about the number of family members contributing unpaid labor to the farming operation, and the approximate number of labor hours each family member contributed.[4] These unpaid labor hours were totaled and were allocated to barley production based on its share of whole farm gross revenue. The value of unpaid labor was set at the minimum wage rate of US$4.25 per hour, in order to represent the minimum opportunity cost of the unpaid farm labor. Saskatchewan unpaid wage costs are based on a machine hours adjusted for down and waiting time, and machinery preparation and servicing. A base wage rate of US$7.61 was used[5].

The cost of operating capital represents the opportunity cost of having available cash tied up in the purchase of farm inputs. Since production costs were estimated for 1994, the cost of operating capital was determined using the April 1994 short term in-

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[4] It was assumed that the farmer/operator provided the bulk of the unpaid labor used for whole farm production, but the questionnaire did not include a specific question about the number of labor hours contributed. Therefore, it was assumed that the farmer/operator contributed 40 hours of labor a week, or 1920 hours (40 hours/week * 52 weeks) per year in unpaid labor.

[5] This is a relatively conervative approach in that it omits other types of demands on operator labor. When these are included, this gives an approximate wage rate of US$5.44/hour.

terest rate of 6.85% charged by Farm Credit Services for short term (6-month) operating loans. The capital cost per acre was calculated as 6.85% of total direct cash variable costs per acre for barley production.

Fixed Costs

Fixed costs are those costs which are incurred on the farm whether barley is produced or not. Fixed costs include interest on capital investment, depreciation, overhead, indirect maintenance costs, and the land cash rent equivalent.

Land Rents. Survey respondents were asked to estimate a cash equivalent for land rent for acreage involved in barley production. In Saskatchewan, the use value of land is a blend of value of crop share, cash rent and cash rent equivalent of owned land.

The remaining fixed costs were allocated based on barley's cost share of total variable cash costs. In some cases, the survey respondents designated the percentage of whole farm operating costs attributable to barley. In other cases, this percentage was imputed from barley's contribution to whole farm gross revenue.

Overhead. Overhead is calculated differently in Canada than in the United States. Under the Canadian definition, overhead includes the cost of maintaining and operating farm trucks and pickups, the cost of insurance (except crop insurance), etc.[6] and the cost of general farm operation. In order to ensure comparability, the Sas-

[6] General farm overhead includes variable and fixed truck costs, insurance costs (excluding crop insurance), and general farm expenses. General farm overhead and interest expenses are allocated based on the enterprise share of total direct cash costs but excluding paid labor." (Glaze and Schoney, 1995. Pg 370).

katchewan overhead definition was used to calculate Idaho costs. Survey respondents were asked to list whole farm overhead, including pickup and truck operating and maintaining costs, and to indicate the percentage to be allocated to barley. Where the proportion of overhead attributable to barley was unspecified, overhead was allocated based on the percentage share of whole farm gross revenue attributable to barley.

Fixed Costs of Machine and Building Ownership Respondents were asked to list all equipment used on their farms. Specific information requested for each machine included the approximate number of hours used annually, number of hours used for barley production, the year of manufacture, and the 1994 current fair market value.[7] Depreciation is defined as the actual loss in fair market value during the 1994 production year, taking into account inflation in new machine prices. Actual depreciation is based on machine age, type and estimated beginning of period fair market value. The equation for remaining value is

$$V_1 = A * BV_0 \qquad \textit{for new machines}$$

$$V_{n+1} = B * V_n \qquad \textit{for used machines} \qquad \textbf{(1)}$$

where n=age of machine at the beginning of the production year
and n= 0 represents a new machine and n >0 represents a used machine,
V_0, V_n = value of a new machine and
A, B = coefficients from Table 1.

The year of manufacture entered by the survey respondent was compared to standard machine lifetimes for typical farm equipment (Table 1). If the machine was older than

[7] It was assumed that the estimated value listed was the value of the machine at the end of the 1994 growing season.

the standard machine lifetime, then the current value listed by the respondent was treated as the salvage value of the machine.

Table 1: Salvage coefficients and estimated life used to calculate depreciation.

Type of Equipment	Remaining Value Coefficient [a]		Estimated Years of Useful Life[b]
	A	B	
Tractors	0.95	0.93	10-15 years
Seeding & Tillage Equip.	0.91	0.90	10-15 years
Combines, Harvest Equip.	0.97	0.88	+/- 8 years
Spraying equipment	0.98	0.90	+/- 10 years
Trucks, pickups	0.96	0.93	+/- 8 years

[a] The remaining value coefficients are based on the Top Management database.

[b] Averages from Willett and Smathers (1992).

Real depreciation and interest for each piece of machinery is calculated according to the equations:

$$D: = V_n * (1 + g) - V_{n+1} \quad \textbf{(2)}$$

where D = depreciation charge,
V_n = beginning market value,
V_{n+1} = ending market value and
g = inflation rate

and

$$I = V_n * (1 + r) * [(1 + r)/(1 + g) - 1] \quad \textbf{(3)}$$

where I = annual interest charge and
r = cost of capital (interest rate).

The US cost of capital is based on the short term nominal interest rates (6.85%) in effect over the 1994 growing season. Saskatchewan rates were based on avrage FCC lending rates of 9.25%[8]. An average Saskatchewan inflation rate of 1.5% was used.

The proportion of depreciation allocated to barley production was based on the percentage of time the piece of equipment was used on barley (as listed on the questionnaire). If the survey respondent did not specify the hours of annual use and/or hours used on barley, then depreciation is allocated according to barley's percentage contribution to whole farm gross revenue.

Indirect Fuel and Repairs. Indirect fuel and repairs and indirect depreciation and interest were calculated for equipment such as trucks and pickups, farm shop buildings, etc., where the direct contribution to barley production is uncertain. These costs were allocated according to barley's share of gross farm revenues.

Cost Weightings

Individual farms may have a variety of barley sub-enterprises. In addition, farms vary widely in terms of the total acres of barley grown. In order not to give undue consideration to small acreages, sample costs are weighted according to the following procedure. Costs are estimated on per acre basis for each respondent. These are multiplied by the number of barley acres in each farm and summed to give total sample costs. Average acreage and bushel costs are derived by dividing total sample costs by total sample acres and bushels, respectively.

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[8] FCC is the Federal Credit Corporation and is similar in function to the FmHA.

Exchange Rates

The last step is to convert Canadian costs to US. Since most Canadian production costs were incurred during the first four months of 1994, the average exchange rate for that period was calculated from the Key Currency Cross Rates as reported daily in the Wall Street Journal. This average daily exchange rate was $1.3994 Canadian to $1 US. All Canadian costs were divided by $1.3994 to convert those costs to US dollars. The cost of Idaho barley production was then compared to the cost of Saskatchewan and Alberta barley production.

Results

In the first of the following sections, the Idaho barley industry is described and production cost differences among Idaho barley producers are assessed. In the second section, Idaho, Alberta, and Saskatchewan production costs are compared.

Idaho Within-State Comparisons

A total 17 Idaho producers completed the survey. Approximately 27.5% of their total acreage farmed was planted in barley. Slightly over 82% of the barley acreage was used to produce feed quality barley, while 17.6% was planted in malting barley. Approximately 33.0% of the surveyed barley acreage was irrigated. Of the Idaho barley producers surveyed, 76.5% produced only feed barley, 5.9% produced only malting barley, while the remaining 17.6% grew a combination of both feed and malting barley on their barley acreage.

Of the barley producers surveyed, 94% generally grew barley in rotations with other crops, while only 6% grew barley exclusively. Wheat was included in rotations of 88% of producers. Alfalfa was included in 70.6% of the barley rotations, while 29.4% of producers surveyed included potatoes, edible legumes, and/or other crops in their rotation plans. For the majority (76.5%) of producers surveyed, barley was not the major source of income for the farm. For all Idaho barley producers covered by the survey, barley production contributed an average 28.7% to whole farm income.

Five barley COP classification are delineated: irrigated barley, dryland barley, malt barley, feed barley production and all barley producers. The results are presented in Tables 2a and 2b.

Comparison of Irrigated and Dryland Producers

The superior yields of irrigated to dryland farming in Idaho are readily apparent in Table 2a--irrigated yields are 62% higher than those associated with dryland farming. Direct cash inputs per acre (seed, fertilizer, chemicals) are nearly double those of dryland, resulting in somewhat higher costs per bushel--$0.74/bu versus $0.61/bu, respectively for irrigated and dryland production. Other irrigated variable cash costs such as power, repairs and labor, are 4.5 times higher than dryland costs. This results in a 24% increase in irrigated total variable costs over that of dryland production.

In dryland Idaho crop production, most crops are more or less independent of other crops and they use mostly the same resources. In this case, dryland barley must

Table 2a: COP for all categories of barley and for all producers, Idaho

Return, Cost	Irrigated	Dryland	Malt Barley	Feed Barley	All Producers
			(Wtd avg/ac)		
Size:					
Farm size (acres)	897.	1960.	983.	1472.	1397.
Acres in Barley	249.	535.	289.	335.	383.
% of Farm in Barley	27.7	27.3	29.4	22.8	27.5
Land Tenure					
% Owned	59.5	67.8	49.9	63.3	63.4
% Leased	40.5	32.2	50.1	36.7	36.6
Crop Share	0.0	0.0	0.0	0.0	0.0
Cropping Intensity					
% Fallow	5.9	6.2	8.3	6.4	6.0
Barley Income/Total Income	21.9	36.3	19.6	25.6	28.7
Revenue					
Yield (bu/acre)	91.	56.	81.	65.	68.
Price ($/bu)	2.2	2.6	3.1	2.3	2.4
Govt. Grain Programs ($/ac)	15.6	8.4	0.0	13.2	10.9
Gross Returns ($/ac)	225.5	159.1	252.7	164.3	181.9
Costs					
Variable Costs ($/ac)					
Seed	11.1	7.3	11.3	8.0	8.6
Fertilizer	25.8	15.2	21.1	18.3	18.8
Herbicide	12.7	8.9	11.8	9.9	10.2
Insecticide	0.0	0.0	0.0	0.0	0.0
Other Chemicals	0.0	0.0	0.0	0.0	0.0
Technical Services	0.0	0.0	0.0	0.0	0.0
Custom Services	8.5	3.0	4.6	5.0	4.9
Other Direct Crop Expense	9.8	0.0	1.7	3.7	3.3
Total Direct Cash Inputs	68.1	34.6	50.7	45.1	46.1
Other Variable Cash Costs					
Crop Insurance	0.0	0.0	0.0	0.0	0.0
Gov. Programs	0.0	0.0	0.0	0.0	0.0
Power	32.8	4.4	9.7	15.1	14.2
Repairs	15.2	6.9	5.0	10.7	9.7
Paid Labor	19.9	3.5	8.7	9.2	9.2
Total Other Variable Costs	68.0	14.9	23.5	35.2	33.1
Total Variable Cash Costs	136.1	49.5	74.3	80.4	79.3
Variable Non-Cash Costs	0.0	0.0	0.0	0.0	0.0
Unpaid Labor	12.9	9.2	12.1	10.2	10.5
Cost of Operating Capital	5.4	3.4	5.0	3.8	4.1
Non-Cash Variable Costs	18.3	12.6	17.2	14.0	14.6
TOTAL VARIABLE COSTS	154.5	62.2	91.5	94.4	93.9
Fixed Costs ($/ac)					
Overhead	132.5	33.5	27.6	761.1	67.5
Direct Deprec. & Interest	15.8	17.3	31.8	13.5	16.8
Indirect Fuel & Repairs	2.8	3.3	10.1	1.7	3.1
Indirect Deprec. & Interest	2.0	1.0	2.2	1.2	1.3
Total Land	98.3	32.6	57.4	54.7	55.2
TOTAL FIXED COSTS	251.7	87.9	129.3	147.4	144.2
TOTAL COSTS ($/ac)	406.2	150.2	220.9	241.8	238.1

Table 2b: COP for all categories of barley and for all producers, Idaho,

Return, Cost	Irrigated	Dryland	Malt Barley	Feed Barley	All Producers
			(Wtd avg/bu)		
Revenue					
Yield (bu/acre)	91.	56.	81.	65.	68.
Price ($/bu)	2.2	2.6	3.1	2.3	2.4
Govt. Grain Programs ($/bu)	0.1	0.1	0.0	0.2	0.1
Gross Returns ($/bu)	2.4	2.8	3.1	2.5	2.6
Costs					
Variable Costs ($/bu)					
Seed	0.1	0.1	0.1	0.1	0.1
Fertilizer	0.2	0.2	0.2	0.2	0.2
Herbicide	0.1	0.1	0.1	0.1	0.1
Insecticide	0.0	0.0	0.0	0.0	0.0
Other Chemicals	0.0	0.0	0.0	0.0	0.0
Technical Services	0.0	0.0	0.0	0.0	0.0
Custom Services	0.0	0.0	0.0	0.0	0.0
Other Direct Crop Expense	0.1	0.0	0.0	0.0	0.0
Total Direct Cash Inputs	0.7	0.6	0.6	0.6	0.6
Other Variable Cash Costs					
Crop Insurance	0.0	0.0	0.0	0.0	0.0
Gov. Programs	0.0	0.0	0.0	0.0	0.0
Power	0.3	0.0	0.1	0.2	0.2
Repairs	0.1	0.1	0.0	0.1	0.1
Paid Labor	0.2	0.0	0.1	0.1	0.1
Total Other Variable Costs	0.7	0.2	0.2	0.5	0.4
Total Variable Cash Costs	1.4	0.8	0.9	1.2	1.1
Variable Non-Cash Costs	0.0	0.0	0.0	0.0	0.0
Unpaid Labor	0.1	0.1	0.1	0.1	0.1
Cost of Operating Capital	0.0	0.0	0.0	0.0	0.0
Non-Cash Variable Costs	0.2	0.2	0.2	0.2	0.2
TOTAL VARIABLE COSTS	1.6	1.1	1.1	1.4	1.3
Fixed Costs ($/bu)					
Overhead	0.6	0.5	0.3	1.1	0.9
Direct Deprec. & Interest	0.1	0.3	0.3	0.2	0.2
Indirect Fuel & Repairs	0.0	0.0	0.1	0.0	0.0
Indirect Deprec. & Interest	0.0	0.0	0.0	0.0	0.0
Total Land	0.8	0.5	0.7	0.8	0.8
TOTAL FIXED COSTS	1.7	1.5	1.5	2.2	2.1
TOTAL COSTS ($/bu)	3.3	2.6	2.7	3.7	3.4

compete against all other dryland Idaho crops on an even basis in order to be competitive at the farm level, and, in the long run, each crop must generate sufficient revenue to cover the opportunity costs of all fixed inputs for it to be profitable. This means that fixed costs are an important part of their overall cost structure and they will affect

Idaho's international competitiveness. This is not the case in irrigated production, however. Barley, especially feed barley, is a lower valued crop and COP often exceeds revenues. This is because much of the fixed investment associated with irrigation equipment, farm machinery and land are generated by other much higher valued crops such as potatoes. Barley serves mainly as a rotation crop to break disease or pest cycles. For this reason, barley has an important role in the profit maximizing crop portfolio. As long as barley generates revenues above variable costs of $1.68/bu and serves as effective disease and pest break, it is contributing toward the profitability of the whole crop portfolio. In maximizing returns to the whole crop portfolio, barley serves as an optimal loss minimizing strategy and its true cost is the sum of the opportunity costs or the resources it uses or approximately $1.68/bu.[9]

Idaho and Western Canada Comparisons

Since both Idaho and Saskatchewan sample data were available, sample means and means and variances were tested for statistically significant differences as outlined in Ott (1993). The data for Alberta participants were not tested because individual observations were not available.

Idaho and Saskatchewan average direct cash, variable, fixed and total cost means and variances were tested based on unweighted data. Levene's test was used to compare country variances. In all cases, equal variances was rejected at the 5% probability level or less. Next, the sample means were tested using the T test of inde-

[9] In a mathematical programming context, the reduced costs of barley are the sum of the shadow prices. In this case, they are approximately $1.68/bu .

pendent samples and assuming unequal sample variances. Again, the null hypothesis that the means were the same was rejected at the 5% probability level or less.

All Barley Producers

Average COP per bushel (ATC) for all Idaho barley producers was compared to average COP per bushel for barley producers in Saskatchewan and Alberta (Table 3). Barley yields for all Idaho producers were almost 40% higher than for Saskatchewan and over 82% greater than for Alberta due in part to the larger proportion of irrigated producers In Idaho. However, high yields did not translate in to lower costs-- Idaho was still the highest cost producer. Average Idaho ATC per bushel was more than twice that of Saskatchewan and 53.5% greater than Alberta's costs. Land and overhead were the major contributors to the higher Idaho production costs.

Average variable costs (AVC) make up less than half of average total costs (ATC) for all three producing regions. For all Idaho producers, AVC represent 39.2% of total costs, while AVC represent 46.6% and 48.2% of ATC for Saskatchewan and Alberta, respectively. However, Idaho AVC per bushel were 81% higher than Saskatchewan's cost and 25% higher than those of Alberta producers. Some of this difference is due to the additional costs associated with irrigated barley production in Idaho.

The largest cost differences between Idaho and Canadian barley producers were in total fixed costs. Idaho AFC per bushel were approximately 142% greater than Saskatchewan's costs and almost 80% greater than those of Alberta. Overhead costs and land values of Idaho producers were largely responsible for this difference. Over-

Table 3: 1994 Barley Detailed Cost of Production per bushel, All Idaho Barley, Saskatchewan and SE Alberta

Return, Cost	IDAHO All Producers		SASKATCHEWAN All Producers		ALBERTA All Producers	
Size:						
Farm size (acres)	1397.		2295.			
Acres in Barley	383.		333.		341.	
Land Tenure						
% Owned	63.4		66.2			
% Leased	36.6		26.5			
%Crop Share	0.0		7.3			
Cropping Intensity						
% Fallow	6.0		20.9			
Production/Income	28.7					
Revenue						
Yield (bu/acre)	68.		49.		37.	
Price ($/bu)	2.4		2.1		1.9	
Govt. Grain Programs ($/bu)	0.1				0.2	
Gross Returns ($/bu)	2.6		2.1		2.2	
Costs ($/ac)						
Variable Costs ($/bu)	*($/bu*	*% AV*	*($/bu*	*% AV*	*($/bu*	*% AV*
Seed	0.1	9.6	0.0	7.2	0.1	10.7
Fertilizer	0.2	19.9	0.2	26.7	0.3	27.1
Herbicide	0.1	11.0	0.1	13.8	0.1	13.6
Insecticide	0.0	0.0	0.0	0.0	0.0	0.0
Other Chemicals	0.0	0.0	0.0	0.0	0.0	0.0
Technical Services	0.0	0.0	0.0	0.0	0.0	0.0
Custom Services	0.0	5.1	0.0	2.0	0.0	7.5
Other Direct Crop Expense	0.0	3.7	0.0	2.1	0.0	0.0
Total Direct Cash Inputs ($/bu)	0.6	49.3	0.3	51.8	0.6	59.3
Other Variable Cash Costs						
Crop Insurance	0.0	0.0	0.0	5.7	0.0	0.0
Gov. Programs	0.0	0.0	0.0	0.7	0.0	0.0
Power	0.2	15.4	0.1	12.8	0.1	9.3
Repairs	0.1	10.3	0.1	13.6	0.1	8.9
Paid Labor	0.1	9.6	0.0	0.1	0.0	6.1
Total Other Variable Costs ($/bu)	0.4	35.3	0.2	33.0	0.2	24.3
Total Variable Cash Costs ($/bu)	1.1	84.6	0.6	84.8	0.9	83.6
Variable Non-Cash Costs						
Unpaid Labor	0.1	11.0	0.1	15.2	0.1	13.6
Operating Capital Cost	0.0	4.4	0.0	0.0	0.0	2.3
Non-Cash Variable Costs ($/bu)	0.2	15.4	0.1	15.2	0.1	16.4
TOTAL VARIABLE COSTS ($/bu)	1.3	100.0	0.7	100.0	1.0	100.0
Fixed Costs ($/bu)	*($/bu*	*% AF*	*($/bu*	*% AF*	*($/bu*	*% AF*
Overhead	0.9	46.7	0.0	9.8	0.3	28.8
Direct Deprec. & Interest	0.2	11.9	0.2	29.8	0.1	15.3
Indirect Fuel & Repairs	0.0	2.4	0.0	5.3	0.0	1.3
Indirect Deprec. & Interest	0.0	1.0	0.1	18.7	0.1	16.2
Total Land	0.8	38.1	0.3	36.4	0.4	38.0
TOTAL FIXED COSTS ($/bu)	2.1	100.0	0.8	100.0	1.1	100.0
TOTAL COSTS ($/bu)	3.4		1.6		2.2	

head costs, as listed by Idaho barley producers, were over 12 times larger than overhead costs for Saskatchewan producers and almost 3 times larger than overhead costs in Alberta. Land value per bushel for all Idaho barley producers is approximately twice the land value per bushel for their Canadian counterparts. As in the case of total variable costs, greater average total fixed costs for all Idaho barley producers reflects additional general farm expenses (such as property taxes) and additional value of land associated with irrigated barley production.

Dryland Barley Producers

Because the majority of both Idaho and Canadian barley is produced under dryland conditions, a more valid comparison can be made by excluding irrigated Idaho barley producers and comparing dryland production costs (Table 4).[10] With irrigated producers excluded, Idaho dryland barley yields are still superior to western Canadian yields, averaging 14.4% and 50.3% greater yields than for Saskatchewan and Alberta, respectively.

Idaho barley per bushel ATC ranged from a low of $2.66 for dryland producers to a high of $3.71 for all (irrigated and dryland) feed barley producers. Even though average total COP (ATC) per bushel for Idaho dryland barley was almost 25% lower than that of all Idaho barley producers, Idaho costs still remained higher than Canadian costs (Table 4). Idaho's ATC per bushel (US$2.66) was 65% greater than that of Saskatchewan (US$1.61) and 18% greater than that Alberta (US$2.26).

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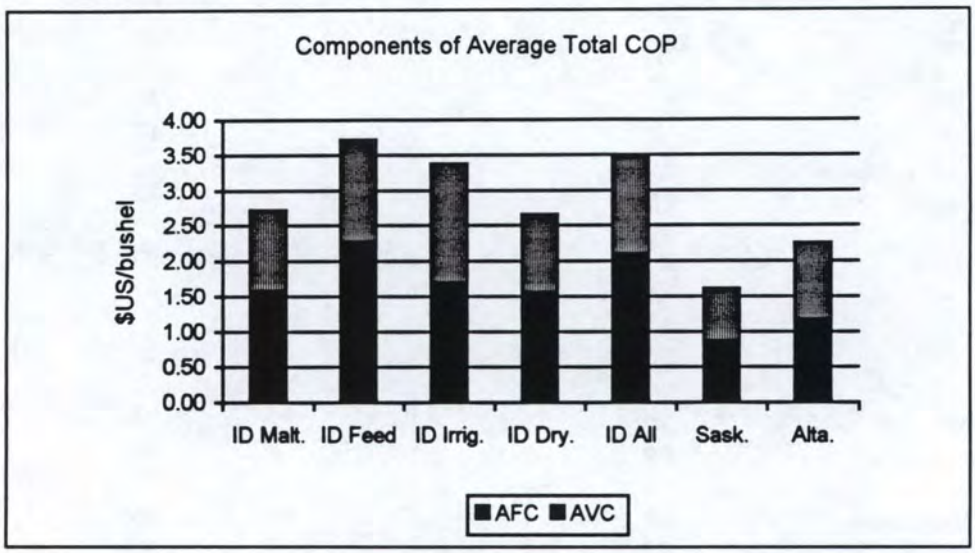
[10] Comparing COP on a per bushel basis is more valid than comparing COP per acre, because for all categories of barley studied, Idaho produces considerably more per acre than her Canadian neighbors.

Table 4: 1994 Barley Detailed Cost of Production per bushel, Idaho Dryland Barley, Saskatchewan and SE Alberta

Return, Cost	IDAHO All Dryland		SASKATCHEWAN All Dryland		ALBERTA All Dryland	
Size:						
Farm size (acres)	1960.		2295.			
Acres in Barley	535.		333.		341.	
Land Tenure						
% Owned	67.8		66.2		0.0	
% Leased	32.2		26.5		0.0	
%Crop Share	0.0		7.3		0.0	
Cropping Intensity						
% Fallow	6.2		20.9		0.0	
Production/Income	36.3		0.0		0.0	
Revenue						
Yield (bu/acre)	56.		49.		37.	
Price ($/bu)	2.6		2.1		1.9	
Govt. Grain Programs ($/bu)	0.1					
Gross Returns ($/bu)	2.8		2.1		2.2	
Costs ($/ac)						
Variable Costs ($/bu)	*($/bu*	*% AV*	*($/bu*	*% AV*	*($/bu*	*% AV*
Seed	0.1	11.8	0.0	7.2	0.1	10.7
Fertilizer	0.2	24.5	0.2	26.7	0.3	27.1
Herbicide	0.1	14.5	0.1	13.8	0.1	13.6
Insecticide	0.0	0.0	0.0	0.0	0.0	0.0
Other Chemicals	0.0	0.0	0.0	0.0	0.0	0.0
Technical Services	0.0	0.0	0.0	0.0	0.0	0.0
Custom Services	0.0	4.5	0.0	2.0	0.0	7.5
Other Direct Crop Expense	0.0	0.0	0.0	2.1	0.0	0.0
Total Direct Cash Inputs ($/bu)	0.6	55.5	0.3	51.8	0.6	59.3
Other Variable Cash Costs						
Crop Insurance	0.0	0.0	0.0	5.7	0.0	0.0
Gov. Programs	0.0	0.0	0.0	0.7	0.0	0.0
Power	0.0	7.3	0.1	12.8	0.1	9.3
Repairs	0.1	10.9	0.1	13.6	0.1	8.9
Paid Labor	0.0	5.5	0.0	0.1	0.0	6.1
Total Other Variable Costs ($/bu)	0.2	23.6	0.2	33.0	0.2	24.3
Total Variable Cash Costs ($/bu)	0.8	80.0	0.6	84.8	0.9	83.6
Variable Non-Cash Costs						
Unpaid Labor	0.1	14.5	0.1	15.2	0.1	13.6
Operating Capital Cost	0.0	5.5	0.0	0.0	0.0	2.3
Non-Cash Variable Costs ($/bu)	0.2	20.0	0.1	15.2	0.1	16.4
TOTAL VARIABLE COSTS ($/bu)	1.1	100.0	0.7	100.0	1.0	100.0
Fixed Costs ($/bu)	*($/bu*	*% AF*	*($/bu*	*% AF*	*($/bu*	*% AF*
Overhead	0.5	37.8	0.0	9.8	0.3	28.8
Direct Deprec. & Interest	0.3	19.9	0.2	29.8	0.1	15.3
Indirect Fuel & Repairs	0.0	3.8	0.0	5.3	0.0	1.3
Indirect Deprec. & Interest	0.0	1.3	0.1	18.7	0.1	16.2
Total Land	0.5	37.2	0.3	36.4	0.4	38.0
TOTAL FIXED COSTS ($/bu)	1.5	100.0	0.8	100.0	1.1	100.0
TOTAL COSTS ($/bu)	2.6		1.6		2.2	

Most of the differences in ATC between Idaho and western Canadian barley costs are due to differences in fixed production costs, not variable costs (figure 1). Among all Idaho barley producers, average variable costs ranged from $1.10 per bushel for all dryland producers to $1.68 per bushel for all irrigated barley producers.

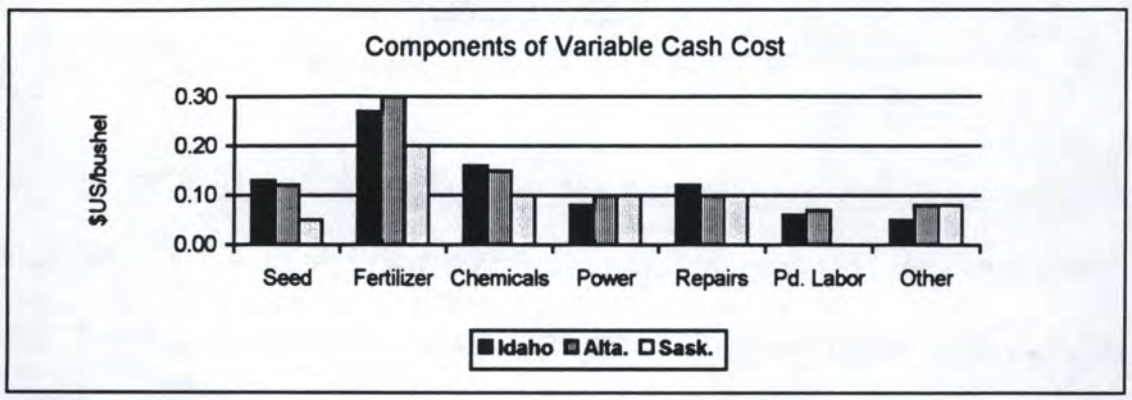
Figure 1: Comparison of AVC and AFC per bushel for Idaho and Canadian barley producers.



Comparisons of country variable cash cost components are presented in figure 2. Interestingly, average variable costs (AVC) were approximately the same for barley producers in Idaho and Alberta (US$1.10/bu and US$1.09/bu, respectively). However, Saskatchewan AVC (US$0.75/bu) were 31.5% lower than those of either Idaho or Alberta. Much of these differences are accounted for by greater Idaho and Alberta expenditures on seed and chemicals-- they were approximately 60% greater than those of Saskatchewan barley growers. Idaho, Alberta and Saskatchewan dryland producer AVC cost components are compared in figure 2. Fertilizer represents the largest single variable cash cost for both Idaho and Canadian barley producers. However, fertilizer

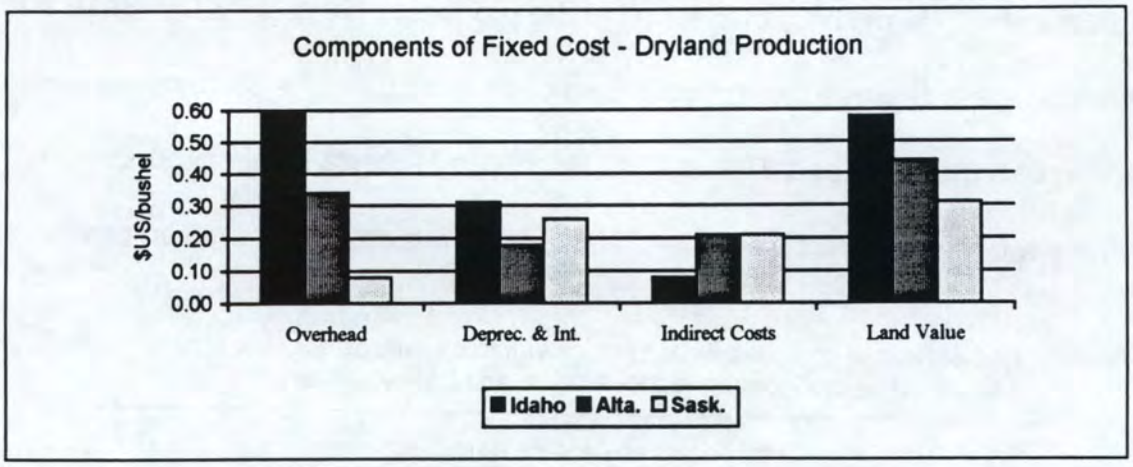
generally represents a relatively larger percentage of total AVC per bushel for all Canadian producers (27% of AVC) than for all Idaho producers (20% of AVC). Seed and other chemicals also represent significant cash costs per bushel for barley producers, representing between 21% and 27% of AVC. Idaho and Alberta barley producers spend nearly two-thirds more on seed and chemicals than do Saskatchewan producers.

Figure 2: Comparison of components of average variable cash costs for per bushel for all dryland barley producers in Idaho, Alberta, and Saskatchewan.



Average fixed costs (AFC) per bushel for Idaho barley ranged from $1.56 per bushel for dryland barley to $2.27 per bushel for all feed barley. Using the Idaho dryland barley AFC (US$1.56/bu), Idaho's costs were 79.3% and 33.3% higher than those Saskatchewan (US$0.87/bu) and Alberta (US$1.17/bu), respectively. These differences are mostly due to higher Idaho overhead and higher land costs (figure 3). For all Idaho barley producers, the overhead and land cost components represent approximately 85% of AFC per bushel. This is considerably higher than for Saskatchewan (44.8%) or for Alberta (66.7%).

Figure 3: Comparison of components of average fixed costs per bushel for all dryland barley producers in Idaho, Alberta, and Saskatchewan.



Potential Reasons Underlying Idaho- Saskatchewan Cost Differences

The differences between Idaho and Saskatchewan costs are many and statistically different--most at the 1% level. There are a number of potential causes--some methodological and some associated with differences in farm cost structure. While cost definitions were standardized, some potential methodological problems including differences in sampling procedure, survey instruments and survey administration, still remain. The following section examines some of the reasons for the major differences in costs.

COP Sensitivity to Yields

Because yields per acre differ so much between western Canada and Idaho, comparisons are based on costs per bushel, not per acre. Unfortunately, this makes the results more sensitive to variations in yield. Thus, care should be used to make sure that 1) yields are typical of the study area and 2) yields are not unduly affected by random events generated by weather or pest infestations.

The average COP data for Idaho was developed from a statistically small sample, as only 17 usable survey data forms were returned. With a sample this small, one relatively high- (or low-) cost producer could raise (or lower) the average per bushel COP by several cents. A higher survey response rate could result in different results than are presented here.

In the case of Saskatchewan, 1994 producer yields matched almost exactly average provincial yields--49.4 versus 49.3 bu/ac for the Top Management and the province respectively. However, 1994 yields were approximately 7% higher than the provincial 10-year average (Table 5).

Table 5: Comparison of sample yields, 1994 average and 10-year average yields for Idaho and Saskatchewan, on costs per bushel, all barley producers.

Yield, Cost	IDAHO			SASKATCHEWAN			SE ALBERTA
	Sample	Stage Averages		Sample	Provincial Averages		Sample
	1994	1994	1985-94	1994	1994	1985-94	
Yield (bu/ac)	68.	75.	70.	49.	49.	45.	37.6
AVC ($/ac)	1.3	1.2	1.3	0.7	0.7	0.8	1.0
AFC ($/ac)	2.1	1.9	2.0	0.8	0.8	0.9	1.1
ATC ($/ac)	3.4	3.1	3.3	1.6	1.6	1.7	2.2

Note :Costs are recalculated based on the associated state or provincial yield.

Among Idaho barley producers surveyed, average yields for all barley produced (68.6 bu/ac) were 8.5% lower than the 1994 state average yield (75 bu/ac) and 2.7% lower than the state 10-year average yield (70.5 bu/ac). Statewide, average yields were down by 6.5% for all producers compared to 1993, because of drought conditions in the eastern dryland production area.

Obviously, yield per acre has a major impact on comparative per bushel cost of production between trading partners. In order to assess the impact of varying crop yields, per bushel costs were recalculated for Idaho and Saskatchewan using 1994 and 10-year average yields for Idaho and Saskatchewan (Table 5). Using state one-year and ten-year averages, total COP per bushel for all Idaho producers drops 9% or $0.30/bu for the state 1994 average, and 3% or $0.09/bu for the 10-year state average. Total COP per bushel for Saskatchewan increases $0.13 US or 8% when using the 10-year average. Still, Idaho total COP is $1.61/bu or 48% higher than COP per bushel for Saskatchewan producers. Idaho dryland barley producers would have to increase average yields to 68 and 83 bushels per acre to overcome the COP advantage of Alberta and Saskatchewan barley producers, respectively.[11]

COP Sensitivity to Exchange Rates

Exchange rate also have an important impact on COP comparisons. Lower (less than $1.3994 Canadian = $1.00 US) exchange rates reduce the Canadian COP advantage. Conversely, higher exchange rates would increase the COP advantage of Canadian barley production, relative to Idaho cost of production. Table 6 illustrates the impacts of different exchange rates on Canadian COP per bushel.

Even if the exchange rate was $1.00 Canadian = $1.00 US[12], the lowest exchange rate in modern times, Canadian barley producers would still have a COP ad-

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[11] In order for all Idaho barley producers to overcome the COP advantage of Alberta and Saskatchewan producers, average yields for all Idaho producers would have to increase to 103 and 125 bushels per acre, respectively.

[12] The last time $1.00 Canadian was greater than or equal to $1.00 US was in November, 1976, when $0.98 Canadian = $1.00 US.

vantage over all Idaho barley producers, and barley producers in Saskatchewan would have a slight COP advantage over Idaho dryland barley producers. However, because of the lower cost of producing dryland barley in Idaho, an exchange rate of $1.18 Canadian = $1.00 US would equalize COP between Idaho dryland barley producers and SE Alberta producers.

Table 6: Impacts of different exchange rates on Canadian COP components, compared to Idaho COP for all Idaho producers and Idaho dryland producers.

Cost	IDAHO		SASKATCHEWAN			SE ALBERTA		
	ALL	DRYLAND	Exchange Rate (= $1.00 US)			Exchange Rate (= $1.00 US)		
			1.3994	1.268	1.4233	1.3994	1.2680	1.4233
AVC ($/bu)	1.3	1.1	0.7	0.8	0.7	0.9	1.2	1.0
AFC ($/bu)	2.1	1.5	0.8	0.9	0.8	1.1	1.2	1.1
ATC ($/bu)	3.4	2.6	1.6	1.7	1.5	2.2	2.4	2.2

NOTE: The four-month (January 1995 - April 1995) average exchange rate used for the study is $1.3994 Canadian = $1.00 US. The maximum exchange rate for that four-month period was $1.4233 Canadian = $1.00 US. The 10-year average exchange rate is $1.268 Canadian = $1.00 US.

Adjustment Differences

Because of the difference in US-Canada farm programs, the adjustment process to the 1987 to 1994 depressed grain markets may have been much different between the two countries. In this adjustment process, Saskatchewan production costs and, particularly, fixed costs were reduced dramatically. For example, from 1987 to 1994, ATC declined 26% in nominal terms or an average annual decrease of 4.3%. When adjusted for changes in US-Canada currency exchange rates, these rates are 27.6% and 4.5%, respectively. Almost all the decreases in ATC were accounted for by decreases in fixed costs associated with land, depleted machinery inventory values and

decreased interest rates. However, with the 1994 rebound in commodity prices, costs have started to increase - 1995 costs were projected to increase by approximately 15%.

Conclusions

Western Canadian barley producers, and in particular, Saskatchewan barley producers have a definite cost of production advantage in producing barley. Idaho barley per bushel ATC ranged from a low of $2.66 for dryland producers to a high of $3.71 for all (irrigated and dryland) feed barley producers. In dryland cohort comparisons, Idaho dryland barley ATC per bushel (US$2.66) was 65% greater than that of Saskatchewan (US$1.61) and 18% greater than that Alberta (US$2.26). Producers in both Canadian areas were also able to cover all costs, although in the case of Alberta, it was only by a few pennies per bushel. Under the rules of a regional trade agreement such as NAFTA, Canadian producers could sell their barley in the United States at a considerably lower price than Idaho producers, cover their cost of production, and make a sizable profit--depending upon local transportation costs[13].

Why are western Canadian, and in particular Saskatchewan, costs so much lower than Idaho's? Saskatchewan and Idaho barley production are very different. In Idaho, barley serves mainly as a rotation crop to break disease or pest cycles and contributes towards the profitability of the whole crop portfolio. In this case, traditional enterprise cost accounting is a poor measure of the net cost of barley to the whole crop portfolio. In Saskatchewan, barley must compete directly with other cereals and has

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[13] At this time (June 1996), the cost of shipping barley from Saskatchewan are CAN$50-60/tonne or about US$0.78 to $0.93 per bushel. Most of Saskatchewan's COP advantage is eroded away by local (Canadian) transportation costs.

fewer side benefits. Accordingly, it must recover more of all costs in order to be included in the crop portfolio. Here, traditional cost accounting measures give a better, but not necessarily completely accurate, picture of the internal costs of production. If the disease break and other benefits are included, local Idaho feed barley prices may be able to drop considerably in equalizing Idaho-Canada prices without necessarily affecting Idaho production.

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