Agricultural Economics Report No. 425 **August 1999**

Barley Production Costs: A Cross-Border Comparison

D. Demcey Johnson and Edward L. Janzen

Department of Agricultural Economics
Agricultural Experiment Station
North Dakota State University
Fargo, ND 58105-5636

Acknowledgments

Constructive comments were received from William Wilson, Dwight Aakre, and Joon Park. However, the authors assume responsibility for any errors or omissions. Carol Jensen helped prepare the manuscript. Funding for this research was obtained from the North Dakota Barley Council and through a cooperative agreement with the Economic Research Service of USDA, entitled "Government Intervention in the Canadian Barley Sector and Its Influence on Trade," #43-3AEK-8-80036.

We would be happy to provide a single copy of this publication free of charge. You can address your inquiry to: Carol Jensen, Department of Agricultural Economics, North Dakota State University, P.O. Box 5636, Fargo, ND, 58105-5636, Ph. 701-231-7441, Fax 701-231-7400, e-mail cjensen@ndsuext.nodak.edu . This publication is also available electronically at this web site: http://agecon.lib.umn.edu/ndsu.html

Information on other titles in this series may be obtained from: Department of Agricultural Economics, North Dakota State University, P.O. Box 5636, Fargo, ND 58105. Telephone: 701-231-7441, Fax: 701-231-7400, or e-mail: cjensen@ndsuext.nodak.edu.

Table of Contents

List of Tables

List of Figures

Abstract

Barley production costs are compared for five states and three Canadian provinces. A stochastic simulation, incorporating yield and exchange-rate risk, is used to characterize regional cost advantages in terms of probabilities.

Key words: barley, production costs, yield risk, simulation analysis.

Highlights

This paper presents a comparison of barley production costs in five major producing states (North Dakota, Montana, Idaho, Minnesota, and South Dakota) and three Prairie provinces (Alberta, Saskatchewan, and Manitoba). Cost estimates are derived from several independent studies and, as such, reflect a range of methodologies; nevertheless, they provide a rough indication of cost differences among growing regions. Results of a stochastic simulation are also presented. The simulation incorporates two sources of randomness: yield risk and exchange-rate risk. This allows regional cost advantages in cents per bushel to be described in a probabilistic sense.

Benchmark cost comparisons for 1997 are presented. On a per-acre basis, Saskatchewan had the lowest production costs ($94.86) and Idaho the highest ($346.82). The Idaho estimate reflects higher-than-average costs in several categories, including fertilizer and chemical inputs, labor, irrigation-related expenses, and land costs. Of the remaining U.S. regions, Montana has the lowest per-acre costs ($104.01), followed by North Dakota ($117.25), South Dakota ($126.35), and Minnesota ($137.82). Rankings are only slightly different in terms of cost per bushel. Using trend yields, Manitoba had the lowest cost per bushel ($1.74), followed by Saskatchewan ($1.88) and Alberta ($2.13). Montana was the lowest-cost U.S. region ($2.19), followed by North Dakota ($2.22), Minnesota ($2.30), and South Dakota ($2.84). Idaho had the highest cost per bushel ($4.31).

Production costs per bushel are inversely related to yields, which exhibit different levels of variability and correlation across regions. To capture the random influence of yields on inter-regional cost relationships, a stochastic simulation was conducted. Yield variability, measured by deviations from trend yield in each region, was estimated through regression analysis. In addition, the Canadian dollar exchange rate was introduced as a random variable with mean equal to the 1997 average value. Simulation results, based on 2,500 random drawings from a specified distribution, allow regional cost differences to be characterized in terms of probabilities. Results of the analysis confirm the position of the Prairie provinces as low-cost suppliers.

Differentials in shipping and handling costs were also considered. Canadian origins have a rail freight advantage in shipping to export points (i.e., Vancouver and Lake ports), which is only partly offset by higher elevation charges. With high probability, representative origins in Montana and North Dakota can supply barley to California more cheaply than Alberta or Saskatchewan. However, the Prairies appear to be reasonably competitive in Midwestern malting barley markets despite a large freight disadvantage (relative to barley producers in North Dakota and Minnesota), owing to low production costs.

These results challenge the notion that Canadian barley exports to the United States would not occur if there were a 'level playing field' for agricultural producers on both sides of the border. Cross-border differences in production costs are largely unrelated to issues of marketing organization (i.e., Wheat Board control) or producer supports, which are minimal in Canada. Rail rates in Canada do reflect a different regulatory environment, but the effects of reforming this system—in particular, removing the rate caps on grain shipments to ports, which is now under discussion—are difficult to anticipate. To the extent that reforms in Canada result in higher shipping costs to ports, the effect may be to induce larger shipments to alternative destinations, including U.S. barley markets.

Some qualifications should be mentioned. Cost estimates were derived from a variety of published sources, with different levels of detail. It is unknown to what extent the regional differences in per-acre costs are due to differences in budgeting assumptions or accounting conventions (e.g., for costs of machinery and equipment). This cautions against reading too much into a comparison of (independent) estimates for different states and provinces. The estimates may also mask considerable variation among farms within a state or province.

Cross-border cost comparisons are influenced by the exchange rate. The Canadian dollar has fallen by about 20 percent against the U.S. dollar in this decade, and this has surely improved the competitive position of Canadian exports, including barley. An appreciation (strengthening) of the Canadian dollar would reverse some of this gain. Land values are another important factor. To the extent that benefits under U.S. farm programs have been bid into farmland prices, the indirect costs of U.S. barley production have been inflated. With the decline in market transition payments and other U.S. producer supports—combined with current low prices for farm commodities—U.S. land values seem likely to decline. This could narrow the cost advantage now enjoyed by Canadian barley producers.

Barley Production Costs: A Cross-Border Comparison

D. Demcey Johnson and Edward L. Janzen*

1. Introduction

U.S. imports of barley from Canada have increased sharply in recent years, while U.S. barley acres have declined. For U.S. producers, these trends have raised concerns about cross-border competition. The prospect of Canadian barley making further inroads in U.S. markets, displacing U.S. barley, is especially troubling to producers in the Northern Plains where cropping choices are limited. Producers in North Dakota, Montana and Minnesota have been among the most vocal critics of the trade agreements that have facilitated U.S. imports of Canadian grain.

Much of the public controversy surrounding Canada/U.S. grain trade has concerned the role of the Canadian Wheat Board, a state trading enterprise. Allegations of hidden subsidies and unfair trading practices may have encouraged the belief that Canadian policies, rather than market forces, are to 'blame' for U.S. barley imports. The CWB surely has some impact on the volume and pattern of Canadian barley trade.[1] However, it is relevant to ask whether Canadian producers enjoy competitive advantages for other reasons. Economic theory suggests that production costs, combined with shipping costs to major markets, should help to determine the geography of barley production and trade.

This paper presents a comparison of barley production costs in five major producing states (North Dakota, Montana, Idaho, Minnesota, South Dakota) and three Prairie provinces (Alberta, Saskatchewan, and Manitoba). Cost estimates are derived from several independent studies and, as such, reflect a range of methodologies; nevertheless, they provide a rough indication of cost differences among growing regions. Results of a stochastic simulation are also presented. The simulation incorporates two sources of randomness: yield risk and exchange-rate risk. This allows regional cost advantages in cents per bushel to be described in a probabilistic sense.

The plan of the paper is as follows. The next section reviews data sources and procedures, and provides a benchmark comparison of estimated production costs in five states and three provinces. The third section presents the simulation analysis. The paper concludes with a short summary and discussion of implications.

2. Benchmark Comparison of Barley Production Costs

For purposes of a benchmark comparison, production costs were assembled from a variety of sources. These are summarized below by state or province. Procedures for standardizing the data (putting estimates on a common footing) are also described briefly. It should be noted that few previous studies have reported barley production costs for more than one state or province. An

---

*Associate professor and research associate, Department of Agricultural Economics, North Dakota State University, Fargo.

[1]See Johnson (1999) for discussion.

exception is the report by Meyer et al. (1996) comparing costs in Idaho, Saskatchewan, and Alberta. The U.S. Department of Agriculture now reports 'Barley Costs and Returns' on a regional basis, with the 'Northern Plains' defined to include Montana, Wyoming, North and South Dakota, and Minnesota. Thus, for more detailed regional comparisons, it is necessary to collect estimates from individual states and provinces and to reconcile any differences in cost measurement or definition. The 1997 crop year was chosen as a base, as that was the most recent year for which most data were available.

2.1. Data Sources by State and Province

North Dakota

Source of Data: Farm Management Planning Guide, Projected 1997 Crop Budgets (by regions), NDSU Extension Service, North Dakota State University, Fargo, December 1996. The crop budgets provide an *estimate* of revenues and costs for selected crops in each of the eight multi-county Farm Management regions.

Standardization Procedures: The North Dakota farm management guide format is used as the base template for the various cost categories in this study. Agricultural Statistics Service county data are used to calculate the total harvested acres for each of the Farm Management planning regions in North Dakota in 1997. Total harvested acres are used to weight the various crop budgets to arrive at state average costs of production.

Montana

Source of Data: Departmental Special Reports (#25, #26, #27, #28), Production Costs for Annually-Planted Crops Produced on Dryland Cropland (by major land resource area), Department of Agricultural Economics, Montana State University, Bozeman, July 1998.
These reports summarize information obtained through a cropping practices *survey* conducted by the Montana Agricultural Statistics Service for the 1995 crop year. Separate reports are provided for barley after fallow and barley recrop practices. The state is divided into four MLRAs (Major Land Resource Areas).

Standardization Procedures: Additional information in the surveys is used to estimate the number of acres included in each of the farming practices for each of the MLRAs. These acres are used to weight the reports for the various MLRA/farming practice scenarios to arrive at state average costs of production. The 1995 costs are adjusted to a 1997 cost base by applying the percentage change in the North Dakota Crop Budgets from 1995 to 1997 for each of the various cost categories.

Idaho

Source of Data: 1997 Crop Costs and Returns Estimates (by districts), Cooperative Extension Service, University of Idaho, Moscow, ID, December 1997. The cost and return *estimates* are provided for representative model farm operations in four districts. They include separate estimates for feed and malting barley as well as irrigated and dryland practices where applicable.

Standardization Procedures: Data from the Idaho State Statistical Report noting acres planted to feed barley and malting barley for each of the districts are combined with additional data from the report noting irrigated and non-irrigated barley acres by district for 1997 to calculate weighting factors. These calculated acres are used to weight the crop costs and return estimates for the various district/farming practice scenarios to arrive at the state average costs of production.

Minnesota

Source of Data: Crop Enterprise Analysis, 1997, Reports (by region and statewide summary), Farm Business Management Education Program, Minnesota State Colleges and Universities. The reports provide a *summary of crop enterprise analyses* of farm owners and operators participating in the Farm Business Management Program. The state is divided into seven regions with separate reports for owned land, cash rented land, and share rented land operations.

Standardization Procedures: The number of acres reported in each category (owned land, cash rented land, and share rented land) is used to weight the reported crop costs to arrive at the state average costs of production.

South Dakota

Source of Data: 1998 Estimated Costs of Production for Spring Crops (by districts), Cooperative Extension Service, South Dakota State University, Brookings. The budgets, intended as *planning guides* only, are provided for nine districts in the state.

Standardization Procedures: Given the availability of the 1998 estimated costs of production and the understanding that they differ little from 1997, these cost estimates are used as the base for calculation. Agricultural Statistics Service data indicating acres harvested by district are used to weight the estimates for each of the districts to arrive at state average costs of production.

Alberta

Source of Data: 1997 Crops Enterprise Analyses (by region), Production Economics & Statistics Branch, Alberta Agriculture, Food and Rural Development, Edmonton, AB, August 1998. Costs and returns tables provide *summary data* from selected cooperating enterprises in each of five regions. Separate summaries are provided for feed and malt barley and irrigated and dryland practices where applicable.

Standardization Procedures: The reported acres cropped for each of the region/farming practice combinations is used to weight the summary data reports to arrive at province average costs of production.

Manitoba

Source of Data: Guidelines for Estimating 1997 Crop Production Costs, Farm Management Group, Manitoba Agriculture, Winnipeg, MB, January 1997. The budgets are *estimates* of the costs of producing several different crops. A single budget for the province is provided for each of the crops considered.

Standardization Procedures: Since only a single guideline for estimating barley production costs is provided for the province, it is used to represent the average costs of production.

Saskatchewan

Source of Data: Farm Facts, Crop Planning Guide 1997 (by major soil zones), Saskatchewan Agriculture and Food, Regina, SK, January 1997. The crop budgets provide a planning guide and *estimates* for three seeding practices (fallow seeded, conventional seeded, and direct seeded) in each of the three major soil zones (brown, dark brown, and black).

Standardization Procedures: Crop district definitions are overlaid on a map showing the major soil zones. Crop district production data from Saskatchewan Agriculture and Food are used to estimate the barley acres harvested in each of the three major soil zones. In the absence of any data to determine use of the various seeding practices, an arbitrary breakdown of 10 percent fallow seeded and 45 percent each for conventional seeded and direct seeded is used in each of the soil zones. The acreage data are combined with the seeding practice calculations to determine the province average costs of production.

2.2. Cost Definitions

Costs in the planning budgets or enterprise analysis reports are expressed in terms of dollars per acre for each of the various cost categories. These costs generally hold true regardless of the yield or level of production. Costs per bushel of production are of interest and can be calculated for each of the producing entities, assuming an average or estimated yield per acre for each state or province.

Direct or variable costs of production for barley are costs directly related to planting and harvesting the crop. They include seed, fertilizer, chemicals, crop insurance, fuel and lubrication, repairs, miscellaneous, and operating interest. These costs are defined fairly consistently for states and provinces in this study.

Indirect costs are the overhead costs allocated to the various production operations. They include machinery investment, machinery depreciation, land investment, land taxes, and miscellaneous overhead. The indirect cost categories are *not* consistently identified in the various crop budget/enterprise analysis reports. They range from a single number identified as ownership costs (Montana) to different and overlapping cost categories in other reports. Land costs seem to be handled in different ways. Numerous categories are included in the summary table so that region-specific details are not masked.

Unless specifically identified as custom or paid labor or paid management, returns to labor and management are *not included* in either direct or indirect costs. Given estimated yields (bushels per acre) and estimated price per bushel, returns to unpaid labor and management can be calculated as a residual.

2.3. Estimated Costs by State and Province

Benchmark cost comparisons for 1997 are shown in Table 1. (See appendix tables for additional detail.) All Canadian costs have been converted into U.S. dollars. Trend yields, derived from regression analysis (described in next section), were used to convert costs per acre into costs per bushel.

On a per-acre basis, Saskatchewan has the lowest production costs ($94.86) and Idaho the highest ($346.82) (Figure 1). The Idaho estimate reflects higher-than-average costs in several categories, including fertilizer and chemical inputs, labor, irrigation-related expenses, and land costs. Of the remaining U.S. regions, Montana has the lowest per-acre costs ($104.01), followed by North Dakota ($117.25), South Dakota ($126.35), and Minnesota ($137.82).

Rankings are only slightly different in terms of cost per bushel (Figure 2). Manitoba has the lowest cost per bushel ($1.74), followed by Saskatchewan ($1.88), and Alberta ($2.13). Montana is the lowest-cost U.S. region ($2.19), followed by North Dakota ($2.22), Minnesota ($2.30), and South Dakota ($2.84). Idaho has the highest cost per bushel ($4.31) despite its high average yield (80.5 bu/acre).[2]

Differences in indirect costs, rather than direct costs, appear to explain the lower total cost of production in Prairie provinces relative to contiguous states. For example, Saskatchewan and North Dakota have comparable direct costs on a per-acre basis, but Saskatchewan has much lower indirect costs: $43.53/acre versus $62.58/acre for North Dakota. Indirect costs include the economic opportunity costs associated with land and machinery ownership, which were calculated in different ways for different states and provinces. However, as land costs reflect the available cropping alternatives, some regional variation in these costs is to be expected. Differences in farm programs between the United States and Canada may also account for some cross-border differences in land values.

---

[2]Meyer et al. point out that in Idaho, "barley mainly serves as a rotation crop to break disease and pest cycles and therefore, contributes towards the overall 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." (p. 24).

Table 1. Estimated 1997 Barley Production Costs by Region

	ND	MT	ID	MN	SD	AB	MB	SK
Direct Costs ($/acre)								
Seed	7.31	5.14	13.99	8.64	9.97	6.84	6.00	4.04
Chemicals	9.85	4.77	19.69	13.85	2.01	10.62	14.45	10.92
Fertilizer	13.05	9.57	30.39	24.13	15.02	19.78	22.32	17.22
Crop Insurance	3.75	4.81	10.28	6.47	4.92	3.69	4.19	3.63
Fuel and Lubricants	7.22		11.12	7.27	2.38	8.21	7.95	4.81
Repairs	9.88		6.53	8.63		11.61		4.75
Machinery Operating Costs		20.86		2.74	5.94		7.22	
Custom Work & Spec. Labor			46.45	2.07	19.58	3.97		2.28
Labor			25.60	0.27	5.40	5.09		
Irrigation Related Expenses			35.21			0.90		
Miscellaneous/Other	1.00			0.80		11.40	5.42	2.15
Operating Interest	2.60	1.06	7.22	3.71	3.55	1.22	2.51	1.55
Fallow Operating costs		4.28						
Sum of Listed Direct Costs	54.67	50.49	206.48	78.58	68.77	83.33	70.06	51.33
Indirect (Fixed) Costs ($/acre)								
Miscellaneous Overhead	4.31		23.80	12.50	5.07	4.35	1.55	3.81
Machinery Depreciation	16.44						12.64	
Equip. & Building Depreciation				8.48		21.90		10.62
Machinery Investment	8.99						5.06	5.45
Depreciation & Interest			34.02					
Property Taxes (Machinery)			2.01					
Machinery Ownership Costs					14.08			
Land Investment	28.75						11.56	20.29
Land Taxes	4.09						3.97	
Real Estate & Property Taxes				2.61				3.35
Land Charges					38.43	12.17		
Land Rent			80.15	26.91				
Interest				8.88		7.66		
Ownership Costs		53.52						
Sum of Listed Indirect Costs	62.58	53.52	140.34	59.38	57.58	46.09	34.78	43.53
Summary								
Total Cost, Direct and Indirect								
Estimated Yield (bu/acre)	52.72	47.43	80.47	59.87	44.46	60.63	60.32	50.39
Unit Cost ($/bu)	2.22	2.19	4.31	2.30	2.84	2.13	1.74	1.88

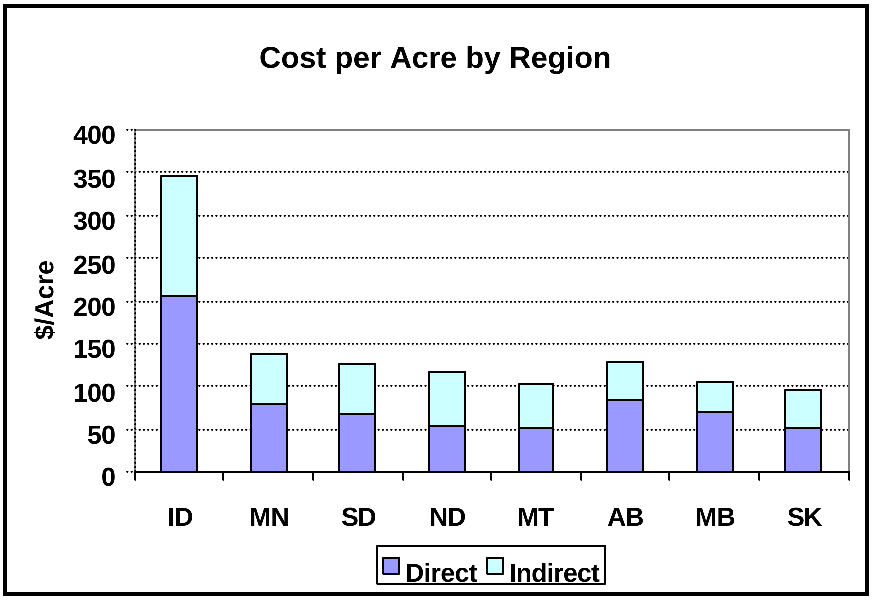


Figure 1. Per-Acre Production Costs by Region

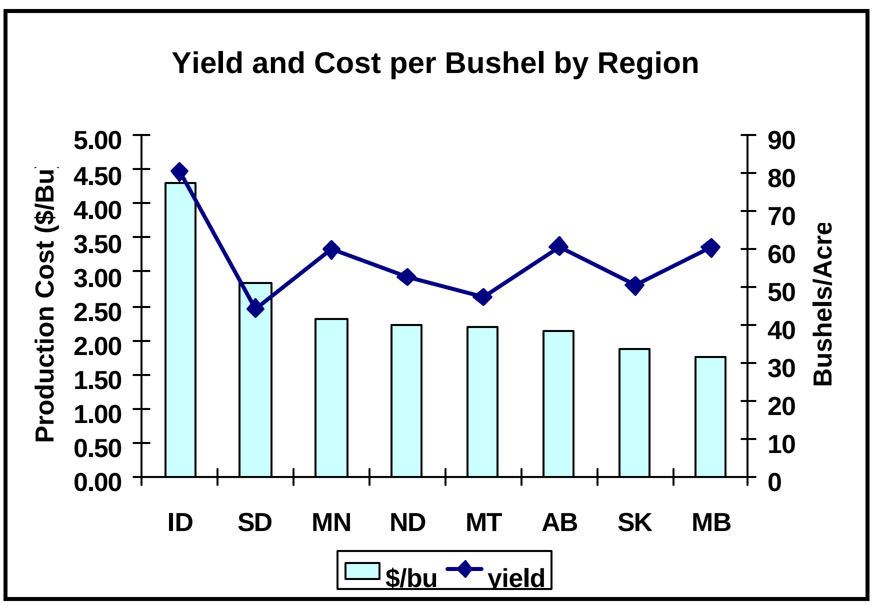


Figure 2. Yield and Cost Comparison

3. Stochastic Simulation

A limitation of the cost comparisons presented in Table 1 is that they do not take into account two important sources of year-to-year variation. The first is harvested yield, which varies with weather conditions by region, and the second is the exchange rate. Yield variability, defined as deviation from trend, can produce major changes in cost per bushel; these changes will be correlated across regions to the extent that yields are correlated. The exchange rate may also be regarded as a random variable, affecting all Canadian regions symmetrically; as the Canadian dollar declines in value, Canadian costs per bushel fall in U.S. dollar terms. Both sources of variation are incorporated in the simulation analysis.

3.1. Yield and Exchange Rate Risk

For a given cost per acre, barley yield (bushels per acre) determines the cost per bushel:

$$\text{cost per bushel} = \text{cost per acre} / \text{bushels per acre}$$

With yields treated as a random variable, the cost per bushel is also random. Cost differentials between regions (expressed in cents per bushel) are influenced by the joint distribution of yields. In general, a high degree of correlation in yields should lead to more stable cost relationships between regions.

Yield distributions were derived from a regression analysis. Trend yield equations were estimated for each region. These had the form:

$$HY = b_0 + b_1 t$$

where HY denotes harvested yield (bushels per acre), t is a time index ($t = 1,2,...,24$), and b_0 and b_1 are estimated parameters. Data from 1974-97 were used in the analysis. Regression results for all regions are shown in Table 2. For illustrative purposes, actual and trend yields for North Dakota are shown in Figure 3. Note that large negative deviations from the trend occurred in three years, 1974, 1980, and 1988—years of lower than average rainfall in North Dakota.

Deviations from trend, measured by regression residuals, were used to measure yield uncertainty in each region. Covariance and correlation matrices were derived from the regression residuals; these are shown in Tables 3 and 4. For purposes of simulation, yields are assumed to follow a multivariate normal distribution. Expected yields for 1997 were derived from the regression equations, and covariances between regions are as indicated. Note that covariances may be either positive or negative, and correlations tend to be largest (in absolute terms) for adjacent regions.

Table 2. Trend Yield Equations†

Region	b_o	b_1	R-squared	Durbin Watson
Alberta	40.529 (21.716)**	0.837 (6.411)**	.65	1.95
Idaho	50.011 (23.519)**	1.269 (8.528)**	.77	2.30
Manitoba	37.328 (11.830)**	0.958 (4.388)**	.46	1.81
Minnesota	45.533 (11.771)**	0.597 (2.207)*	.18	1.86
Montana	34.879 (9.904)**	0.523 (2.122)*	.17	1.69
North Dakota	37.868 (10.040)**	0.619 (2.345)*	.20	1.62
Saskatchewan	37.146 (15.582)**	0.552 (3.308)**	.33	1.67
South Dakota	31.761 (9.040)**	0.529 (2.152)*	.17	1.75

† T-values in parentheses. (*) indicates significant at 5% level.
(**) indicates significant at 1% level.

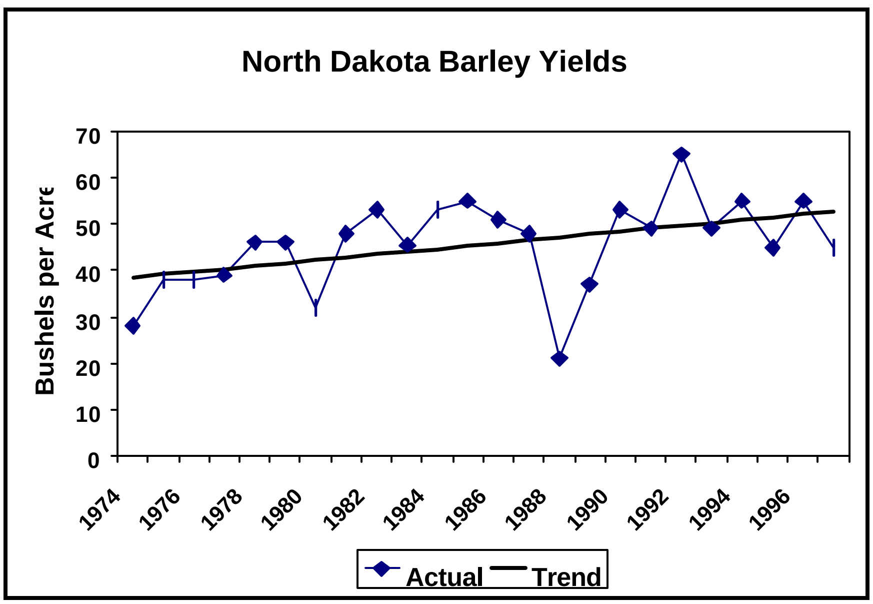


Figure 3. North Dakota Barley Yields, 1974-97

Table 3. Yield Covariance Matrix†

	AB	ID	MB	MN	MT	ND	SK	SD
AB	17.984							
ID	4.324	23.347						
MB	-6.917	1.980	51.405					
MN	-13.677	7.442	49.861	77.254				
MT	14.976	25.390	-3.244	-6.743	64.030			
ND	-10.690	11.667	52.383	64.242	7.612	73.457		
SK	6.972	5.590	28.282	19.892	16.866	27.887	29.343	
SD	-11.507	8.494	39.980	60.270	-2.605	55.956	15.105	63.735

†Units are bushels per acre. Matrix is symmetric; only lower triangle is shown.

Table 4. Yield Correlation Matrix†

	AB	ID	MB	MN	MT	ND	SK	SD
AB	1.000							
ID	0.211	1.000						
MB	-0.228	0.057	1.000					
MN	-0.367	0.175	0.791	1.000				
MT	0.441	0.657	-0.057	-0.096	1.000			
ND	-0.294	0.282	0.852	0.853	0.111	1.000		
SK	0.304	0.214	0.728	0.418	0.389	0.601	1.000	
SD	-0.340	0.220	0.698	0.859	-0.041	0.818	0.349	1.000

†Matrix is symmetric; only lower triangle is shown.

The exchange rate affects all cross-border cost comparisons. This is specified as a normal variable with mean equal to the 1997 average, 72.2 U.S. cents per Canadian dollar. Exchange-rate risk is represented by the standard deviation of annual percentage changes in the exchange rate,[3] or 4.1 percent, multiplied by the base rate. As the Canadian dollar rises in value, Canadian production costs (converted to U.S. dollars) rise relative to U.S. regions. Conversely, as the Canadian dollar falls in value, Canadian production becomes more competitive. The exchange rate is assumed to be statistically independent of yields.

3.2. Simulation Results

The @Risk software program was used to conduct the stochastic simulation. The results reported below are based on 2,500 iterations. For each region, the variables of interest include cost per bushel and two measures of relative costs. In addition, cost differences are analyzed for specific pairs of regions. Probability distributions are summarized in terms of the sample mean, standard deviation, skewness, and kurtosis. Values of the cumulative distribution function (CDF) are also provided for each variable.

Table 5 shows the distribution of cost per bushel in each region. The three Prairie provinces have the lowest mean costs, as well as lower standard deviations than most U.S. producing regions. Idaho exhibits the least variation of any U.S. region (and lower standard deviation than Saskatchewan), but the highest mean cost. Costs are positively skewed for all regions.[4] Values of the cumulative distribution function can be interpreted as follows. For North Dakota, there is a 5 percent chance that cost per bushel will fall below \$1.75, and a 50 percent chance that it will fall below \$2.22. Similarly, for Saskatchewan, there is a 50 percent chance that cost per bushel will fall below \$1.88.

Other comparisons of production costs are shown in Tables 6 and 7. In Table 6, each region's production cost is expressed in deviation form, relative to the weighted average for all regions.[5] Thus, the mean deviation for North Dakota is 8.0 c/bu, indicating a higher-than-average cost of production, while that for Saskatchewan is -27.5 c/bu. Table 7 shows the total supply of barley (in eight states and provinces) that is produced at lower cost than in the indicated region. For North Dakota, the mean share is 57.4 percent, meaning that (on average) more than half of total production is produced more cheaply than in North Dakota. The cumulative distributions reveal that, of all eight regions, Manitoba is most frequently the cheapest source of barley supply, followed by Saskatchewan.

---

[3]This is calculated as the standard deviation of $Z_t = \ln X_t - \ln X_{t-1}$, where X_t is the average exchange rate in year t. Data from 1975-98 were used in this calculation.

[4]Positive skewness and large kurtosis show that these series are not normally distributed. That is as expected: cost per bushel is defined as (\$/acre) / (bu/acre). The denominator is a normal variable, so the ratio is non-normal.

[5]Production weights are derived from simulated yields and 1997 harvested acres. Barley acres ('000) were as follows: Alberta 5099.9; Idaho 760; Manitoba 1340.0; Minnesota 540; Montana 1200; North Dakota 2250; Saskatchewan 4349.9; and South Dakota 130.

Table 5. Distribution of Production Costs by Region ($/bu)†

	ND	MT	ID	MN	SD	AB	SK	MB
Mean	2.29	2.26	4.33	2.36	2.89	2.15	1.93	1.76
St.Deviation	0.41	0.42	0.26	0.37	0.37	0.17	0.34	0.23
Skewness	1.33	1.36	0.37	1.08	0.82	0.37	1.14	0.75
Kurtosis	7.39	7.24	3.25	5.53	4.33	3.15	5.87	4.29
Cumulative Probability Distributions								
Probability	($/bu)							
5%	1.75	1.72	3.92	1.86	2.37	1.88	1.47	1.43
10%	1.84	1.80	4.00	1.94	2.46	1.93	1.55	1.49
15%	1.90	1.87	4.06	2.00	2.52	1.97	1.61	1.53
20%	1.96	1.92	4.10	2.05	2.58	2.00	1.65	1.57
25%	2.00	1.97	4.14	2.10	2.63	2.02	1.69	1.60
30%	2.05	2.01	4.18	2.14	2.67	2.05	1.74	1.63
35%	2.09	2.06	4.21	2.18	2.71	2.07	1.78	1.66
40%	2.14	2.10	4.25	2.22	2.76	2.09	1.82	1.69
45%	2.18	2.15	4.28	2.26	2.80	2.11	1.85	1.71
50%	2.22	2.19	4.31	2.30	2.84	2.13	1.88	1.74
55%	2.27	2.24	4.34	2.35	2.89	2.15	1.92	1.77
60%	2.32	2.29	4.38	2.39	2.93	2.17	1.97	1.80
65%	2.37	2.34	4.41	2.44	2.98	2.20	2.01	1.83
70%	2.43	2.41	4.45	2.50	3.04	2.23	2.06	1.86
75%	2.50	2.47	4.49	2.56	3.10	2.26	2.11	1.89
80%	2.58	2.56	4.54	2.63	3.17	2.29	2.18	1.93
85%	2.67	2.66	4.60	2.72	3.25	2.33	2.25	1.98
90%	2.81	2.80	4.67	2.84	3.37	2.37	2.38	2.06
95%	3.03	3.03	4.78	3.04	3.55	2.45	2.55	2.19

†Production costs include both direct and indirect costs.

Table 6. Deviations from Weighted Average Cost (c/bu)†

	ND	MT	ID	MN	SD	AB	SK	MB
Mean	8.0	5.3	211.7	14.9	67.8	-6.3	-27.5	-44.5
St.Deviation	32.4	37.3	25.9	33.0	33.6	18.7	18.0	15.6
Skewness	1.3	1.2	0.2	0.8	0.6	-0.1	1.7	0.5
Kurtosis	7.8	7.0	3.0	4.8	4.0	3.2	8.5	3.9
Cumulative Probability Distributions								
Probability	(c/bu)							
5%	-34.6	-44.1	171.4	-31.7	19.1	-38.2	-49.0	-67.3
10%	-27.7	-35.3	179.5	-22.4	28.7	-30.1	-45.9	-62.9
15%	-22.0	-29.5	184.9	-16.1	35.0	-25.3	-43.7	-59.7
20%	-17.8	-24.2	189.2	-12.1	40.2	-22.0	-41.6	-57.0
25%	-13.8	-20.0	193.8	-8.0	44.3	-18.8	-39.9	-54.8
30%	-10.7	-15.8	197.7	-4.4	48.2	-15.6	-38.2	-52.9
35%	-7.0	-11.6	201.0	-0.7	52.4	-13.1	-36.4	-51.2
40%	-3.2	-8.0	204.4	3.7	55.9	-10.4	-34.5	-49.3
45%	-0.1	-4.0	207.4	8.1	60.2	-8.3	-32.7	-47.4
50%	3.0	-0.1	210.8	11.6	64.2	-5.9	-31.2	-45.7
55%	6.3	4.5	214.3	15.5	68.2	-3.9	-29.2	-43.7
60%	10.2	8.6	218.0	19.1	72.4	-1.7	-27.0	-42.0
65%	14.6	13.3	221.1	23.0	77.0	0.7	-24.8	-40.2
70%	19.4	18.3	225.3	27.5	82.4	3.5	-22.4	-38.0
75%	24.0	24.4	229.4	32.8	87.8	6.4	-19.6	-35.4
80%	30.4	30.9	233.2	39.7	94.8	9.4	-15.8	-32.2
85%	38.8	39.6	238.4	46.9	101.6	12.9	-10.9	-28.4
90%	48.2	52.0	244.5	57.2	111.2	17.3	-5.1	-24.5
95%	66.6	71.6	255.0	73.3	127.4	24.4	6.5	-17.0

† Cost per bushel in indicated region minus weighted average for 8 regions, using production weights.

Table 7. Share of Production Produced at Lower Cost†

	ND	MT	ID	MN	SD	AB	SK	MB
Mean	57.4	56.9	93.0	68.0	90.3	39.0	19.8	11.0
St.Deviation	23.7	29.4	0.6	23.7	7.3	18.1	20.4	19.1
Skewness	-0.6	-0.6	-2.7	-1.0	-4.4	-0.6	1.1	1.7
Kurtosis	2.0	2.1	37.2	2.9	24.3	2.4	3.0	5.1
Cumulative Probability Distributions								
Probability	(share of lower-cost suppliers, %)							
5%	10.2	0.0	92.1	11.1	79.9	7.5	0.0	0.0
10%	16.5	8.6	92.3	33.6	87.3	8.8	0.0	0.0
15%	34.5	25.5	92.5	40.7	88.7	9.7	0.0	0.0
20%	35.9	33.5	92.6	49.6	91.5	26.0	8.3	0.0
25%	37.3	35.1	92.7	51.6	91.7	32.8	8.9	0.0
30%	39.0	37.0	92.8	54.0	91.9	33.8	9.1	0.0
35%	41.4	47.8	92.9	57.7	92.0	34.8	9.3	0.0
40%	44.6	52.0	93.0	70.2	92.1	35.8	9.4	0.0
45%	68.8	55.7	93.0	75.4	92.2	38.3	9.6	0.0
50%	71.5	68.5	93.1	77.2	92.3	40.4	9.7	0.0
55%	74.1	70.4	93.2	79.3	92.4	41.9	9.9	0.0
60%	75.3	71.8	93.2	83.6	92.5	43.9	10.2	0.0
65%	76.2	74.5	93.3	88.0	92.6	51.2	14.5	0.0
70%	76.8	84.8	93.4	88.6	92.7	53.6	24.2	7.9
75%	77.6	86.4	93.4	88.8	92.7	54.9	30.7	25.9
80%	78.4	86.9	93.5	89.1	92.8	56.4	46.1	27.2
85%	79.3	87.3	93.6	89.3	92.9	58.1	48.7	28.6
90%	80.2	87.8	93.7	89.6	93.0	59.9	54.1	35.0
95%	81.3	88.5	93.9	89.9	93.2	61.8	63.9	56.5

† Share of total production (in 8 states and provinces) that is produced at lower cost per bushel.

Tables 8 and 9 show the distribution of cost differences between pairs of regions. On average, North Dakota's production cost is 14.3 c/bu higher than that of Alberta, and 35.5 c/bu higher than that of Saskatchewan (Table 8). However, the cumulative distributions show considerable variability in these cost differences. North Dakota enjoys a cost advantage relative to Alberta about 41 percent of the time. Relative to Saskatchewan, North Dakota enjoys an advantage about 14 percent of the time.

Cross-border differentials in barley production costs may be partially offset by differentials in shipping costs to major markets. Table 10 shows costs of rail movements from Canadian and U.S. origins to selected destinations. These reflect published barley tariffs for the Canadian National (CN) and Burlington Northern Santa Fe (BNSF) railroads.[6] Tulare is the approximate center of California's feed barley demand, while Minneapolis, MN; Milwaukee, WI; and Vancouver, WA are locations of malt plants. Offshore exports from the United States and Canada are largely through the Pacific ports.

Consider the costs differentials between North Dakota and Alberta. Figure 4 shows the cumulative distribution function (CDF) for the difference in productions costs (North Dakota minus Alberta). Also indicated in the figure is the difference in shipping costs to Tulare from two representative origins: Devils Lake, ND, and Camrose, AB. Rail costs from Devils Lake are 30 c/bu lower. Given the distribution of production costs, this means that Devils Lake could supply barley to Tulare at lower cost than Camrose about 67 percent of the time.

Similarly, Figure 5 shows the distribution of the cost differential between North Dakota and Saskatchewan, the leading Canadian supplier of malting barley. Shipping costs from Devils Lake to Milwaukee are 21 c/bu lower than from Saskatoon to Milwaukee. However, Saskatchewan's production cost advantage is such that Devils Lake could supply Milwaukee at lower cost only 34 percent of the time.

Other pair-wise cost comparisons of this type are shown in Table 11. Each pair includes one U.S. and one Canadian origin. Shipping cost differentials to specific destinations are indicated. In each case, two probabilities are calculated. The first is the probability that the U.S. origin is the lower-cost source of supply, based on differentials in production costs and shipping. (Probabilities are calculated from data in Tables 8, 9, and 10.) The second probability has a similar interpretation, but reflects differentials in production, shipping, and elevation costs. Grain handling costs are higher at Canadian primary and terminal elevators than at U.S. elevators. Differences in elevation charges are estimated as 8 c/bu for primary elevators, and 9 c/bu for terminal (port) elevators.[7] These cost differentials are analogous to those for shipping costs; their inclusion raises the probability that a U.S. origin can supply barley to a given market at lower cost.

---

[6]Sources include CN freight tariffs CNR 1243-D and 2156-E, and BNSF Rate Book 4022J. CN per-car rates are for covered hoppers having capacity between 4500 and 5149 cubic feet. CN rates for 25-car or higher movements were used where available (from BC Pyramid to Tulare, and from Fort Frances to Minneapolis and Milwaukee). All BNSF rates are for 26 cars and higher. Per-bushel rates were calculated assuming 93 tons per car, or 3,875 bushels.

[7]Calculated from Parsons and Wilson, p. 79.

Table 8. Cross-Border Production Cost Differentials (c/bu)

	ND-AB	ND-SK	ND-MB	MT-AB	MT-SK	MT-MB
Mean	14.3	35.5	52.5	11.6	32.8	49.8
St.Deviation	48.4	36.3	26.7	39.6	43.6	48.9
Skewness	0.9	0.3	1.6	1.3	0.5	0.8
Kurtosis	5.6	4.8	10.3	7.0	4.9	5.4
Cumulative Probability Distributions						
Probability	(c/bu)					
5%	-54.1	-19.5	17.8	-41.5	-34.6	-21.1
10%	-42.0	-6.2	24.1	-31.8	-17.7	-7.6
15%	-31.8	2.3	28.0	-25.2	-8.6	2.4
20%	-25.0	8.2	31.5	-19.8	-1.0	11.0
25%	-19.2	13.2	34.5	-14.5	5.3	17.8
30%	-13.5	17.6	37.5	-10.3	11.6	24.4
35%	-7.4	21.7	40.1	-6.6	16.4	29.6
40%	-1.4	26.2	42.8	-2.8	21.0	34.9
45%	4.3	30.1	45.4	1.1	25.8	40.3
50%	9.0	34.4	48.5	5.4	30.5	45.9
55%	13.7	37.9	51.5	9.5	35.6	50.5
60%	19.7	42.4	54.8	14.5	40.9	57.3
65%	26.3	46.5	57.9	19.7	45.6	63.7
70%	33.9	51.6	61.3	25.2	50.4	70.0
75%	41.8	56.6	65.4	32.1	56.7	77.3
80%	51.4	62.3	70.3	39.2	64.6	84.9
85%	62.5	70.4	76.4	49.3	72.4	96.2
90%	75.5	79.0	84.7	61.4	85.2	109.8
95%	99.2	94.0	100.8	85.0	109.4	135.2

Table 9. Cross-Border Production Cost Differentials (c/bu)

	MN-AB	MN-SK	MN-MB	ID-AB	ID-SK
Mean	21.2	42.4	59.4	218.0	239.2
St.Deviation	45.8	40.1	25.7	28.9	39.0
Skewness	0.7	-0.1	1.0	0.2	-0.4
Kurtosis	4.3	4.2	5.2	3.1	3.8
Cumulative Probability Distributions					
Probability			(c/bu)		
5%	-46.2	-23.0	23.3	170.5	171.2
10%	-32.2	-5.3	30.0	181.3	189.6
15%	-23.7	4.2	35.1	188.2	200.3
20%	-16.5	12.7	38.7	193.5	208.8
25%	-10.7	18.7	41.7	198.7	215.8
30%	-5.1	23.6	44.9	202.7	221.5
35%	0.4	28.2	47.8	206.0	227.3
40%	6.7	32.6	50.7	209.9	232.1
45%	11.9	37.5	53.6	213.7	236.6
50%	18.1	42.5	56.3	217.5	241.7
55%	23.3	46.6	59.2	220.8	246.5
60%	28.8	51.3	62.5	225.1	251.5
65%	34.4	56.4	65.6	228.6	255.5
70%	40.2	61.1	69.0	232.8	260.2
75%	48.1	65.8	73.3	236.2	265.2
80%	56.3	72.6	77.7	241.7	271.1
85%	66.7	81.4	84.2	248.2	277.6
90%	78.7	91.8	91.2	255.5	285.1
95%	101.0	107.9	106.4	267.6	299.4

Table 10. Costs of Representative Barley Shipments, c/bu

Origins ↓	Destinations					
	Pacific Ports *	Lake Ports**	Tulare CA	Milwaukee WI	Minneapolis MN	Vancouver WA
Camrose, AB	30	69	120	110	91	76
Saskatoon, SK	36	54	127	95	76	83
Winnipeg, MB	60	27	150	68	49	106
Devils Lake, ND	76	49	90	74	49	n.a.
Great Falls, MT	59	77	81	103	77	n.a.
Crookston, MN	76	35	90	61	35	n.a.
Moscow, ID	26	102	n.a.	128	102	26

* Vancouver, BC or Portland. ** Thunder Bay (Fort Frances) or Duluth/Superior.
n.a. = Not available.

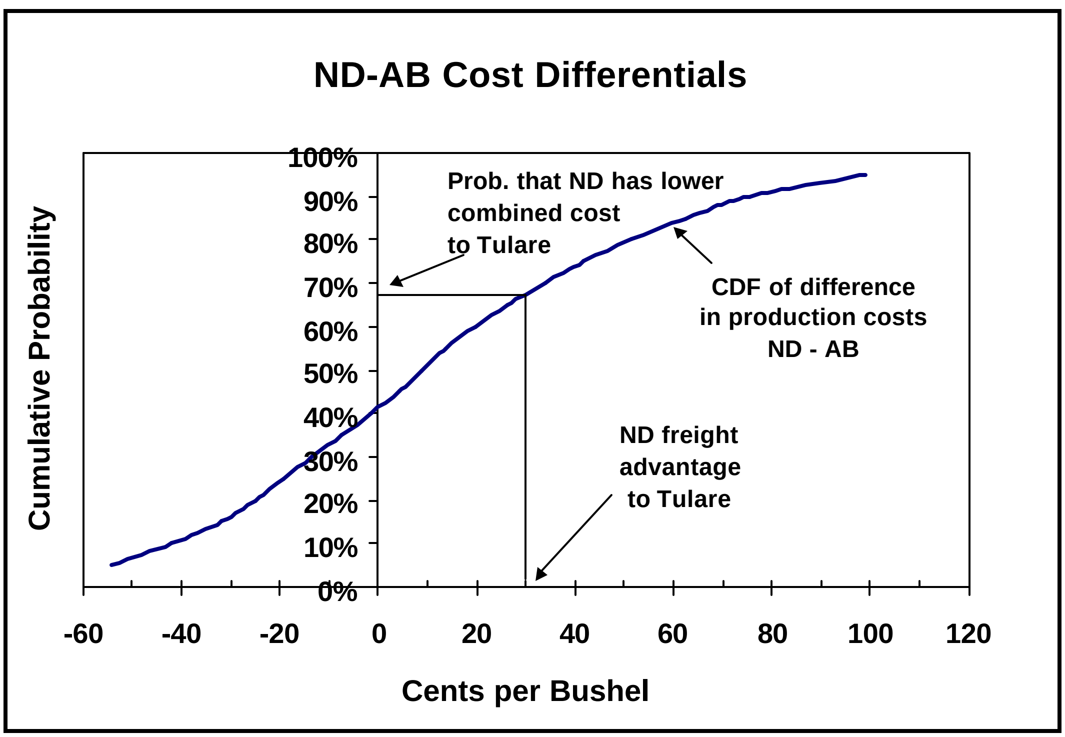


Figure 4. Cost Comparison for North Dakota and Alberta

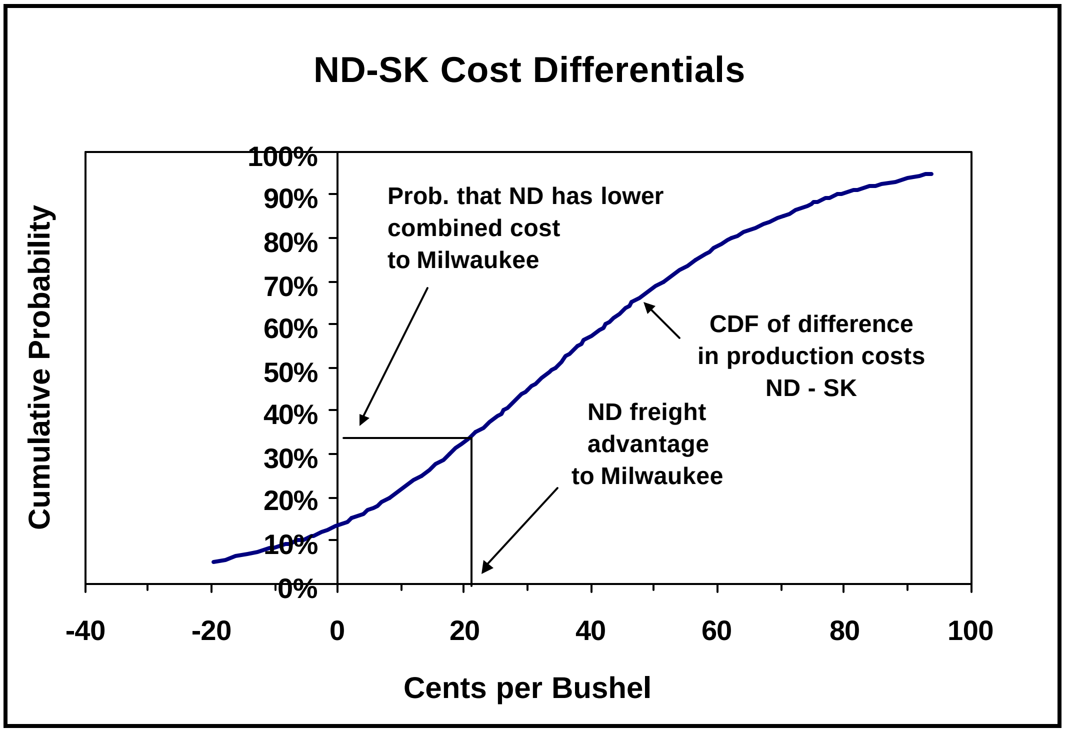


Figure 5. Cost Comparison for North Dakota and Saskatchewan

The representative North Dakota and Montana origins are shown to have a significant cost advantage over Alberta in supplying barley to California (Table 11). For example, Great Falls is likely to be a lower-cost supplier than Camrose about 84 percent of the time, based on all cost differentials for shipments to Tulare. However, U.S. origins appear to be at a severe cost disadvantage in supplying barley for offshore export, either through the Pacific or Lake ports. For movements to Pacific ports, in particular, the Canadian origins have lower shipping costs which reinforce their production cost advantage. For example, Saskatoon has a 23 c/bu shipping advantage relative to Great Falls—even though the latter is closer geographically to the Pacific. This reflects the low, regulated rail rate structure for Canadian grain movements from Prairie locations to port position. As a result, Great Falls could be expected to supply barley for offshore export more cheaply than Saskatoon only 17 percent of the time, taking all costs into account. Saskatchewan is also able to compete with North Dakota and Minnesota in Midwest malting barley markets. For serving the Minneapolis market, the shipping cost differential favors Crookston over Saskatoon by 41 c/bu; but given other costs, Crookston could supply barley more cheaply with only 58 percent probability.

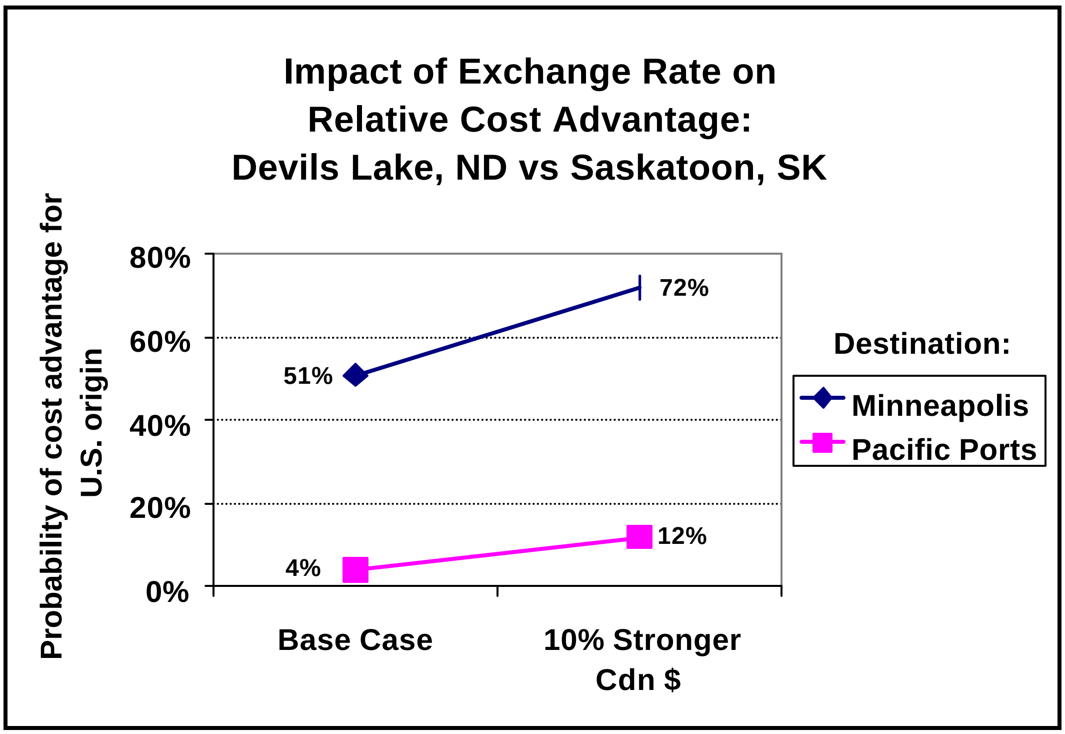
Table 11. Cost Comparison: U.S. Relative to Canadian Origins

Origins		Destination	Shipping Cost Differential † (c/bu)	Probability (%) of Lower Cost At U.S. Origin, Based on	
U.S.	Canada			Production and Shipping Costs Only	Production, Shipping, and Elevation Costs ‡
Devils Lake, ND	Camrose, AB	Tulare, CA	30	67	73
Devils Lake, ND	Camrose, AB	Pacific ports	-46	8	17
Devils Lake, ND	Camrose, AB	Minneapolis	42	75	79
Devils Lake, ND	Saskatoon, SK	Pacific ports	-40	0	4
Devils Lake, ND	Saskatoon, SK	Minneapolis	27	41	51
Devils Lake, ND	Saskatoon, SK	Milwaukee	21	34	44
Great Falls, MT	Camrose, AB	Tulare, CA	39	80	84
Great Falls, MT	Camrose, AB	Pacific ports	-29	12	28
Great Falls, MT	Camrose, AB	Minneapolis	14	60	67
Great Falls, MT	Saskatoon, SK	Pacific ports	-23	8	17
Great Falls, MT	Saskatoon, SK	Minneapolis	-1	20	26
Great Falls, MT	Saskatoon, SK	Milwaukee	-8	15	21
Crookston, MN	Saskatoon, SK	Tulare, CA	37	44	53
Crookston, MN	Saskatoon, SK	Pacific ports	-40	0	5
Crookston, MN	Saskatoon, SK	Minneapolis	41	49	58
Crookston, MN	Winnipeg, MB	Lake ports	-8	0	0
Crookston, MN	Winnipeg, MB	Minneapolis	14	0	4
Crookston, MN	Winnipeg, MB	Milwaukee	7	0	0
Moscow, ID	Saskatoon, SK	Vancouver WA	57	0	0
Moscow, ID	Saskatoon, SK	Milwaukee	-33	0	0

† Positive number indicates advantage in shipping from U.S. origin.

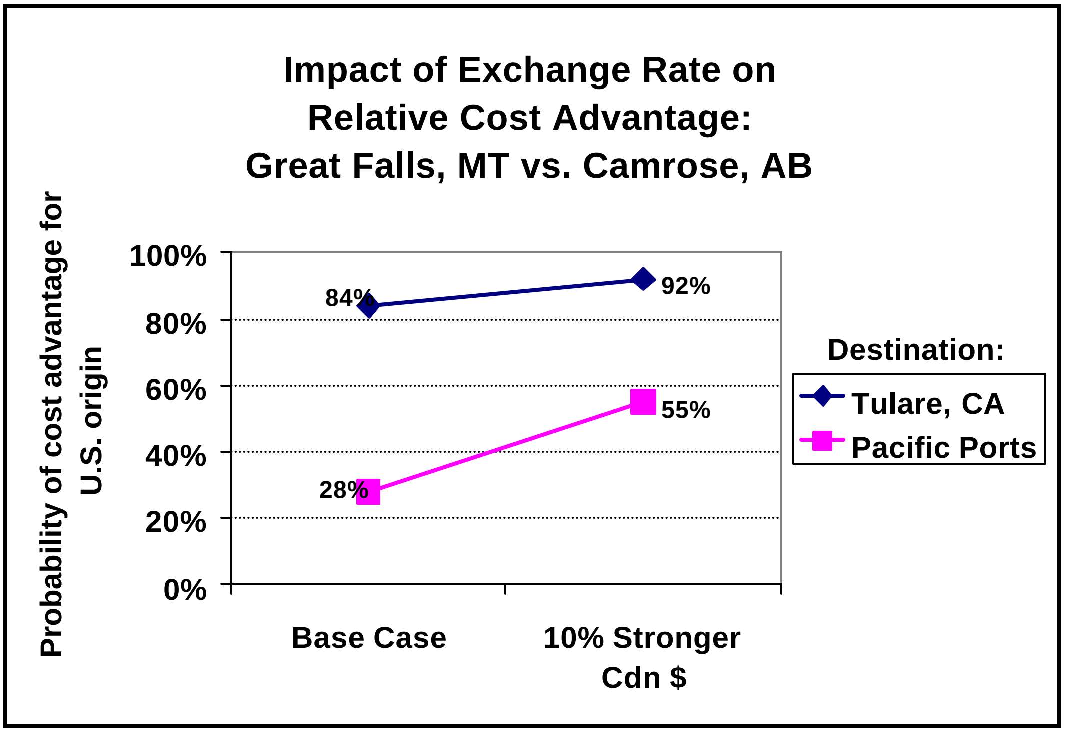
‡ Assumes 8 c/bu higher country elevation in Canada and 9 c/bu higher terminal elevation. Both country and terminal elevation apply to offshore export shipments; only country elevation applies to other shipments.

The exchange rate has an important impact on cross-border cost comparisons. For purposes of illustration, simulations were performed with a stronger Canadian dollar. Specifically, the mean value was raised by 10 percent relative to the base case. With Canadian costs per acre held constant (by assumption) in Canadian dollar terms, this reduces the relative cost advantage for Canadian origins. Figure 6 shows the effect of a stronger Canadian dollar on the relative costs of barley from two origins: Devils Lake, ND and Saskatoon, SK. The vertical scale shows the probability that Devils Lake enjoys a cost advantage (where costs include production, shipping, and handling) relative to Saskatoon. For shipments to Minneapolis, Devils Lake is the lower cost producer with 51 percent probability in the base case and 72 percent probability after Canadian dollar appreciation. Figure 7 makes similar comparisons for Great Falls, MT and Camrose, AB. In general, a stronger Canadian dollar improves the competitive position of barley from U.S. origins. (Detailed simulation results are shown in appendix tables B1 through B5.)



* Based on simulated costs of production and estimated shipping and handling differentials.

Figure 6. Impact of Stronger Canadian Dollar on Relative Costs: Devils Lake, ND vs. Saskatoon, SK



* Based on simulated costs of production and estimated shipping and handling differentials.

Figure 7. Impact of Stronger Canadian Dollar on Relative Costs: Great Falls, MT vs. Camrose, AB

4. Summary and Discussion

Costs of production differ substantially across the barley growing regions of the United States and Canada. Expressed on a per-acre basis, they vary from about $105 in Manitoba to $357 in Idaho. Average yields also differ substantially across regions. However, in terms of cost per bushel, the Prairie provinces all compare favorably to contiguous regions of the United States. Alberta and Saskatchewan, where most Canadian barley is grown, have production costs of $2.13 and $1.88 per bushel (based on trend yields). North Dakota and Montana, ranked first and second among U.S. producing states, have costs of $2.22 and $2.19, respectively.

Production costs per bushel are inversely related to yields, which exhibit different levels of variability and correlation across regions. To capture the random influence of yields on inter-regional cost relationships, a stochastic simulation was conducted. Yield variability, measured by deviations from trend yield in each region, was estimated through regression analysis. In addition, the Canadian dollar exchange rate was introduced as a random variable with mean equal to the 1997 average value. Simulation results, based on 2,500 random drawings from a specified distribution, allow regional cost differences to be characterized in terms of probabilities. Results of the analysis confirm the position of the Prairie provinces as low-cost suppliers. Of the eight states and provinces considered, Manitoba is the lowest-cost supplier about 65 percent of the time, and Saskatchewan about 15 percent of the time.

Differentials in shipping and handling costs were also considered. Canadian origins have a rail freight advantage in shipping to export points (i.e., Vancouver and Lake ports), which is only partly offset by higher elevation charges.   With high probability, representative origins in Montana and North Dakota can supply barley to California more cheaply than Alberta or Saskatchewan. However, the Prairies appear to be reasonably competitive in Midwestern malting barley markets despite a large freight disadvantage (relative to barley producers in North Dakota and Minnesota), owing to low production costs.

These results challenge the notion that Canadian barley exports to the United States would not occur if there were a 'level playing field' for agricultural producers on both sides of the border. Cross-border differences in production costs are largely unrelated to issues of marketing organization (i.e., Wheat Board control) or producer supports, which are minimal in Canada. Rail rates in Canada do reflect a different regulatory environment, but the effects of reforming this system—in particular, removing the rate caps on grain shipments to ports, which is now under discussion—are difficult to anticipate.[8] To the extent that reforms in Canada result in higher shipping costs to ports, the effect may be to induce larger shipments to alternative destinations, including U.S. barley markets.

Some qualifications should be mentioned. The per-acre cost estimates shown in Table 1 were derived from a variety of published sources, with different levels of detail. It is unknown to what extent the regional differences in per-acre costs are due to differences in budgeting assumptions or accounting conventions (e.g., for costs of machinery and equipment). This cautions against reading too much into a comparison of (independent) estimates for different states and provinces. The estimates may also mask considerable variation among farms within a state or province.

Cross-border cost comparisons are influenced by the exchange rate. The Canadian dollar has fallen by about 20 percent against the U.S. dollar in this decade, and this has surely improved the competitive position of Canadian exports, including barley. An appreciation (strengthening) of the Canadian dollar would reverse some of this gain.[9] Land values are another important factor. To the extent that benefits under U.S. farm programs have been bid into farmland prices, the indirect costs of U.S. barley production have been inflated. With the decline in market transition payments and other U.S. producer supports—combined with current low prices for farm commodities—U.S. land values seem likely to decline. This could narrow the cost advantage now enjoyed by Canadian barley producers.

---

[8]For a recent analysis of rail rate deregulation, see Fulton et al.

[9]The net effect would depend on the extent of 'pass-through' from the exchange-rate to costs of production. As the Canadian dollars appreciates, prices of tradeable goods (measured in Canadian currency) should fall, lowering the costs of some productive inputs.

References

Antweiler, W. 1998. *PACIFIC Exchange Rate Service* (http://pacific.commerce.ubc.ca/xr/).

Cooperative Extension System. 1997. *Idaho Crop Costs and Return Estimates*. University of Idaho, College of Agriculture, Moscow, ID, Crop Budgets, December.

Cooperative Extension Service. 1998. *Estimated Costs of Production for Spring Crops*. South Dakota State University, Brookings, SD.

Farm Business Management Program. 1997. *Crop Enterprise Analysis, Statewide Reports*. Minnesota State Colleges & Universities, (accessed 07/14/98, http://www.mgt.org/fbm/reports/1997/state/state.htm).

Farm Facts. 1997. *Crop Planning Guide 1997*. Regina, SK: Department of Agriculture and Food, Regina, SK, January.

Farm Management Group. 1997. *Guidelines for Estimating 1997 Crop Production Costs*. Winnipeg, MB: Manitoba Agriculture, January.

Fulton, M., K. Baylis, H. Brooks, and R. Gray. 1998. *The Impact of Deregulation on the Export Basis in the Canadian Grain Handling and Transportation System*. University of Saskatchewan, Saskatoon, December.

Johnson, D. 1999. *Single-Desk Selling of Canadian Barley: Price Pooling, Price Discrimination, and Systemic Costs*. Agricultural Economics Report No. 411, Department of Agricultural Economics, North Dakota State University, Fargo, January.

Johnson, J. B., W. E. Zedack, S. M. Capalbo, and J. M. Antle. 1998. *Production Costs for Annually-Planted Crops Produced on Dryland Cropland*. Department Special Reports #25, #26, #27, and #28, Montana State University, Department of Agricultural Economics and Economics, Bozeman, MT, July.

Meyer, N., R. Schoney, and M. Hartmans. 1996. *Comparing Barley Production Costs: Idaho, Saskatchewan, and Alberta*. A.E. Extension Series No. 96-6, University of Idaho, College of Agriculture, Moscow, ID, Revised November.

NDSU Extension Service. 1996. *Farm Management Planning Guide, Projected 1997 Crop Budgets*. North Dakota State University, Fargo, December.

Parsons, G., and W. Wilson. 1999. *Grain Handling and Transportation Systems: A Canada - United States Comparison*. Report prepared for the Organization for Western Economic Cooperation, Regina, SK, January.

Production Economics & Statistics Branch. 1998. *1997 (Preliminary) Crop Averages*. Edmonton, AB: Alberta Agriculture, Food and Rural Development.

APPENDIX A

STATE / PROVINCE DETAIL COSTS

Production Costs Detail for Districts/regions Within the State/province:

Page

Table A-1. NORTH DAKOTA: Projected Crop Budgets, 1997

	FEED BARLEY	FEED BARLEY	MALTING BARLEY	MALTING BARLEY	MALTING BARLEY	MALTING BARLEY	MALTING BARLEY	MALTING BARLEY	
	Region 1 North West	Region 4 South West	Region 2 North Central	Region 3A North East	Region 3B North Valley	Region 5 South Central	Region 6A South East	Region 6B South Valley	Weighted by Acres Harvested
Market Yield (bu/acre)	42.0	38.0	49.0	49.0	58.0	52.0	53.0	59.0	45.0
Market Price ($/bu)	$1.77	$1.77	$2.01	$2.31	$2.31	$1.90	$2.30	$2.30	
MARKET INCOME	74.34	67.26	98.49	113.19	133.98	98.80	121.90	135.70	
DIRECT COSTS									
Seed	5.00	5.00	6.60	8.80	8.80	6.60	8.80	8.80	7.31
Herbicides	6.46	6.46	8.71	8.71	9.90	8.71	8.71	9.90	8.60
Fungicides	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Insecticides	-	-	-	-	-	-	-	-	0.00
Fertilizer	14.02	8.27	12.28	13.56	13.39	14.35	14.06	16.42	13.05
Crop Insurance	3.10	3.60	4.20	3.20	3.20	4.00	4.20	4.00	3.75
Fuel & Lubrication	6.91	6.80	7.10	7.10	8.20	7.18	7.21	8.23	7.22
Repairs	9.72	9.67	9.81	9.81	10.48	9.84	9.86	10.49	9.88
Drying	-	-	-	-	-	-	-	-	0.00
Miscellaneous	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Operating Interest	2.37	2.10	2.55	2.67	2.81	2.65	2.75	3.00	2.60
Sum of Listed Direct Costs	49.83	44.15	53.50	56.10	59.03	55.58	57.84	63.09	54.67
INDIRECT (FIXED) COSTS									
Misc Overhead	4.22	4.17	4.28	4.28	4.55	4.32	4.34	4.57	4.31
Machinery Depreciation	16.14	16.00	16.31	16.31	17.45	16.41	16.45	17.49	16.44
Machinery Investment	8.81	8.70	8.91	8.91	9.59	8.99	9.02	9.61	8.99
Land Taxes	2.45	2.36	3.12	4.29	7.02	3.97	5.96	7.45	4.09
Land Investment	21.67	19.00	26.52	27.64	44.91	26.25	34.91	50.98	28.75
Sum of Listed Indirect Costs	53.29	50.23	59.14	61.43	83.52	59.94	70.68	90.10	62.58
SUM OF ALL LISTED COSTS	103.12	94.38	112.64	117.53	142.55	115.52	128.52	153.19	117.24
RETURN TO LABOR & MGT	(28.78)	(27.12)	(14.15)	(4.34)	(8.57)	(16.72)	(6.62)	(17.49)	(117.24)
LISTED COSTS PER BUDGET UNIT (bu)									
Direct Costs	1.19	1.16	1.09	1.14	1.02	1.07	1.09	1.07	1.216
Indirect Costs	1.27	1.32	1.21	1.25	1.44	1.15	1.33	1.53	1.392
Total Costs	2.46	2.48	2.30	2.40	2.46	2.22	2.42	2.60	2.607
SOURCE: NDSU Extension Service, Fargo, ND									
Acres Planted (000)	82.5	213.7	681.3	576.8	192.9	457.8	105.8	85.9	2,396.7
Acres Harvested (000)	68.5	179.2	656.3	541.1	178.7	436.1	104.1	83.1	2,247.1
Production (000 bu)	2,324.0	6,381.0	29,274.5	24,438.0	8,667.0	20,502.5	5,260.5	4,204.5	101,052.0
Yield per Acre (bu)	33.9	35.6	44.6	45.2	48.5	47.0	50.6	50.6	

Table A-2. MONTANA: Production Costs, 1995 Crop Year (1)

	BARLEY After Fallow MLRA 52 Northern	BARLEY Recrop MLRA 52 Northern	BARLEY After Fallow MLRA 53A Northeastern	BARLEY Recrop MLRA 53A Northeastern	BARLEY After Fallow MLRA 54 East Central	BARLEY Recrop MLRA 54 East Central	BARLEY After Fallow MLRA 58A Southeastern	BARLEY Recrop MLRA 58A Southeastern	Weighted by Acres	ND % 95 to 97	"Adjusted" to 1997
Market Yield (bu/acre)	61.0	59.2	34.9	29.9	26.1	23.6	42.9	39.3	46.3	(3)	53.0
Market Price ($/bu) (2)	$2.96	$2.96	$2.73	$2.73	$2.58	$2.58	$2.61	$2.61			
GROSS RETURNS/ACRE	180.56	175.23	95.27	81.62	67.33	60.88	111.96	102.57			
DIRECT COSTS											
Seed, Cleaning, Treatment	3.73	3.78	3.96	4.31	4.15	4.25	3.56	3.80	3.87	32.8%	5.14
Pesticides	3.80	5.90	1.25	1.70	2.84	2.55	1.87	4.79	3.82	25.0%	4.77
Fertilizer	7.34	12.92	2.25	8.24	4.57	5.28	7.64	11.56	9.08	5.4%	9.57
Crop Insurance	5.71	6.94	2.48	2.20	0.51	1.36	2.84	4.85	4.58	5.1%	4.81
Machinery Operating Costs											
Preplant till & seeding	6.22	6.38	6.57	6.04	4.85	4.58	5.35	7.13	6.21	11.1%	6.90
Fertilizer application	3.53	2.70	-	3.18	6.36	4.48	2.64	1.36	2.73	11.1%	3.03
Pesticide Application	1.16	2.12	1.77	1.19	0.65	0.50	2.73	2.12	1.67	11.1%	1.86
Harvesting, including tracking	9.25	9.25	7.37	7.13	5.84	6.14	7.28	7.84	8.17	11.1%	9.07
Interest on Operating Costs	0.92	1.13	0.58	0.78	0.67	0.66	0.76	0.98	0.91	17.1%	1.06
Sum of Listed Direct Costs	41.66	51.12	26.23	34.77	30.44	29.80	34.67	44.43	41.04		46.23
Fallow Operating Costs, including Interest	10.87	-	7.67	-	7.83	-	10.57	-	3.85	11.1%	4.28
OPERATING COSTS Including Fallow	52.53	51.12	33.90	34.77	38.27	29.80	45.24	44.43	44.89		50.50
NET RETURNS/ACRE above Op Costs	128.03	124.11	61.37	46.85	29.06	31.08	66.72	58.14	(44.89)		(50.50)
Ownership Costs	84.18	43.08	67.57	33.71	67.87	33.95	71.90	36.52	53.36	0.3%	53.52
TOTAL (All Operating & Ownership Costs)	136.71	94.20	101.47	68.48	106.14	63.75	117.14	80.95	98.25		104.03
NET RETURNS / ACRE	43.85	81.03	(6.20)	13.14	(38.81)	(2.87)	(5.18)	21.62	(98.25)		(104.03)
LISTED COSTS PER BUDGET UNIT (bu)											
	0.86	0.86	0.97	1.16	1.47	1.26	1.05	1.13	0.969		0.953
Indirect Costs	1.38	0.73	1.94	1.13	2.60	1.44	1.68	0.93	1.151		1.010
Total Costs	2.24	1.59	2.91	2.29	4.07	2.70	2.73	2.06	2.120		1.963
SOURCE: Dept of Agricultural Economics, Montana State University, Bozeman, MT											
(1) Averages obtained from farm operators who participated in Montana Agricultural Statistics Service cropping practices survey											
(2) 1995 Post Harvest Price											
(3) 1997 State Average Yield											
Acres in Survey	12,417	13,452	3,357	6,714	1,053	4,219	4,419	10,417	56,048		
By Production (Acres x Ave Yield)	757,437	796,358	117,149	200,735	27,478	99,547	189,553	409,388	2,597,646		

Table A-3. MINNESOTA: Crop Enterprise Analysis - 1997 (1)

	BARLEY on Owned Land Region 1 Northwest	BARLEY on Owned Land Region 1A RR Valley	BARLEY on Owned Land Region 2 NE/East Cent	BARLEY on Owned Land Region 3 West Central	BARLEY on Owned Land Region 6 Southeast	STATE AVERAGES Owned Land	STATE AVERAGES Cash Rented Land	STATE AVERAGES Share Rented Land	Weighted by Acres Reported
Barley									
Yield per Acre (bu)	49.3	49.9	41.5	54.1	62.0	49.1	47.8	56.4	48.7
Price per Bu	$1.83	$1.91	$1.86	$1.75	$2.09	$1.86	$1.88	$1.84	
	90.47	95.40	77.01	94.70	129.41	91.33	89.65	104.09	
Other Product					4.47	0.12	0.21		
Miscellaneous Income	11.80	14.58	22.99	24.60	14.72	15.48	17.44	9.74	
GROSS RETURNS	102.27	109.98	100.00	119.30	148.60	106.93	107.30	113.83	
DIRECT EXPENSES									
Seed	8.32	8.14	9.77	10.85	16.59	8.87	8.44	9.61	8.64
Fertilizer	22.76	26.63	17.13	9.76	4.58	22.91	24.54	26.86	24.13
Crop Chemicals	12.29	16.45	5.38	0.14		12.70	14.37	14.86	13.85
Crop Insurance	6.02	7.07	2.33	0.57	0.20	5.98	6.73	6.33	6.47
Drying Fuel	0.25	0.22	0.03			0.18	0.28	0.04	0.24
Fuel & Oil	7.84	6.24	7.94	6.82	7.69	7.38	6.81	7.52	7.03
Repairs	8.31	12.13	11.78	5.13	3.29	8.71	8.53	9.35	8.63
Repair, Machinery	3.93		4.00	10.53	10.89	3.92	2.22	1.56	2.74
Repair, Buildings	0.66		0.85	0.40	0.56	0.46	0.12	0.17	0.23
Custom Hire	1.94	1.07	4.22	6.11	4.00	2.03	2.08	2.14	2.07
Hired Labor		0.27	0.54			0.25	0.31		0.27
Marketing					0.58	0.01	0.14		0.09
Operating Interest	2.61	6.20	1.90	0.44	3.62	3.62	3.79	3.22	3.71
Miscellaneous	0.58	0.28	0.21	1.17	0.97	0.45	0.54		0.48
Total Direct Costs	75.51	84.70	66.08	51.92	52.97	77.47	78.90	81.66	78.58
RETURN OVER DIRECT EXPENSES	26.76	25.28	33.92	67.38	95.63	29.46	28.40	32.17	(78.58)
OVERHEAD EXPENSES									
Custom Hire	1.44	1.57	0.61			1.41	0.89	0.57	1.04
Hired Labor	3.17	4.56	4.35	3.13	3.96	3.66	3.10	3.95	3.33
Repairs					1.67	0.03	0.00	0.44	0.03
Machinery & Bldg Leases	1.51	2.05	2.41	2.26	0.90	1.51	2.31	0.85	1.98
Land Rent							40.68	29.28	26.91
Real Estate & Property Taxes	5.15	13.58	5.43	5.50	10.18	8.02	0.01	0.04	2.61
Farm Insurance	2.10	3.16	2.37	1.58	2.05	2.43	2.04	1.90	2.16
Utilities	1.69	1.81	1.51	1.48	2.45	1.76	1.44	1.35	1.54
Dues & Prof Fees	0.93	1.04	0.78	0.14	0.21	0.83	0.67	0.64	0.72
Interest	15.80	32.33	17.12	25.35	27.09	20.24	3.39	3.95	8.88
Machinery & Bldg. Depre.	10.94	8.13	10.68	18.46	13.00	10.66	7.25	9.75	8.48
Miscellaneous	1.94	2.27	1.40	1.03	2.79	2.02	1.53	1.66	1.70
Total Overhead Expenses	44.67	70.50	46.66	58.93	64.30	52.57	63.31	54.38	59.37
TOTAL LISTED EXPENSES	120.18	155.20	112.74	110.85	117.27	130.04	142.21	136.04	137.95
NET RETURN per ACRE	(17.91)	(45.22)	(12.74)	8.45	31.33	(23.11)	(34.91)	(22.21)	(137.95)
LISTED COSTS PER BUDGET UNIT (bu)									
Direct Costs	1.53	1.70	1.59	0.96	0.85	1.58	1.65	1.45	1.615
Indirect Costs	0.91	1.41	1.13	1.09	1.04	1.07	1.32	0.96	1.220
Total Costs	2.44	3.11	2.72	2.05	1.89	2.65	2.98	2.41	2.835

SOURCE: http://www.mgmt.org/fbm/reports

(1) Averages of reporting participants in the Farm Business Management Education Program through the Minnesota State Colleges and Universities

Number of Farms	160	176	19	
Average Acres	67.5	118.2	89.7	
Total Acres	10,800	20,803	1,704	33,307
Production	530,280	994,185	96,114	1,620,579

0Table A-4. IDAHO: Crop Costs and Returns Estimate, 1997

	FEED BARLEY District 1 Northern	FEED BARLEY District 2 Southwest	FEED BARLEY District 3 South Central	FEED BARLEY District 4 Southeast	FEED BARLEY (Dryland) District 4 Southeast	MALTING BARLEY District 3 South Central	MALTING BARLEY District 4 Southeast	Weighted by Acres Harvested
Barley - Yield per Acre (bu)	62.5	135.4	135.4	131.2	50.0	129.2	120.8	87.2
Price per Bu	$2.45	$2.45	$2.40	$2.30	$2.30	$3.07	$3.07	
	153.00	331.50	325.00	302.40	115.20	396.80	371.20	
Straw - Yield per Acre (Tons)	-	0.60	-	-	-	-	-	
Price per Ton	-	30.00	-	-	-	-	-	
	0.00	18.00	0.00	0.00	0.00	0.00	0.00	
GROSS RETURNS	153.00	349.50	325.00	302.40	115.20	396.80	371.20	
OPERATING COSTS								
Seed	12.80	14.40	14.00	14.00	8.40	16.00	15.20	13.99
Fertilizer	27.30	51.45	41.40	42.20	18.60	29.10	21.10	30.39
Pesticides	24.16	3.35	25.37	21.05	2.00	25.37	21.05	19.69
Custom								
Spray	1.50			9.25			9.25	4.82
Fertilize		6.35	5.20	5.35	5.35	5.20	5.35	4.88
Swath							11.00	3.28
Combine		26.50	21.25	23.00	15.00	21.25	23.00	19.83
Haul		22.75	16.25	15.75	6.00	15.50	14.50	13.27
Bale/Stack		8.94						0.37
Crop Insurance	2.70	6.75	12.00	10.75	3.10	14.00	12.70	10.28
Irrigation								
Water Assessment		26.60	24.60	8.95		24.60	8.95	12.00
Irrigation Repairs		2.77	12.32	8.40		12.32	8.40	7.55
Irrigation Power			14.30	9.75		14.30	9.75	8.63
Labor (irrigation)		21.18	7.93	8.09		7.93	8.09	7.03
Labor								
Machine	24.92	34.94	21.60	24.56	20.13	21.60	24.56	23.79
Non-machine	1.37	2.09	2.09	2.09		2.09	2.09	1.81
Fuel/Lube	15.55	13.40	8.29	11.94	7.00	8.29	12.82	11.12
Machinery Repair	8.24	9.26	6.51	6.32	4.41	6.51	6.57	6.53
Interest on Operating Capital @10.25%	5.38	10.62	7.52	8.07	5.50	6.71	7.46	7.22
Total Operating Costs/acre	123.92	261.35	240.63	229.52	95.49	230.77	221.84	206.48
CASH OWNERSHIP COSTS								
General Overhead	4.15	9.55	8.98	8.43	3.15	8.83	8.33	7.63
Land Rent	29.55	100.00	100.00	90.00	22.00	100.00	90.00	80.51
Management Fee	7.65	17.48	16.25	15.12	5.76	19.84	18.56	15.45
Property Taxes (Machinery)	3.73	2.20	1.31	2.02	2.01	1.31	2.09	2.01
Property Insurance	1.33	0.79	0.47	0.72	0.72	0.47	0.75	0.72
Total Cash Ownership Costs/acre	46.41	130.02	127.01	116.29	33.64	130.45	119.73	106.33
NON-CASH OWNERSHIP COSTS								
Depreciation & Interest (Equipment)	65.49	36.86	22.06	33.52	35.02	22.06	34.69	34.02
TOTAL COSTS/ACRE	235.82	428.23	389.70	379.33	164.15	383.28	376.26	346.83
RETURNS to RISK	(82.82)	(78.73)	(64.70)	(76.93)	(48.95)	13.52	(5.06)	(346.83)
LISTED COSTS PER BUDGET UNIT (bu)								
Operating Costs	1.98	1.93	1.78	1.75	1.91	1.79	1.84	2.369
Indirect Costs	1.79	1.23	1.10	1.14	1.37	1.18	1.28	1.610
Total Costs	3.77	3.16	2.88	2.89	3.28	2.97	3.11	3.980
SOURCE: University of Idaho Cooperative Extension Service, Moscow, ID								
Acres Harvested (000)	51.7	24.6	61.2	122.5	62.1	90.8	175.5	588.4
Production (000 bu)	3,206.0	2,383.0	6,641.0	10,862.0	2,766.0	9,855.0	15,567.0	51,280.0
Yield per Acre (bu) (calculated fr est)	62.0	96.9	108.5	88.7	44.5	108.5	88.7	

Table A-5. SOUTH DAKOTA: Estimated Costs of Production, 1998

	FEED BARLEY Northeast	FEED BARLEY East Central	FEED BARLEY Southeast	FEED BARLEY North Central	FEED BARLEY Central	FEED BARLEY South Central	FEED BARLEY Northwest	FEED BARLEY West Central	FEED BARLEY Southwest	Weighted by Acres Harvested
Barley										
Yield per Acre (bu)	63.7	56.6	53.2	56.0	46.0	50.0	42.6	48.0	50.6	38.0
Price per Bu	$1.90	$1.90	$1.90	$1.90	$1.90	$1.90	$1.90	$1.90	$1.90	
	121.03	107.54	101.08	106.40	87.40	95.00	80.94	91.20	96.14	
Straw										
Yield	-	-	-	-	-	-	-	-	-	
Price per Ton	-	-	-	-	-	-	-	-	-	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
GROSS RETURNS	121.03	107.54	101.08	106.40	87.40	95.00	80.94	91.20	96.14	
OPERATING COSTS										
Seed	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97
Fertilizer	17.26	15.43	15.47	15.25	13.79	14.96	12.64	14.38	16.78	15.02
Pesticides	2.20	1.72	1.72	2.20	1.72	1.72	1.72	1.72	1.72	2.01
Custom										
Spray					3.40			3.40	3.40	0.46
Combine	13.60	13.60	13.60	13.60	13.60	13.60	13.60	13.60	13.60	13.60
Haul	5.73	5.09	4.79	6.75	4.14	4.50	3.83	4.32	4.55	5.52
Crop Insurance	4.50	4.50	4.50	4.50	4.50	5.90	5.90	5.90	5.90	4.92
Labor	4.12	8.12	9.18	5.66	5.15	5.39	5.63	4.88	4.88	5.40
Fuel	2.07	2.75	3.05	2.49	2.42	2.31	2.39	2.23	2.23	2.38
Machinery-Operating Cost	5.10	7.25	8.10	5.76	5.55	5.76	7.06	5.56	5.56	5.94
Capital Costs	3.56	3.69	3.82	3.54	3.47	3.55	3.48	3.65	3.81	3.55
Total Operating Costs/acre	68.11	72.12	74.20	69.72	67.71	67.66	66.22	69.61	72.40	68.76
CASH OWNERSHIP COSTS										
Land Charges	53.50	69.90	77.70	41.20	38.60	34.80	18.80	21.70	21.70	38.43
Management Fee	6.05	5.38	5.05	5.32	4.37	4.75	4.05	4.56	4.81	5.07
Total Cash Ownership Costs/acre	59.55	75.28	82.75	46.52	42.97	39.55	22.85	26.26	26.51	43.50
NON-CASH OWNERSHIP COSTS										
Machinery-Ownership Cost	11.74	16.38	17.17	16.10	15.68	12.71	11.65	12.29	12.29	14.08
TOTAL COSTS/ACRE	139.40	163.78	174.12	132.34	126.36	119.92	100.72	108.16	111.20	126.33
NET PROFIT or LOSS	(18.37)	(56.24)	(73.04)	(25.94)	(38.96)	(24.92)	(19.78)	(16.96)	(15.06)	(126.33)
LISTED COSTS PER BUDGET UNIT (bu)										
Operating Costs	1.07	1.27	1.39	1.25	1.47	1.35	1.55	1.45	1.43	1.809
Indirect Costs	1.12	1.62	1.88	1.12	1.28	1.05	0.81	0.80	0.77	1.515
Total Costs	2.19	2.89	3.27	2.36	2.75	2.40	2.36	2.25	2.20	3.324
SOURCE: Cooperative Extension Service, South Dakota State University, Brookings, SD										
1997: Acres Harvested (000)	23.0	2.9	2.0	54.5	9.0	4.0	26.0	3.6	5.0	130.0
Production (000 bu)	1,005.6	116.0	87.0	2,316.0	300.8	141.4	758.4	64.8	150.0	4,940.0
Yield per Acre (bu)	43.7	40.0	43.5	42.5	33.4	35.4	29.2	18.0	30.0	

Table A-6. ALBERTA: Crops Enterprise Analysis, 1997

		Region 1 - Southern				Region 2 - Central		Region 3 N Eastern	Region 4 N. Western	Region 5 Peace River		Weighted by Acres
		Feed Barley		Malt Barley		Feed Barley	Malt Barley	Feed Barley	Feed Barley	Feed Barley	Malt Barley	
		Irrigated	Dryland	Irrigated	Dryland							Cropped
	Estimated Yield (bu/acre)	98.3	50.8	79.1	53.1	64.8	75.8	44.8	64.0	34.9		63.0
	Expected Mkt Price ($/bu)	C$2.91	C$2.99	C$3.49	C$2.95	C$2.64	C$3.40	C$2.32	C$2.31	C$2.06		
(A)	1 Crop Sales	286.26	151.87	276.12	156.45	170.95	257.59	103.91	147.73	72.02	0.00	
	2 Crop Insurance Receipts	0.00	0.00	4.34	0.00	5.57	7.62	0.00	4.88	2.78		
	3 Miscellaneous Receipts	0.39	16.07	2.63	0.19	4.06	7.18	7.57	17.15	3.51		
	4 Government Program	0.71	0.02	1.21	0.52	0.57	0.16	13.75	14.82	1.03		
	5 Add Revenue (Straw / After Grazing)	15.91	13.61	12.75	0.00	6.17	13.13	10.87	15.71	7.51		
	GROSS RETURN	303.27	181.57	297.05	157.16	187.32	285.68	136.10	200.29	86.85	0.00	
(B)	VARIABLE COSTS/ACRE											
	1 Seed	10.83	6.94	12.74	6.86	11.47	14.13	6.32	7.99	6.99		9.47
	2 Fertilizer	44.28	26.50	18.33	17.99	26.40	35.27	17.69	30.18	23.13		27.38
	3 Chemicals	15.20	10.14	22.36	11.23	15.83	25.57	10.83	15.29	11.12		14.70
	4 Hail/Crop Insurance & Prog Premiums	7.73	4.62	6.83	3.44	6.83	7.82	2.14	3.03	1.75		5.11
	5 Trucking & Marketing	3.53	0.00	21.14	1.26	2.51	0.10	0.63	0.15	0.86		1.91
	6 Fuel	10.20	8.09	11.71	10.78	12.85	9.77	12.61	9.86	13.18		11.37
	7 Irrigation Fuel & Electricity	9.73	0.00	8.79	0.00	0.00	0.00	0.00	0.00	0.00		1.25
	8 Repairs - Machine	19.47	18.61	26.56	11.45	14.87	9.13	17.31	17.52	18.35		16.07
	9 Repairs - Buildings	4.54	8.71	2.35	1.02	0.72	0.94	0.57	5.99	3.26		2.74
	10 Utilities & Miscellaneous	10.01	11.53	14.34	6.80	14.66	9.12	7.38	7.94	14.66		11.13
	11 Custom Work & Specialized Labor	15.71	8.97	2.00	0.00	5.04	5.51	6.89	2.85	0.93		5.49
	12 Operating Interest Paid	2.52	1.69	1.73	3.68	1.47	0.15	1.21	0.73	2.40		1.69
	13 Paid Labour & Benefits	13.03	7.34	1.95	3.26	9.88	8.64	1.39	4.87	2.27		7.04
	Total Variable Costs	166.78	113.14	150.83	77.77	122.53	126.15	84.97	106.40	98.90	0.00	C$115.35
(C)	1 Cash/Share Rent & Land Lease	27.22	15.52	37.50	8.79	25.12	17.93	8.52	6.50	2.43		16.85
	2 Taxes, Water Rates, Lic. & Insurance	14.69	5.83	15.84	3.97	3.51	4.34	3.42	7.47	4.57		5.91
	3 Equipment & Building Depreciation	47.24	40.66	48.11	13.17	24.67	36.60	26.52	32.01	34.51		30.32
	Equipment & Building Lease Payments	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.00	0.00		0.11
	4 Paid Capital Interest	19.68	11.99	14.79	10.64	9.58	0.33	7.61	10.87	10.60		10.61
	Total Capital Costs	108.83	74.00	116.24	36.57	62.88	59.20	47.21	56.85	52.11	0.00	C$63.80
(D)	CASH COSTS (B+C-B14-C3)	228.37	146.48	218.96	101.17	160.74	148.75	105.66	131.24	17.60	0.00	148.84
(E)	TOTAL PRODUCTION COSTS (B+C)	275.61	187.14	267.07	114.34	185.41	185.35	132.18	163.25	151.01	0.00	179.16
	GROSS MARGIN (A-D)	74.90	35.09	78.09	55.99	26.58	136.93	30.44	69.05	69.25	0.00	
	Return to Unpaid Labor (A-E+B14)	27.66	(5.57)	29.98	44.82	1.91	100.33	3.92	37.04	34.74	0.00	
	Return to Investment (A-E+C4)	47.34	6.42	44.77	53.46	11.49	100.66	11.53	47.91	(53.56)	0.00	
	Return to Equity (A-E)	27.66	(5.57)	29.98	42.82	1.91	100.33	3.92	37.04	(64.16)	0.00	
	INVESTMENT Land	819.13	235.93	990.91	438.71	373.34	529.92	215.19	510.83	385.80		447.68
	Buildings	74.21	120.08	173.45	22.48	63.78	69.28	87.05	121.26	120.96		82.22
	Machinery	292.18	395.07	222.59	126.92	232.72	361.19	237.69	285.26	316.11		262.03
	Irrigation Machinery	188.33	0.00	164.08	0.00	0.00	0.00	0.00	0.00	0.00		24.16
	TOTAL	1,373.85	751.08	1,551.03	588.11	669.84	960.39	539.93	917.35	822.87	0.00	816.10
	LISTED COSTS PER BUDGET UNIT (bu) Variable Costs	1.70	2.23	1.91	1.46	1.89	1.66	1.90	1.66	2.84		1.831
	Indirect Costs	1.11	1.46	1.47	0.69	0.97	0.78	1.05	0.89	1.49		1.013
	Total Expenses	2.80	3.68	3.38	2.15	2.86	2.45	2.95	2.55	4.33	0.00	C$2.844
	SOURCE: Alberta Agriculture, Food and Rural Development Enterprises	12	6	4	5	25	4	13	14	5		88
	Acres Cropped	98.0	127.3	55.0	217.0	137.2	158.8	76.1	110.8	162.0		
	Total Acres	1,176.0	764.0	220.0	1,085.0	3,429.0	635.0	989.0	1,551.1	810.0		10,659.1
	Production (Acres x Yield) (000 bu)	115.6	38.8	17.4	57.6	222.0	48.1	44.3	99.3	28.3		671.4

Table A-7. MANITOBA: Crop Production Costs (Guidelines for Estimating)

	BARLEY						
	1998	1997 (1)	1996	1995	1994	1992 (1)	1987 (1)
Breakeven Yield (bu/acre)	64.4	57.3	64.7	82.7	83.0	68.6	52.4
Estimated Mkt Price ($/bu)	C$2.50	C$2.31	C$2.50	C$1.85	C$1.80	C$1.85	C$1.55
ESTIMATED GROSS REVENUE/acre	161.00	132.36	161.75	152.92	149.40	126.91	81.22
OPERATING COSTS							
Seed & Treatment	9.19	8.31	10.50	6.38	5.63	5.25	4.90
Fertilizer	27.11	30.90	29.87	26.78	22.95	19.53	22.25
Chemicals	22.00	20.00	16.50	17.50	15.00	15.00	16.50
Fuel	11.00	11.00	10.00	10.00	10.00	10.00	10.00
Machinery Operating Costs	10.00	10.00	10.00	10.00	10.00	9.50	6.50
Crop Insurance & Hail	5.70	5.80	5.15	5.10	4.96	6.05	5.80
Other Costs	7.50	7.50	7.50	7.50	7.50	7.50	5.50
Interest on Operating	3.55	3.47	4.25	3.97	3.24	3.89	4.30
Total Variable Expense	C$96.05	C$96.98	C$93.77	C$87.23	C$79.28	C$76.72	C$75.75
OTHER EXPENSES/ACRE							
Storage Cost	2.14	2.14	2.32	2.49	2.85	2.83	2.85
Land Taxes	5.50	5.50	5.00	5.00	5.00	5.00	-
Machinery Depreciation	17.50	17.50	16.00	15.00	13.50	12.00	12.00
Machinery Investment	7.00	7.00	9.60	9.00	10.80	9.60	9.60
Land Investment	17.80	16.00	21.60	20.70	26.00	26.00	29.00
Total Other Expenses	C$49.94	C$48.14	C$54.52	C$52.19	C$58.15	C$55.43	C$53.45
TOTAL EXPENSES	C$145.99	C$145.12	C$148.29	C$139.42	C$137.43	C$132.15	C$129.20
RETURN OVER VARIABLE EXPENSES	64.95	35.38	67.98	65.69	70.12	50.19	5.47
RETURN OVER TOTAL EXPENSES	15.01	(12.76)	13.46	13.50	11.97	(5.24)	(47.98)
Break-even Price ($/bu)							
To Cover Variable Expenses	1.49	1.69	1.45	1.06	0.96	1.12	1.45
To Cover Total Expenses	2.27	2.53	2.29	1.69	1.66	1.93	2.47
LISTED COSTS PER BUDGET UNIT (bu)							
Variable Costs	1.49	1.69	1.45	1.06	0.96	1.12	1.45
Indirect Costs	0.78	0.84	0.84	0.63	0.70	0.81	1.02
Total Expenses	C$2.27	C$2.53	C$2.29	C$1.69	C$1.66	C$1.93	C$2.47

SOURCE: Manitoba Agriculture

(1) Provincial Average Yield and Price

Table A-8. SASKATCHEWAN: Crop Planning Guide, 1997

	FEED BARLEY Brown Soil Zone				FEED BARLEY Dark Brown Soil Zone				FEED BARLEY Black Soil Zone				
	Summer Tillage Fallow	Fallow Seeded (1)	Conventional Seeded Stubble Crop	Direct Seeded Stubble Crop	Summer Tillage Fallow	Fallow Seeded (1)	Conventional Seeded Stubble Crop	Direct Seeded Stubble Crop	Summer Tillage Fallow	Fallow Seeded (1)	Conventional Seeded Stubble Crop	Direct Seeded Stubble Crop	Weighted by Est Acres Harvested
"Calculated" Actual Yield (bu/acre)		48.6	41.8	41.8		55.4	41.1	41.1		56.2	48.6	48.6	46.8
Est on Farm Mkt Price ($/bu)		C$1.80	C$1.80	C$1.80		C$1.80	C$1.80	C$1.80		C$1.80	C$1.80	C$1.80	
ESTIMATED GROSS REVENUE/acre	0.00	87.48	75.15	75.15	0.00	99.72	73.98	73.98	0.00	101.16	87.48	87.48	
VARIABLE EXPENSES/ACRE													
Seed		5.18	5.18	5.18		5.69	5.69	5.69		5.69	5.69	5.69	5.59
Fertilizer - Nitrogen		6.20	13.95	13.95		7.75	15.50	15.50		9.30	18.60	18.60	16.25
- Phosphorus		5.60	5.60	5.60		7.00	7.00	7.00		8.40	8.40	8.40	7.59
- Sulfur & Others		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00
Chemical - Herbicides	2.86	8.18	8.46	13.15	2.86	11.41	11.41	16.38	2.86	11.41	11.41	16.38	13.32
- Insecticides/Fungicides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
- Others	0.00	1.66	1.66	1.66	0.00	1.82	1.82	1.82	0.00	1.82	1.82	1.82	1.79
Machinery Operating - Fuel	3.70	6.29	7.40	5.18	3.70	6.29	7.40	5.18	3.70	6.29	7.40	5.18	6.66
- Repair	1.75	5.00	5.00	4.00	2.50	6.25	6.25	5.25	3.00	7.00	7.00	7.00	6.57
Custom Work & Hired Labor	1.50	3.00	3.00	3.00	1.50	3.00	3.00	3.00	1.50	3.00	3.00	3.00	3.15
Crop Insurance Premium		7.42	4.86	4.86		7.08	4.84	4.84		5.34	4.93	4.93	5.02
Utilities & Miscellaneous	1.95	1.95	1.95	1.95	2.85	2.85	2.85	2.85	2.90	2.90	2.90	2.90	2.97
Interest on Variable Expenses	1.06	1.51	1.71	1.76	1.21	1.77	1.97	2.03	1.26	1.83	2.13	2.22	2.15
Total Variable Expense	12.82	64.81	58.77	60.29	14.62	75.53	67.73	69.54	15.22	78.20	73.28	76.12	C$71.05
OTHER EXPENSES/ACRE													
Building Repair	0.95	0.95	0.95	0.95	1.15	1.15	1.15	1.15	1.65	1.65	1.65	1.65	1.57
Property Taxes	3.50	3.50	3.50	3.50	4.00	4.00	4.00	4.00	4.50	4.50	4.50	4.50	4.64
Insurance & Licenses	1.05	1.05	1.05	1.05	1.50	1.50	1.50	1.50	1.90	1.90	1.90	1.90	1.83
Machinery Depreciation	3.50	10.00	10.00	8.00	5.00	12.50	12.50	10.50	6.00	14.00	14.00	14.00	13.13
Building Depreciation	0.95	0.95	0.95	0.95	1.15	1.15	1.15	1.15	1.65	1.65	1.65	1.65	1.57
Machinery Investment	2.10	6.00	6.00	4.80	3.00	7.50	7.50	6.30	3.60	8.40	8.40	7.20	7.54
Building Investment	1.14	1.14	1.14	1.14	1.38	1.38	1.38	1.38	1.98	1.98	1.98	1.98	1.88
Land Investment	20.00	20.00	20.00	20.00	23.00	23.00	23.00	23.00	28.00	28.00	28.00	28.00	28.09
Total Other Expenses	33.19	76.78	43.59	40.39	40.18	52.18	52.18	48.98	49.28	62.08	62.08	60.88	C$60.23
TOTAL EXPENSES	46.01	141.59	102.36	100.68	54.80	121.71	119.91	118.52	64.50	140.28	135.36	137.00	C$131.29
RETURN OVER VARIABLE EXPENSES	(12.82)	22.67	16.38	14.86	(14.62)	24.19	6.25	4.44	(15.22)	22.96	14.20	11.36	(71.05)
RETURN OVER TOTAL EXPENSES	(46.01)	(54.11)	(27.21)	(25.53)	(54.80)	(27.99)	(45.93)	(44.54)	(64.50)	(39.12)	(47.88)	(49.52)	(131.29)
Break-even Price ($/bu)*													
To Cover Variable Expenses		1.33	1.41	1.44		1.36	1.65	1.69		1.39	1.51	1.57	1.52
To Cover Total Expenses		2.91	2.45	2.41		2.31	2.92	2.88		2.50	2.79	2.82	2.81
* Break-even prices for summerfallow crops include the previous years tillage fallow expenses.													
LISTED COSTS PER BUDGET UNIT (bu)													
Variable Costs	0.26	1.33	1.41	1.44	0.26	1.36	1.65	1.69	0.27	1.39	1.51	1.57	1.519
Other Expenses	0.68	1.58	1.04	0.97	0.73	0.94	1.27	1.19	0.88	1.10	1.28	1.25	1.288
Total Expenses	0.95	2.91	2.45	2.41	0.99	2.31	2.92	2.88	1.15	2.50	2.79	2.82	C$2.806
SOURCE: Saskatchewan Agriculture and Food													
(1)Total Variable & Total Other Expense Lines Include Fallow Costs													
Seeding Practice (estimated percent)		10%	45%	45%		10%	45%	45%		10%	45%	45%	
Total Calculated Acres in Soil Zone (000)		867.0	867.0	867.0		760.0	760.0	760.0		2,723.0	2,723.0	2,723.0	
Acres (estimated) (000)		86.7	390.2	390.2		76.0	342.0	342.0		272.3	1,211.7	1,225.4	4,336.4
Production (Acres x Yield) (000 bu)		4,213.6	16,288.8	16,288.8		4,210.4	14,056.2	14,056.2		15,303.3	58,890.3	59,552.0	202,859.5

Blank page for duplicating.

APPENDIX B

SIMULATION WITH STRONGER CANADIAN DOLLAR

Table B1. Distribution of Production Costs by Region ($/bu)†
Assuming 10% Stronger Canadian Dollar

	ND*	**MT***	**ID***	**MN***	**SD***	**AB**	**SK**	**MB**
Mean	2.29	2.26	4.33	2.36	2.89	2.36	2.13	1.94
St.Deviation	0.41	0.42	0.26	0.37	0.37	0.19	0.37	0.25
Skewness	1.33	1.36	0.37	1.08	0.82	0.38	1.15	0.75
Kurtosis	7.39	7.24	3.25	5.53	4.33	3.16	5.90	4.29
Cumulative Probability Distributions								
Probability	($/bu)							
5%	1.75	1.72	3.92	1.86	2.37	2.07	1.63	1.58
10%	1.84	1.80	4.00	1.94	2.46	2.13	1.71	1.64
15%	1.90	1.87	4.06	2.00	2.52	2.17	1.77	1.69
20%	1.96	1.92	4.10	2.05	2.58	2.20	1.82	1.73
25%	2.00	1.97	4.14	2.10	2.63	2.23	1.87	1.76
30%	2.05	2.01	4.18	2.14	2.67	2.25	1.91	1.80
35%	2.09	2.06	4.21	2.18	2.71	2.28	1.96	1.83
40%	2.14	2.10	4.25	2.22	2.76	2.30	2.00	1.86
45%	2.18	2.15	4.28	2.26	2.80	2.32	2.03	1.88
50%	2.22	2.19	4.31	2.30	2.84	2.34	2.07	1.92
55%	2.27	2.24	4.34	2.35	2.89	2.37	2.11	1.95
60%	2.32	2.29	4.38	2.39	2.93	2.39	2.16	1.98
65%	2.37	2.34	4.41	2.44	2.98	2.41	2.21	2.01
70%	2.43	2.41	4.45	2.50	3.04	2.45	2.26	2.04
75%	2.50	2.47	4.49	2.56	3.10	2.48	2.32	2.08
80%	2.58	2.56	4.54	2.63	3.17	2.52	2.39	2.12
85%	2.67	2.66	4.60	2.72	3.25	2.56	2.48	2.18
90%	2.81	2.80	4.67	2.84	3.37	2.61	2.61	2.26
95%	3.03	3.03	4.78	3.04	3.55	2.69	2.80	2.4

†Production costs include both direct and indirect costs.

* Distributions for U.S. regions are identical to base case (Table 5).

Table B2. Deviations from Weighted Average Cost (c/bu)†
Assuming 10% Stronger Canadian Dollar

	ND	MT	ID	MN	SD	AB	SK	MB
Mean	-5.8	-8.5	197.9	1.1	54.0	1.3	-22.0	-40.7
St.Deviation	32.1	37.2	26.3	33.0	33.7	20.1	20.3	17.1
Skewness	1.3	1.2	0.2	0.8	0.6	-0.1	1.7	0.5
Kurtosis	7.7	6.8	3.0	4.7	3.9	3.2	8.4	4.0
Cumulative Probability Distributions								
Probability	(c/bu)							
5%	-47.9	-58.4	157.1	-45.8	5.0	-32.6	-46.2	-65.9
10%	-41.4	-49.1	164.8	-36.4	15.0	-24.2	-43.0	-60.7
15%	-35.9	-42.8	170.6	-30.2	21.6	-19.0	-40.4	-57.2
20%	-31.0	-38.3	175.1	-26.0	26.4	-15.7	-37.9	-54.3
25%	-27.4	-33.4	179.7	-21.7	30.7	-11.8	-36.0	-51.9
30%	-24.1	-29.4	183.5	-18.0	34.6	-8.6	-33.9	-49.9
35%	-20.7	-25.2	187.3	-14.2	38.5	-6.0	-32.1	-47.9
40%	-17.0	-21.4	190.7	-9.8	42.4	-3.3	-29.8	-46.1
45%	-13.5	-17.6	193.6	-5.5	46.3	-0.8	-27.8	-44.0
50%	-10.7	-13.6	197.3	-2.0	50.4	1.5	-25.9	-42.2
55%	-7.4	-9.1	200.7	1.7	54.5	3.8	-23.9	-40.0
60%	-3.4	-5.0	204.5	5.5	58.8	6.3	-21.6	-38.0
65%	0.9	-0.4	207.8	9.5	63.5	8.9	-18.9	-36.1
70%	5.6	4.7	211.5	13.5	68.7	11.6	-16.2	-33.5
75%	10.2	10.6	215.6	19.1	74.2	14.8	-13.0	-30.9
80%	16.4	16.8	219.6	25.9	81.0	18.2	-8.7	-27.5
85%	24.7	25.3	224.7	33.5	88.0	22.4	-3.7	-23.1
90%	34.4	38.0	231.0	43.1	97.6	26.6	3.4	-19.0
95%	52.6	57.5	241.6	59.2	113.3	34.1	16.2	-10.8

† Cost per bushel in indicated region minus weighted average for 8 regions, using production weights. Results may be compared to Table 6 (base case).

Table B3. Share of Production Produced at Lower Cost†
Assuming 10% Stronger Canadian Dollar

	ND	MT	ID	MN	SD	AB	SK	MB
Mean	45.7	43.8	93.0	58.4	87.3	43.9	24.1	12.6
St.Deviation	26.9	32.1	0.6	27.4	12.3	18.3	21.5	19.7
Skewness	0.0	0.0	-2.7	-0.4	-2.5	-1.0	0.9	1.6
Kurtosis	1.6	1.7	37.2	1.9	8.7	2.7	2.6	4.7
Cumulative Probability Distributions								
Probability	(share of lower-cost suppliers, %)							
5%	9.1	0.0	92.1	9.6	58.2	7.7	0.0	0.0
10%	9.8	0.0	92.3	11.3	62.9	9.1	0.0	0.0
15%	10.4	0.0	92.5	25.1	86.2	16.3	7.4	0.0
20%	14.3	0.0	92.6	30.1	88.3	31.9	8.5	0.0
25%	16.6	9.1	92.7	36.5	91.4	34.2	9.0	0.0
30%	34.4	25.4	92.8	48.0	91.7	36.9	9.3	0.0
35%	36.2	30.1	92.9	50.5	91.9	40.5	9.6	0.0
40%	37.5	34.9	93.0	52.6	92.0	42.0	9.8	0.0
45%	39.5	36.8	93.0	54.6	92.1	48.3	10.2	0.0
50%	41.4	48.0	93.1	56.2	92.2	52.2	15.6	0.0
55%	43.0	51.4	93.2	59.0	92.3	53.7	16.9	0.0
60%	45.5	53.8	93.2	76.2	92.4	55.1	25.8	4.2
65%	59.3	55.7	93.3	78.1	92.5	56.4	29.0	7.6
70%	75.2	64.8	93.4	83.8	92.6	57.6	30.7	16.7
75%	76.7	72.8	93.4	88.5	92.7	58.5	34.5	26.5
80%	77.8	86.3	93.5	88.9	92.8	59.4	47.2	28.2
85%	78.9	87.1	93.6	89.2	92.9	60.2	53.7	33.3
90%	80.1	87.7	93.7	89.5	93.0	61.1	58.8	39.9
95%	81.3	88.5	93.9	89.9	93.2	62.4	70.0	60.4

† Share of total production (in 8 states and provinces) that is produced at lower cost-per-bushel. Results may be compared to Table 7 (base case).

Table B4. Cross-Border Production Cost Differentials (c/bu) Assuming 10% Stronger Canadian Dollar *

	ND-AB	ND-SK	ND-MB	MT-AB	MT-SK	MT-MB
Mean	-7.1	16.2	34.8	-9.8	13.5	32.2
St.Deviation	49.2	37.4	25.7	39.6	45.1	50.0
Skewness	0.9	0.1	1.5	1.2	0.3	0.7
Kurtosis	5.5	4.6	10.3	6.9	4.6	5.2
Cumulative Probability Distributions						
Probability	(c/bu)					
5%	-77.4	-41.5	1.0	-63.0	-57.4	-40.9
10%	-64.1	-27.9	7.2	-53.4	-39.0	-26.6
15%	-54.0	-18.0	11.3	-46.6	-29.2	-16.3
20%	-47.0	-11.7	14.6	-41.5	-21.6	-7.5
25%	-41.2	-6.3	18.0	-35.6	-14.7	0.0
30%	-35.5	-1.7	20.6	-31.6	-7.9	6.4
35%	-29.3	3.1	23.0	-28.0	-2.7	11.8
40%	-23.1	7.3	26.0	-24.0	2.2	17.3
45%	-17.3	11.5	28.4	-19.9	6.6	22.7
50%	-12.4	15.6	31.4	-15.9	12.2	28.6
55%	-7.6	20.1	34.4	-11.7	17.3	33.7
60%	-1.7	24.1	37.1	-7.0	22.7	40.0
65%	5.3	28.6	39.9	-1.5	27.4	46.8
70%	13.2	33.2	43.5	4.3	32.3	53.3
75%	21.2	38.6	47.8	11.0	39.0	60.5
80%	30.3	44.2	52.0	18.0	46.9	68.5
85%	41.7	51.7	57.8	27.7	55.0	79.1
90%	55.8	60.1	66.4	40.0	66.8	93.4
95%	79.2	74.4	80.2	63.0	90.8	119.0

* Results may be compared to Table 8 (base case).

Table B5. Cross-Border Production Cost Differentials (c/bu) Assuming 10% Stronger Canadian Dollar *

	MN-AB	MN-SK	MN-MB	ID-AB	ID-SK
Mean	-0.2	23.1	41.8	196.6	219.9
St.Deviation	46.8	41.8	25.1	29.4	41.5
Skewness	0.6	-0.2	0.9	0.1	-0.5
Kurtosis	4.2	4.3	5.0	3.1	3.9
Cumulative Probability Distributions					
Probability	(c/bu)				
5%	-69.4	-45.7	5.7	147.5	147.3
10%	-55.0	-28.0	12.5	159.1	166.8
15%	-46.4	-16.4	17.6	165.9	178.7
20%	-38.8	-7.4	21.6	172.0	187.7
25%	-32.8	-0.9	24.8	176.9	195.9
30%	-27.1	4.3	27.9	181.0	201.3
35%	-20.9	9.3	30.9	184.7	207.6
40%	-14.9	13.9	33.6	188.6	212.7
45%	-9.3	18.5	36.1	192.3	217.9
50%	-3.5	23.9	39.1	196.1	223.1
55%	2.0	28.4	41.9	199.7	227.8
60%	8.1	33.2	45.0	203.9	232.7
65%	13.6	38.6	48.1	207.5	237.7
70%	19.2	43.0	51.5	211.4	242.5
75%	27.2	47.8	55.7	215.2	247.6
80%	36.0	54.8	59.7	220.4	254.0
85%	46.5	63.0	65.7	226.7	260.3
90%	58.5	74.3	73.0	234.9	268.7
95%	80.7	89.8	88.0	246.5	282.4

* Results may be compared to Table 9 (base case).

Table B6. Cost Comparison: U.S. Relative to Canadian Origins Assuming 10% Stronger Canadian Dollar

Origins		Destination	Shipping Cost Differential † (c/bu)	Probability (%) of Lower Cost At U.S. Origin, Based on	
U.S.	Canadian			Production and Shipping Costs Only	Production, Shipping, and Elevation Costs ‡
Devils Lake, ND	Camrose, AB	Tulare, CA	30	80	83
Devils Lake, ND	Camrose, AB	Pacific ports	-46	21	35
Devils Lake, ND	Camrose, AB	Minneapolis	42	85	88
Devils Lake, ND	Saskatoon, SK	Pacific ports	-40	6	12
Devils Lake, ND	Saskatoon, SK	Minneapolis	27	63	72
Devils Lake, ND	Saskatoon, SK	Milwaukee	21	56	65
Great Falls, MT	Camrose, AB	Tulare, CA	39	90	92
Great Falls, MT	Camrose, AB	Pacific ports	-29	34	55
Great Falls, MT	Camrose, AB	Minneapolis	14	77	82
Great Falls, MT	Saskatoon, SK	Pacific ports	-23	19	32
Great Falls, MT	Saskatoon, SK	Minneapolis	-1	37	45
Great Falls, MT	Saskatoon, SK	Milwaukee	-8	30	38
Crookston, MN	Saskatoon, SK	Tulare, CA	37	64	72
Crookston, MN	Saskatoon, SK	Pacific ports	-40	7	12
Crookston, MN	Saskatoon, SK	Minneapolis	41	68	76
Crookston, MN	Winnipeg, MB	Lake ports	-8	0	1
Crookston, MN	Winnipeg, MB	Minneapolis	14	11	35
Crookston, MN	Winnipeg, MB	Milwaukee	7	6	11
Moscow, ID	Saskatoon, SK	Vancouver WA	57	0	0
Moscow, ID	Saskatoon, SK	Milwaukee	-33	0	0

† Positive number indicates advantage in shipping from U.S. origin. Shipping cost differentials are identical to those in base case (Table 11).

‡ Assumes 8 c/bu higher country elevation in Canada and 9 c/bu higher terminal elevation. Both country and terminal elevation apply to offshore export shipments; only country elevation applies to other shipments.