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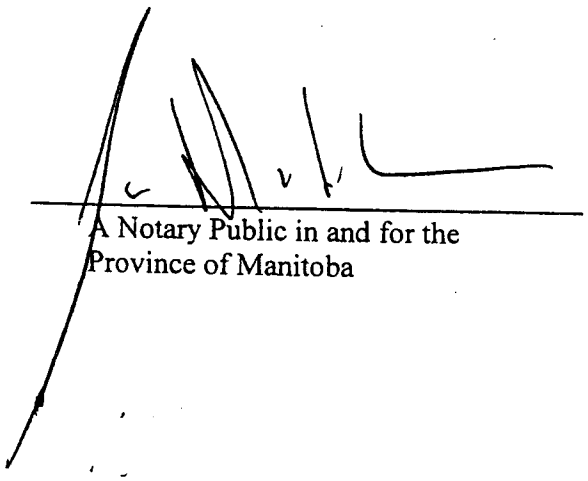

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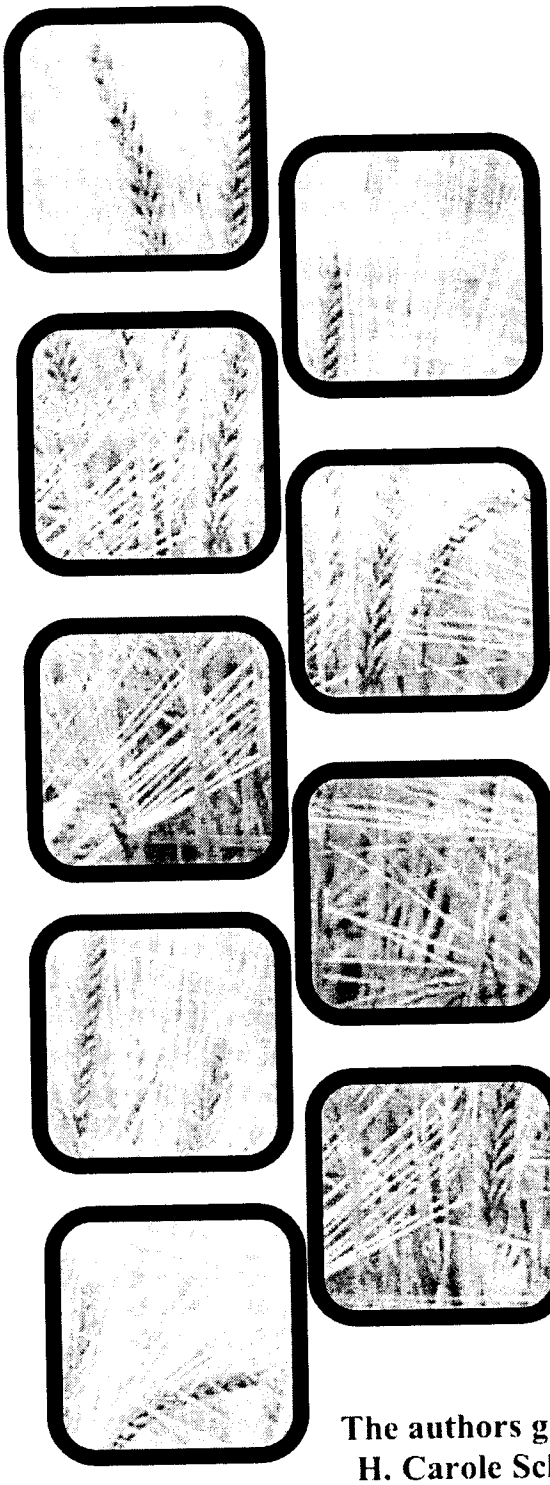

THE CANADIAN WHEAT BOARD AND BARLEY MARKETING

EXECUTIVE SUMMARY

Dr. Andrew Schmitz
Dr. Troy G. Schmitz
Dr. Richard Gray

February 2005

The authors greatly appreciate the professional input of
H. Carole Schmitz, Kjerstin Terry, and Carol Fountain

Executive Summary

The operation of the CWB as the single-desk seller of Western Canada's feed-barley and malting barley for export and for domestic human consumption within Canada is at the centre of ongoing debate and controversy in Western Canada. Some key issues raised are:

1) Does the CWB deliver higher returns to Western Canada's feed-barley and malting-barley producers than would be the case in a multiple-seller environment?
2) Are there benefits provided to producers through the price-pooling operations of the CWB (i.e., risk management)?
3) What are the inherent problems of arbitrage between the annual pooled return (APR) provided by the CWB and the cash off-Board market price?
4) Are there additional marketing costs that are unique to the operation of the CWB as a single-desk seller?

- Recent studies that have examined the economic issues surrounding barley marketing in Western Canada and North America have focused primarily on feed barley, with less emphasis on malting barley. Thus the lack of focus on the interrelationship between these two different barley markets has limited the usefulness of many earlier studies when determining the implications of various possible marketing arrangements for barley producers, the livestock industry, and the malting industry. In addition, these studies have major data limitations because they have had little or no access to actual CWB sales prices and contract terms.

- The specific objectives of this study are:

1) To provide an overview of the world barley trade for both malting and feed barley (Section II);
2) To review previous studies examining the role of the CWB in the domestic and international barley market (Section III);
3) To develop a theoretical framework to examine the role of the CWB in domestic and international feed-barley, barley-malt, and malting-barley markets, and the potential for the CWB and other market participants to exercise market power (Section IV);
4) To test whether the CWB exhibits market power in the international feed-barley market when utilizing actual CWB contract data for the 1995/96 to 2003/04 crop years (Section V);
5) To estimate the returns from a single-desk-seller marketing system using an economic model that uses actual CWB sales transaction data (Section V);
6) To review and evaluate the additional marketing costs found in previous studies that have been attributed to the CWB (Section VI);
7) Discuss price variability in the Canadian and U.S. barley markets;
8) To discuss barley marketing in a highly volatile market setting; and
9) To provide a summary and conclusion of the analysis (Section VIII).

- World barley production has dropped sharply since the 1980s. The largest decrease has been in the production of feed barley. Historically, the

largest barley producer has been the European Union. The major barley exporters are the European Union, Australia, the Ukraine, and Canada. Trade in malting barley has accounted for roughly 30% of world barley trade. Since 1994/95, world malting-barley trade has increased by roughly 45%. The major malting-barley exporters are the European Union, Australia, and Canada but the European Union, Russia, and the Ukraine dominate the feed-barley export market. The European Union is by far the largest barley-malt exporter, followed by Canada, which exports primarily malt and malting barley. The largest importers of malting-barley from Canada are China and the United States. Most feed-barley produced in Canada is used as feed domestically and is not marketed through the CWB. World barley markets are influenced highly by political interventions and by agricultural policy.

- Earlier work pointed out that the CWB has been able to price discriminate among markets (Schmitz et al. 1997). The average difference between CWB contract prices for Japan and the United States over the 1980/81 through 1994/95 period was significant and averaged $25.29/mt. The difference between CWB contract prices for the U.S. and ROW markets was also significant, with an average price difference of $4.46/mt. The difference between CWB contract prices to Japan and the ROW markets was significant and averaged $20.73/mt.

- In this study, data were used from every CWB sale of feed barley, 6-row malting barley, and 2-row malting barley for the 1995/96 to 2003/04 crop years. The data were compiled from CWB contract records. All prices were brought to a common basis point of either FOB Vancouver or St. Lawrence. The sales data were aggregated into the following nine market segments: 1) Japan's feed-barley market; 2) U.S. feed-barley market; 3) all other feed-barley markets; 4) Canada's domestic 6-row malting-barley market; 5) U.S. 6-row malting-barley market; 6) offshore 6-row malting-barley markets; 7) Canada's domestic 2-row malting-barley market; 8) U.S. 2-row malting-barley market; and 9) offshore 2-row malting-barley markets. In the analysis, the CWB allocates the total quantity of barley it receives from producers in a given crop year across the above 9 markets in such a way as to maximize total sales revenue. In order to measure the impact that multiple sellers of Canada's feed barley and malting barley would have had on returns and trade flows, a comparison was made between the actual market structure (i.e., prices and quantities) observed under the CWB and the prices and quantities that would have existed if there had been multiple sellers of Canada's feed barley and malting barley.

  The key difference between the CWB system and a multiple-seller system is the ability to price discriminate. In the absence of constraints on the quantity of feed barley, 6-row malting barley, and 2-row malting barley available for sale

by Canada's producers, the law of one price must hold for all international and domestic barley sales in a multiple-seller environment. In the model used, multiple sellers were assumed to be fully competitive, and this competition resulted in one market price for feed barley and one market price for malting barley at any point in time, which is a characteristic of all competitive markets.

- The impact on prices and revenue of replacing the CWB with multiple sellers of feed barley, 6-row malting barley, and 2-row malting barley for each year from 1995/96 through 2003/04 are as follows:

1) The annual average price increase earned by the CWB for 6-row malting barley relative to what a multiple-seller marketing structure would have had from 1995/96 to 2003/04 was $35.25/mt. This number was computed as the simple average of the difference in the weighted-average price of 6-row malting barley under the CWB versus what the equilibrium price of 6-row malting barley would have generated under the multiple-seller model. For example, the 2000/01 price difference was $43.19/mt, which is equal to the difference between the weighted-average price of 6-row malting barley under the CWB and the weighted-average price of 6-row malting barley under a multiple seller scenario. Relative to multiple sellers, the CWB is estimated to have captured higher prices on sales of 6-row malting barley in all years except 1995/96.

2) The calculated annual average price difference between what the CWB received and what a multiple-seller structure would have received on sales of 2-row malting barley for the 1995/96 to 2003/04 crop years is $40.29/mt. Relative to multiple sellers, the CWB is estimated to have captured higher prices in 2-row malting-barley markets in every year considered here. Under the CWB, the lowest price premium for 2-row malting barley was $19.64/mt in 2003/04 and the highest price premium was $61.82 in 2002/03.

3) The impact on producer revenue from replacing the CWB with multiple sellers of Canada's barley is large. For example, the introduction of multiple sellers of Canada's feed barley and malting barley in 2000/01 would have caused Canada's barley producers to lose $128 million in total revenue. Over the 1995/96 through 2003/04 period, the introduction of multiple sellers would have resulted in an annual average loss of $59 million in revenue accruing to Canada's barley producers. Multiple sellers of Canada's barley would have caused losses in revenue to Canada's barley producers in every year considered here.

- Results were derived using different values for the price elasticity of demand for Canada's feed barley in the rest of the world (ROW) and the price elasticity of domestic demand for Canada's feed barley. Under these alternative assumptions over the 1995/96 to 2003/04 crop years, the introduction of a multiple-seller marketing system would have

resulted in an annual average loss of between $36 million and $58 million in revenue accruing to Canada's barley producers. Also, results were obtained in which the malting barley selection rate under a multiple-seller marketing system was constrained. Under restricted malting barley selection rates over the 1995/96 to 2003/04 crop years, the introduction of a multiple-seller marketing system would have resulted in an annual average loss of between $17 million and $28 million in revenue accruing to Canada's barley producers.

- The impact of replacing the CWB with multiple sellers of Canada's barley was estimated by Schmitz et al. (1997) for the 1985/86 to 1994/95 crop years. On average, the revenue accruing to producers of Canada's barley would have been reduced by $72 million per year under multiple sellers of Canada's barley. This number is higher than the $58 million per year estimated for the 1995/96 to 2003/04 crop years in this study. There are at least three major reasons for the differences between the two studies. First, Canada was a significant net importer of feed grains (barley and corn combined) in several years over the 1995/96 to 2003/04 crop years (especially 2001/02 and 2002/03) whereas Canada was not a net importer of feed grains over the 1985/86 to 1994/95 period. Second, there are several years over the 1995/96 through 2003/04 period in which the ROW feed-barley-export market was not the lowest priced market; this was not the case for the 1985/86 through 1994/95 period. This could have implications for the results due to the fact that the price elasticity of demand for Canada's feed-barley exports to the ROW is set at a relatively high level (i.e., –20.0 associated with the base results). Third, the CWB's ability to attain price premiums increased in the presence of the Export Enhancement Program (EEP), which was terminated in the late 1990s.

- Some authors argue that the single-desk-seller marketing system has larger system costs than does a multiple-seller marketing system. While most of the costs identified are present in Canada's system, they are not unique to CWB grain marketing. Most, if not all, of the costs that earlier studies identified would have been incurred in the absence of the CWB as a single-desk-seller marketing system and likely in the same order of magnitude. The CWB currently uses an annual pooled return to distribute sales revenue to producers. This mechanism does not provide a signal to producers that fully responds on a timely basis to changing market conditions within a given crop year. If export market prices change substantially during a crop year, the prevailing pooled return will not reflect this change on a timely basis. This creates some economic losses because the export value of feed barley at a given point in time is not fully reflected by the CWB pool return outlook (PRO) and by the cash off-Board market price in the domestic feed-barley market in Western Canada. A situation in which export feed-barley prices rise during the crop year and the PRO does not increase as rapidly, more barley is used as feed in Western

Canada than would result under a multiple seller marketing system without price pooling. This creates an economic loss. A loss also results when export barley prices fall during a crop year and the PRO does not fall as rapidly. In this situation, the PRO and Canada's domestic feed-barley prices are above the prevailing world price. As a result, less feed barley is fed domestically and feed-barley exports to the world market are larger than would otherwise occur. Recent changes instigated by the CWB as price signals to farmers, such as cash off-Board market pricing and two shorter pooling periods, are expected to reduce the issue of incomplete arbitrage.

- To analyze barley price variability, an earlier study compared Lethbridge AB off-Board feed-barley prices to U.S. feed-barley-prices at Great Falls MT and Devil's Lake ND as well as to other U.S. points. The average annual standard deviation in the Lethbridge AB cash off-Board market price for the 1988/89 to 1995/96 crop years was $7.88/mt. The average September cash off-Board market price in Lethbridge AB was on average $7.88/mt above or below the average price for the crop year. This compares to $7.88/mt and $7.23/mt measured at Great Falls MT and Devil's Lake ND, respectively. However, from 1999 to 2003 feed-grain price variability was slightly higher for Lethbridge AB than it was for Great Falls MT. However, barley prices were consistently higher in Lethbridge AB than in Great Falls MT.

- The single-desk-seller marketing system of barley creates more sales revenue for Western Canada's farmers than would be the case under a multiple-seller marketing system due to the ability of the CWB to exercise market power. The magnitude of the additional revenue created varies by year depending upon factors that include the occurrence and degree of export subsidization in feed-barley and malting-barley markets. The benefits of the CWB single-desk-seller marketing system are largest for malting barley.

- Feed-barley prices from 1999 to 2003 are consistently higher for Lethbridge, AB than for Great Falls MT by an average of roughly $20/mt. Second, during the drought period of 2002, there was significant variability in barley prices, but this was clearly reflected in the CWB malting-barley-price forecasts. Imports of malting barley that year were due largely to shortages in malting barley in Canada. Because of the 2002 drought, Canada also imported large quantities of corn from the United States to make up for the shortage of feed barley. As a result, it is difficult to argue that barley markets are not arbitraged.

- There have been many studies conducted on the CWB in the marketing of barley that support the notion that the CWB can price discriminate in international markets and, hence, can earn price premiums above what a multiple seller of Canada's barley would earn. Results consistent with those presented in this report were used in at least two

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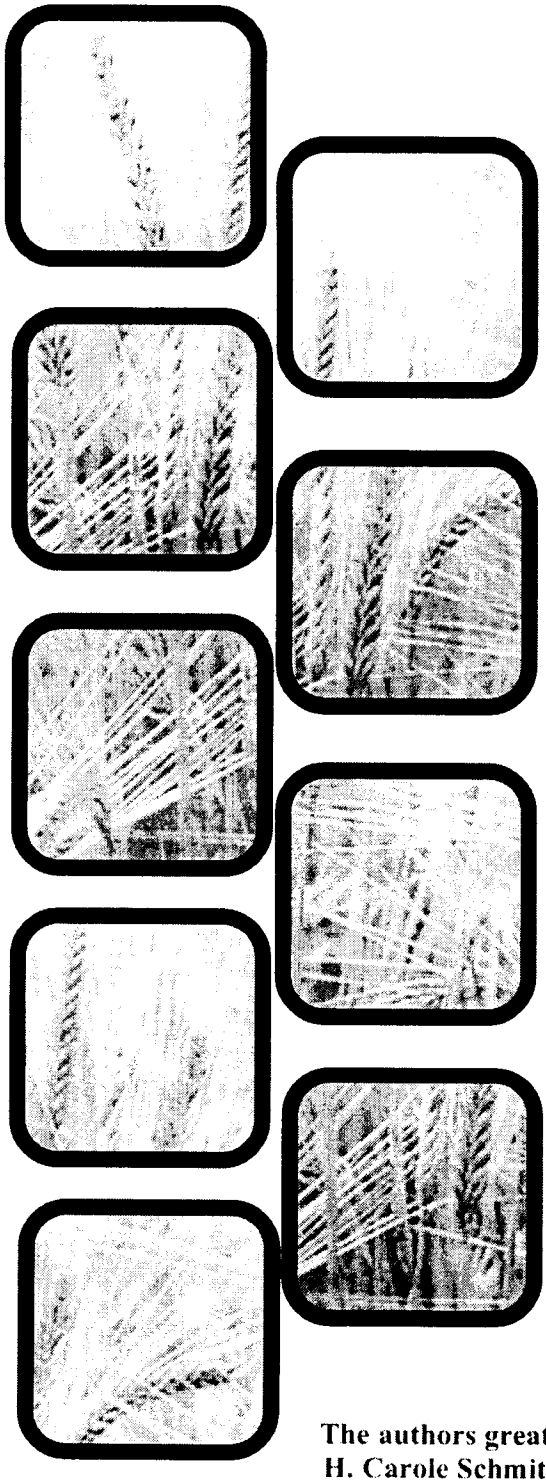
- When analyzing the international barley market we emphasize that it is ever changing especially the feed-barley markets where Canada's exports have decreased along with CWB sales of domestic feed barley within Canada. In addition, over the last several years, barley producers in Canada have not been subsidized through the CWB as there has been no deficit in the barley pool and government credit guarantees on sales have been negligible. Also, at least since 2000, Canada's feed-barley prices have been consistently higher than those in the United States.



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I. INTRODUCTION

Since the 1940s, a discussion has been ongoing about the most appropriate barley-marketing system for Western Canada to utilize. At the centre of this debate is the operation of the Canadian Wheat Board (CWB), which is the single-desk seller of Western Canada's feed-barley and malting-barley exports. The CWB is also the sole seller of Western Canada's barley for domestic human consumption. It operates alongside a cash off-Board market price system for selling Canada's feed barley, which has been increasing in size and importance for domestic-barley producers and domestic-barley users. The majority of Canada's feed barley is used domestically and is not marketed through the CWB.

The Barley Debate

Some key questions in this barley-marketing-system debate are:

1) Does the CWB deliver higher returns to Western Canada's feed-barley and malting-barley producers than would multiple sellers?
2) What are the inherent problems of arbitrage between the annual pooled return (APR) barley price provided by the CWB and that price provided by the cash off-Board market price?
3) What is the price-discovery mechanism for feed barley in Western Canada, given the existence of the Winnipeg Commodity Exchange?
4) Are there additional marketing costs brought about by the feed-barley and malting-barley producers because of the existence of the CWB in Canada?

The barley-marketing-system debate focuses on a range of operational alternatives that include:

a) A continental barley market (CBM) in which there would be a multiple-seller marketing system for the selling of feed barley and malting barley in both the United States and Canada such that the CWB single-desk-seller marketing system would remain in Canada for all other markets;
b) A dual-market system for the selling of feed barley and malting barley in which a multiple-seller system would exist for the selling of Canada's barley in all markets;
c) A hybrid system in which a cash off-Board market-price system would exist for feed-barley sales to all markets, but the CWB would remain as the single-desk-seller marketing system in Canada's malting-barley market; and
d) Alternative operational approaches, like cash trading by the CWB to help alleviate problems of arbitrage between the cash off-Board market prices and the CWB/APR prices.

Several economic studies have addressed Canada's barley-marketing system. The Carter (1993) study is the result of a federal government round-table discussion in 1992/93. Another is the study by Schmitz, Gray, Schmitz, and Storey (1997). Unlike the Schmitz et al. economic study (1997), the Carter study (1993) is highly critical of the CWB as a marketer of Canada's barley.

Since the 1990s, more studies have surfaced concerning the efficiency of the CWB system for marketing Canada's barley. One is a study by Sparks Companies, Inc. (2003) that is highly critical of the CWB.

The analysis of the appropriate marketing system that Western Canada's barley producers should utilize has been complicated by international and domestic factors including: 1) the presence of U.S. farm policy; 2) the European Union's (EU) producer and export-subsidy programs; and (3) the predominance of state-trading agencies such as the CWB, the Australian Barley Board, the U.S. Department of Agriculture's Commodity Credit Corporation (USDA/CCC), and the EU Cereal Management Committee's involvement in the world barley market.

Study Objectives

In light of the debate outlined above, additional information is needed to resolve many of the outstanding issues surrounding the marketing of Canada's barley. Using formalized and integrated economic analysis, the overall objective of this study is to evaluate the economic performance of the CWB with respect to the marketing of feed barley and malting barley both domestically and internationally. We also address the shortcomings of previous studies. The specific objectives of this study include:

1) A review of the world feed-barley and malting-barley production along with Canada's barley production and domestic marketing;
2) An overview of the world barley trade with respect to both malting barley and feed barley;
3) A discussion of agricultural policies, including an assessment of U.S. farm policy on U.S. barley production;
4) A review of previous studies that examine the role of the CWB in both the Canadian and international barley markets;
5) The development of a theoretical framework to examine the role the CWB plays in both the domestic and international feed-barley, barley-malt, and malting-barley markets;
6) A discussion of the potential for the CWB to exercise market power;
7) The estimation of the returns to pool (RTP) from a single-desk-seller marketing system utilizing an economic model that contains actual CWB sales-transaction data;
8) A review and an evaluation of the additional marketing costs attributed to the CWB by previous studies;
9) An evaluation price variability in Canadian and U.S. barley markets; and
10) A summary and conclusion of the analyses.

II. THE WORLD AND CANADA'S BARLEY MARKETS

World barley production has dropped sharply since the 1980s. The largest decrease has been in the production of feed barley. Historically, the largest barley producer has been the European Union. The major barley exporters are the European Union, Australia, the Ukraine, and Canada. Trade in malting barley has accounted for roughly 30% of world barley trade. Since 1994/95, world malting-barley trade has increased by roughly 45%. The major malting-barley exporters are the European Union, Australia, and Canada but the European

Union, Russia, and the Ukraine dominate the feed-barley export market. The European Union is by far the largest barley-malt exporter, followed by Canada, which exports primarily malt and malting barley. The largest importers of malting barley from Canada are China and the United States. Most feed-barley produced in Canada is fed domestically and is not marketed through the CWB. World barley markets are influenced highly by political interventions and by agricultural policy. These include the Common Agricultural Policy (CAP) of the European Union and the U.S. Farm Security and Rural Investment Act of 2002 (FSRIA).

Market Overview

World and Canada's Barley Production

World barley production averaged 145.1 million metric tons (mmt) from 1993 through 2002 (Table 2.1). Over this time period, barley production in the European Union averaged 48.7 mmt; the Former Soviet Union (FSU) averaged 17.9 mmt; Canada averaged 12.4 mmt, the Ukraine averaged 9.1 mmt, and the United States averaged 7.2 mmt

World barley production dropped sharply since the 1980s and averaged 169.4 mmt from 1985/86 to 1994/95 (Schmitz et al. 1997), which is in contrast to 145.1 mmt for the ten-year period from 1993 through 2002. Between 1990 and 1999, world barley production dropped 28% from 178.5 mmt to a low of 127.9 mmt. From 1999 to 2002, production stabilized with production in 2002 at 132.6 mmt (Sparks Companies, Inc. 2003: Table A1.1). This dramatic drop in production was due mainly to the FSU-15 countries that cut back production from 53.3 mmt in 1990 to 22.4 mmt in 1999—a drop of 58%. This shift was a direct result of the economic meltdown of the FSU in the early 1990s, which led to a reduced consumer demand for meats that translated into smaller herds and lower feed-grain needs.

The majority of barley produced in Canada is in the western region. Barley production peaked at 14.6 mmt in 1996 but reached a low of 6.4 mmt in 2002 because of extreme drought conditions (Table 2.2). Except for the drought years of 2001 and 2002, total production remained relatively stable at approximately 12 mmt per year.

Table 2.1: Major Barley-Producing Countries, Selected Years, 1994 to 2002

Year	European Union[1]	Russian Federation	Canada	Ukraine	United States	Turkey
			Thousand mt			
1994	43,687	27,000	11,692	14,508	8,162	6,500
1996	51,716	15,900	15,562	5,725	8,544	7,200
1998	51,907	9,800	12,709	5,870	7,667	7,500
2000	51,565	14,100	13,229	6,872	6,939	7,400
2002	48,023	18,700	7,489	10,350	4,933	7,400
10-Year Average	**48,728**	**17,910**	**12,426**	**9,053**	**7,210**	**7,100**

Year	Australia	China (PRC)	Poland	Kazakhstan	Others	Total
			Thousand mt			
1994	2,913	4,411	2,686	5,497	33,680	**160,736**
1996	6,696	4,000	3,437	2,700	32,140	**153,620**
1998	5,987	2,656	3,612	1,100	27,022	**135,830**
2000	6,743	2,646	2,783	1,675	19,305	**133,257**
2002	3,713	2,470	3,369	2,200	24,144	**132,791**
10-Year Average	**5,877**	**3,446**	**3,306**	**2,962**	**27,068**	**145,085**

[1]EU-15.

Sources: CWB (2002/03 Statistical Tables: 34).

Table 2.2: Barley Production in Western Canada, 1994 to 2003

Year	Total	Year	Total
	thousand mt		*thousand mt*
1994	10,768	**1999**	12,234
1995	12,112	**2000**	12,281
1996	14,623	**2001**	9,737
1997	12,471	**2002**	6,397
1998	11,706	**2003**	11,396
10-Year Average			**11,373**

Source: CWB (2002/03 Statistical Tables: 5).

World Barley Consumption

Like barley production, barley consumption has also dropped dramatically since 1990/91. Barley consumption fell by roughly 40 mmt, almost all of which has been accounted for by the economic collapse within the FSU countries in the early 1990s (Sparks Companies, Inc. 2003).

Barley is used primarily as animal feed and for the production of malt. Barley-malt consumption is much less than is the consumption of barley for feed. Annual global consumption of barley for malt is in the neighbourhood of 19 mmt, of which roughly 18 mmt is used for the production of beer. Annual global feed-barley consumption is in the neighbourhood of 117 mmt.

Until recently, the United States was the most important beer-producing country in the world. In 2002, however, China became the world's largest beer

producer for the first time manufacturing 235.8 million hectolitres (hl) (16.4% of global production), just ahead of the U.S. production of 234 million hl, (Sparks Companies, Inc. 2003). Germany is the third largest beer producer followed by Brazil.

Of the major beer-producing regions, Germany has the largest per-capita beer consumption. Germany has experienced a decrease in beer consumption since 1995. North America's beer consumption has been unchanged. On the other hand, China's beer consumption has been increasing. Even so, per-capita consumption is small compared to Germany (17.7 liters per capita in China as compared to 131.3 liters per capita in Germany (Watts 2002: 21).

World Barley Trade

Total Barley

Based on a 7-year average from the 1997/98 to 2003/04 crop years, the major exporters of barley, in order of importance, are the European Union (5.58 mmt), Australia (3.76 mmt), the Ukraine (1.67 mmt), Russia (1.48 mmt), and Canada (1.46 mmt) (Figure 2.1). Russia and the Ukraine are considered major emerging exporters. The dominance of the European Union in the world barley trade is in part influenced by price supports and by restitution payments that are received by EU barley producers under CAP.

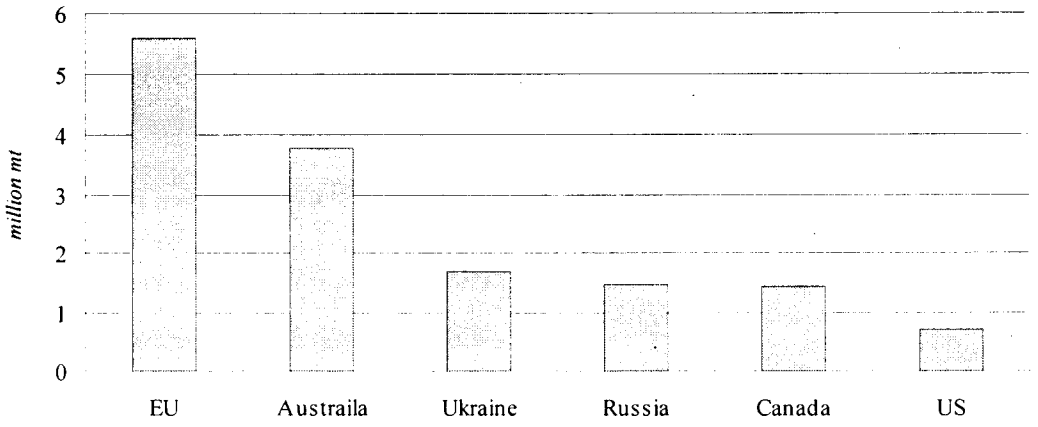

Figure 2.1: Major Feed-Barley and Malting-Barley Exporters, 1997/98 to 2003/04
Source: Grain: World Markets and Trade (1997/98 to 2003/04).

Export market shares for major barley exporters are given in Table 2.3. Over the 1994/95 to 2002/03 crop years, the average EU market share was 35%, which is followed by Australia at 20% and Canada at 13%. Market shares changed significantly from year to year. For example, Canada's market share for 1994/95 was 20%, but this fell to 10% in 2002/03.

Russia and the Ukraine are recent barley exporters. At one time, the FSU was a large barley importer. There was a dramatic increase in the barley export market share for the Ukraine and Russia between 1998/99 and 2002/03. The European Union, Australia, and the Ukraine account for about 77% of the total global barley trade, which excludes intra-trade by the European Union. The top five exporters—the European Union, Australia, the Ukraine, Canada, and Russia—make up about 92% of global barley exports (Sparks Companies, Inc.: 15).

Total annual world-barley trade makes up roughly 9% to 12% of total annual barley consumption. Trade in malting barley accounts for roughly 30% of the total barley trade. The European Union, Russia, and the Ukraine dominate the feed-barley market. All three of these exporters have a geographic advantage over Canada and Australia with respect to the sizeable feed-barley markets in the Middle East (particularly Saudi Arabia) and in North Africa. Australia's key markets are China for malting barley and Japan and Saudi Arabia for feed barley.

Table 2.3: Exports of Barley[1] by Principal Exporters, Selected Years, 1994/95 to 2002/03 (October-September)[1]; Distribution by Quantity and Percentage of Total World Trade

Crop Year	Australia	Canada[2]	European Union[3]	United States	Others	Total
			thousand mt			
1994/95	1,356	3,009	5,061	1,356	4,516	**15,298**
Percent of World Trade	8.9	19.7	33.1	8.9	29.5	100.0
1996/97	3,967	3,439	6,183	1,215	3,117	**17,921**
Percent of World Trade	22.1	19.2	34.5	6.8	17.4	100.0
1998/99	4,241	1,100	8,945	551	3,000	**17,837**
Percent of World Trade	23.8	6.2	50.1	3.1	16.8	100.0
2000/01	3,922	1,941	6,159	1,068	3,818	**16,908**
Percent of World Trade	23.2	11.5	36.4	6.3	22.6	100.0
2002/03	2,200	313	6,100	551	7,499	**16,663**
Percent of World Trade	13.2	9.9	36.6	3.3	45.0	100.0
9-Year World Barley Trade Average	**3,315**	**2,092**	**5,824**	**998**	**4,331**	**16,559**
Percent of Total World Barley Trade	**20.0**	**12.6**	**35.2**	**6.0**	**26.2**	**100.0**

[1]Excludes malt.
[2]Canada: August-July.
[3]EU-15 excludes EU intra-trade.
Because of rounding, percentages may not add up to 100.
Source: CWB (2002/03 Statistical Tables: 35).

Importers

In the late 1990s, the top five barley importers accounted for roughly 60% of the global barley trade. The major single-country importers, in order of importance, were Saudi Arabia, China, Japan, Morocco, the United States, and Iran. For the 1991/92 to 2000/01 crop years, average imports of barley by Saudi Arabia alone were 4.85 mmt, which is roughly one-quarter of the world barley import total of 16.6 mmt. The largest barley-importing region was the Middle East, followed by Asia and North Africa. For the 1991/92 to 2000/01 crop years average world imports totalled 16.6 mmt, which is far less than the 1991/92 to 1993/94 average of 18.3 mmt (CWB 2002/03). Part of this decline was due to the large decrease in the imports of barley by the FSU, when in 1991/92 imports totalled 3.5 mmt but declined to 480,000 mt in 2000/01.

Feed Barley

Feed barley makes up about 75% of the world barley trade, which is down from about 85% in the 1980s. Although the European Union and Australia have dominated the export side of the feed-barley trade, the Ukraine, Russia, and Eastern Europe have all become "emerging" exporters of feed barley. In crop year 2001/02, for example, these countries accounted for 6.2 mmt (47%) of the global feed-barley trade.

The feed-barley-import market is dominated by the Middle East and North Africa. Saudi Arabia is the largest feed-barley importer in the world. Over the 2001/02 and 2002/03 crop years, average imports totalled 4.5 mmt (Watts 2002: 8). As a region, North Africa is the second largest feed-barley importer. Average imports for the same period totalled 1.95 mmt (Watts 2002:8). Japan is the second largest single-country importer of feed barley, importing about 1.5 mmt annually (Watts 2002: 8). Combined, the remaining importers account for about 1.5 mmt to 2.0 mmt of feed-barley-import market annually (Watts 2002: 8).

Malting Barley

Global malting-barley trade increased 44% from 3.2 mmt in 1994/95 to 4.6 mmt in 2001/02 (Watts 2002: 22). China and the United States accounted for about 60% of all malting-barley imports during that time. In 2001/02, China alone imported 2.3 mmt of malting barley, which accounted for roughly 50% of world malting-barley imports. The United States imported 0.525 mmt (11%). Other major importers of malting barley include Eastern Europe (0.2 mmt), Columbia (0.2 mmt), Brazil (0.175 mmt), Russia (0.125 mmt), and Mexico (0.075 mmt).

China is a major malting-barley importer, however the volume of barley imported by China fluctuates greatly from year to year. China imports malting barley through its China National Cereals, Oils, and Foodstuffs Import and Export Corporation (COFCO), which is China's state-trading enterprise (STE). China also imports barley through a multitude of private importers/buyers. For various reasons, China's buyers are often considered to be among those that are the most competitive. China is considered by some exporters of malting barley to be a low-price market. In

addition, China does not rely exclusively on malting barley for the production of beer, instead they import good quality cheap EU feed barley graded as "Fair Average Quality" that they use as malt.

Australia is a very aggressive barley exporter that sells 90% of its barley production into the Chinese barley market. In addition, Australia has a freight advantage over Canada and the United States when it sells barley to China.

Barley-Malt-Production Capacity and Exports

The most important barley-malt-producing countries of the world are those that have local access to ample supplies of high-quality malting barley. Malt is produced only in about one-third of all countries that brew beer. Approximately 66% of global barley-malt production is concentrated in roughly 10 countries. Europe (6.1 mmt) has the largest commercial capacity for producing barley malt, followed by the United States (3.1 mmt), and Canada (0.96 mmt) (Table 2.4).

Of the large multinational corporations (MTNs), the largest in the international barley-malt industry is Cargill, Inc., which has a malting capacity of 1.4 mmt (Table 2.4). Groupe Soufflet is second with 1.3 mmt of production capacity and ConAgra is third at 1.25 mmt of production capacity.

The European Union is by far the largest barley-malt exporter (Figure 2.2). Average EU exports for 1998/99 to 2002/03 were 3 mmt, which included roughly 1 mmt of the intra-EU malt-barley-export trade. Canada is next with exports of 625,000 mt followed closely by Australia with exports of 575,000 mt. These top three malt-barley exporters are responsible for roughly 86% of the global malt-barley trade.

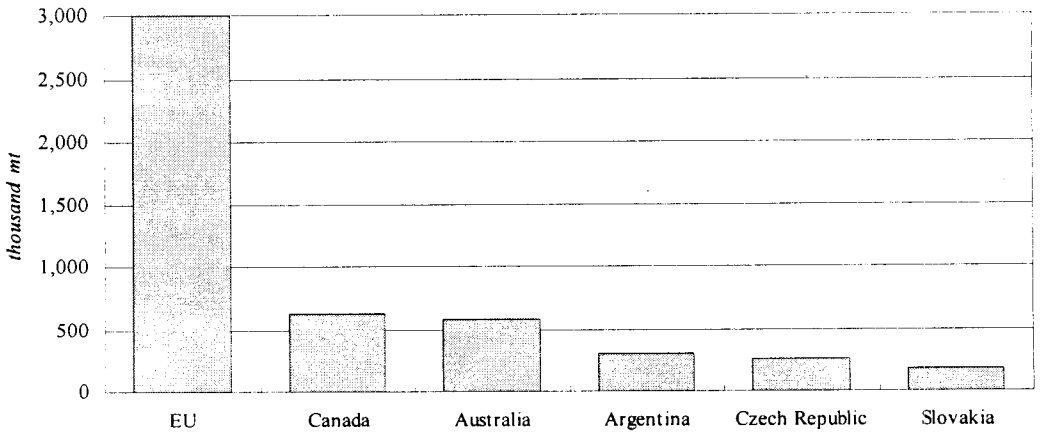

Figure 2.2: Major Malt Exporters: 5-Year Averages, 1998/99 to 2002/03
Source: Sparks Companies, Inc (2003:17).

Table 2.4: Production Capacity for Commercial Malting Companies, 2003

Company	United States	Canada	Asia	Oceania	Europe	South America	E. Europe & Russia	Total
	thousand mt							
Cargill	592	245	65		425	90		1,417
Groupe Soufflet					686		637	1,323
ConAgra / Tiger Oats	300	470		221	261			1,252
Groupe Malteurop			56		963	23	100	1,142
Lesaffre / ADM	772	95		96	105			1,068
Greencore Group					605			605
Anheuser Busch	603							603
Rahr Malting	385	140						525
Weissheimer Malt					395		125	520
Boortmalt			40		348		50	438
AusMalt				412				412
Guangdong Enterprises			400					400
Schill / Global Malt					330			330
Viking Malt Companies					328			328
COFCO - Dalian			300					300
Coors Brewing Company	251							251
Durst Malt					236			236
IREKS Worldwide					221			221
JP Simpson					220			220
Muntons					191			191
Crisp Malting Group					186			186
Franco Suisse					160			160
Bavaria Maltings					120			120
Grupo Modelo SA	107							107
Raisio Group					105			105
Rhein - Main - Malt					101			101
Agromalte						90		90
C Thywissen					90			90
Malteria Do Vale						70		70
Briess Malting Company	54							54
Total	**3,064**	**950**	**861**	**729**	**6,076**	**273**	**912**	**12,865**

Source: Sparks Companies, Inc. (2003: 18).

Although there are approximately 30 countries worldwide that are involved in exporting malt, 75% of world trade is accounted for by just 7 countries. Of these, the EU is by far the most significant. France is the largest exporter within the EU. Some of the success France claims can be attributed to the fact that it supplies the EU both two-row malting barley and the lower quality 6-row malting barley—the latter is preferred particularly to developing countries that have limited hard currency to finance their imports. Of the 4.8 mmt of barley malt that was traded globally in 2001/02, the European Union was responsible for exporting about 2.87 mmt to 135 countries. This barley-malt export amount, however, included intra-EU trade totalling 1.15 mmt (Sparks Companies, Inc.: 18).

Canada's Trade in Barley

Canada exports barley malt, malting barley, and feed barley, of which feed-barley exports are the least important.

Barley-Malt Exports

Canada is the largest exporter of barley malt outside the European Union (Table 2.5). It has about a 10% to 12% export market share. Canada's barley-malt export markets are highly concentrated. From 1997/98 to 2002/03, five countries accounted for roughly 90% of all barley-malt exports from Canada (Table 2.5). Japan is Canada's largest barley-malt customer. For the years 1997/98 to 2002/03 Japan accounted for, on average, about 40% of all Canada's barley-malt exports. Canada's second-largest barley-malt-export market is the United States. It imported on average 19.8% of Canada's total barley-malt exports over the same time period (in 2002/03, however, Canada's barley-malt exports to the United States reached 34%). Brazil is the third largest destination for Canada's barley-malt exports. Generally, South America is a key barley-malt-importing region, despite the fact that South American countries such as Brazil, Peru, Chile, Colombia and Argentina produce barley malt locally However, due largely to the drought in Western Canada, Brazil imported no barley malt from Canada in 2002/03.

Malting-Barley Exports

Canada maintains an excellent reputation for the sale of malting barley. Between 1994/95 and 2002/03, Canada's malting-barley exports averaged 1.08 mmt (Table 2.6). The largest importers of Canada's malting barley are the United States and China. Since 1994/95 these two countries have accounted for more than 90% of Canada's malting-barley exports.

For the 2002/03 crop year, Canada's malting-barley exports fell sharply, totalling only 303,000 mt. This was due to the extreme drought and wet harvest weather in Western Canada that reduced significantly the region's total barley yield and quality.

Canada's share of world malting-barley exports is given in Table 2.7 along with export shares for Australia and the European Union. Canada's share reached a high of 41.8% in 1997/98. Since then, Canada's market share has been stable at roughly 26.5%.

Table 2.5: Canada's Malt Exports by Major Destinations, 1997/98 to 2002/03.

Destination	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03
	metric tons					
Japan	196,652	175,598	182,002	226,809	227,282	168,062
United States	32,215	42,978	114,416	106,331	128,345	158,953
Mexico	21,913	21,449	41,094	34,210	36,658	72,841
Dominican Republic	402	1,154	273	279	1,050	18,003
Korea, South	29,169	17,112	5,241	22,728	19,047	15,256
South Africa	15,032	33,579	34,266	22,583	46,182	15,140
Chile	500	250	9,991	10,591	4,606	5,001
Guatemala	3,000	8,451	8,839	6,000	7,600	4,502
Costa Rica	6,508	10,338	3,288	3,750	3,000	3,018
China	256	620	214	5,259	2,844	1,747
Thailand	-	-	-	-	3,138	1,068
Nicaragua	762	-	-	-	-	1,024
Vietnam	2,081	2,136	-	-	1,523	979
Ecuador	-	2,934	-	-	687	595
Jamaica	-	453	-	-	175	367
Jordan	-	-	-	-	-	300
Russia	-	-	-	691	477	268
Belize	631	-	-	-	-	36
Trinidad & Tobago	-	-	-	0	0	0
Australia	2,289	-	-	-	-	-
Brazil	100,776	105,785	89,497	71,357	16,692	-
Colombia	20,948	5,929	-	3,109	-	-
Congo	-	-	68	-	-	-
El Salvador	5,810	2,474	3,000	2,770	-	-
Haiti	804	375	450	-	-	-
Hong Kong	-	-	589	1,171	-	-
India	-	228	-	-	-	-
Indonesia	-	771	-	-	-	-
Italy	-	-	-	374	-	-
Korea, North	-	-	-	-	572	-
Malaysia	2,393	2,978	1,740	300	-	-
Panama	3,906	-	-	-	-	-
Peru	-	100	-	-	-	-
Philippines	10,281	6,842	2,955	3,528	16	-
Singapore	1,921	1,530	409	2,125	473	-
Slovakia	-	-	-	300	-	-
Taiwan	-	-	-	351	-	-
Togo	-	-	-	-	325	-
United Kingdom	-	-	-	-	6,000	-
Venezuela	30,347	4,000	-	2	-	-
Total Exports	**488,597**	**448,063**	**498,330**	**524,619**	**506,693**	**467,159**

Source: Sparks Companies, Inc. (2003: 19).

Table 2.6: Canada's Malting-Barley Exports by Selected Areas and Countries for Selected Years, 1994/95 to 2002/03

Country	1994/95	1996/97	1998/99	2000/01	2002/03	Average
			thousand mt			
Western Europe:						
Netherlands	6	–	–	–	–	**1**
United Kingdom	–	–	–	9	–	**1**
Total Western Europe	**6**	**–**	**–**	**9**	**T[1]**	**2**
Africa:						
Liberia	–	–	–	4	–	**T[1]**
South Africa	20	–	–	26	61	**18**
Total Africa	**20**	**–**	**–**	**30**	**61**	**18**
Asia:						
China, People's Republic of	384	509	291	472	45	**372**
Japan	59	50	60	21	24	**43**
Total Asia	**478**	**559**	**351**	**493**	**68**	**423**
Oceania:						
Australia	25	–	–	–	–	**4**
Western Hemisphere:						
Argentina	–	37	–	–	–	**4**
Brazil	30	–	–	–	–	**9**
Colombia	88	20	–	T	–	**33**
Ecuador	10	6	–	–	–	**5**
Mexico	–	–	62	34	2	**26**
United States	721	768	555	554	172	**557**
Total Western Hemisphere	**849**	**834**	**617**	**589**	**174**	**636**
Grand Total	**1,388**	**1,393**	**969**	**1,121**	**303**	**1,084**

[1]T - Less than 500 mt.

Source: CWB (2002/03 Statistical Tables: 14).

Table 2.7: Malting-Barley Trade Shares: Canada, Australia, and the European Union, 1995/96 to 2002/03

	Canada	Australia	European Union
		percentage	
1995/96	38.6	48.7	6.8
1996/97	35.2	48.5	10.9
1997/98	41.8	27.9	16.8
1998/99	26.2	40.6	19.6
1999/00	27.4	31.3	34.1
2000/01	27.0	36.6	29.9
2001/02	25.0	39.4	27.1
2002/03	27.7	41.2	21.0

Source: CWB estimates.

Bulk-Barley and Feed-Barley Exports

Bulk-barley exports include both feed barley and malting barley. Of the total bulk barley exported from Canada from 1994/95 to 2002/03, feed-barley exports accounted for less than one-half of Canada's total exports (Table 2.8). Overall, total bulk-barley exports have declined since they peaked in 1996/97.

Of Canada's bulk-barley export total in the latter part of the 1990s, feed-barley exports have also declined. The largest percentage of feed barley in Canada is consumed domestically. Because of drought conditions in 2002, Canada exported almost no feed barley in the 2002/03 crop year.

Barley Supplies and Disposition

The United States and Canada

The United States imports sizeable amounts of barley (Table 2.9). Malting-barley imports peaked in 2001 at 0.56 mmt.

Feed-barley consumption in the United States is far less than that in Canada, but U.S. consumption of malting barley is more than three times the level in Canada (Table 2.10). Feed-barley consumption in Canada peaked at 10.6 mmt in 1997 and the consumption of malting barley peaked at 1.1 mmt in 2000. Feed-barley consumption in the United States peaked at 4.7 mmt in 1996 and the consumption of malting barley reached a high of 3.7 mmt in 1998 (Table 2.10).

Feed barley demand in the U.S. has decreased over the past number of years, because the U.S. feed industry has diversified into corn, sorghum, and other inputs. With the exception of certain localized demand for feed barley, such as in the Pacific North West and in California where barley can still be competitive with corn, current and recent trends indicate that barley acreage in the United States is primarily allocated to malting varieties. The barley-acreage decline is both demand driven and supply driven. Due to incentives in the FSRIA and due to the agronomic advantages of corn production over other feed-grain production, U.S. producers have shifted away from feed-barley production.

Canada's barley supplies and dispositions from 1995/96 to 2002/03 are given in Table 2.11. By far the largest use for Canada's barley is for domestic feed and seed.

Table 2.8: Canada's Bulk Barley Exports by Selected Areas and Countries, Selected Years, 1994/95 to 2002/03

Country	1994/95	1996/97	1998/99	2000/01	2002/03	10-Year Average
			thousand mt			
EU-15:						
Netherlands	6	–	–	–	–	1
United Kingdom	–	–	–	9	–	1
Total EU-15	**6**	–	–	**9**	**T**	**2**
Eastern Europe:						
Latvia	–	–	–	–	–	T
Poland	10	–	–	–	–	1
Total Eastern Europe	**10**	–	–	–	–	**1**
Africa:						
Lybia	–	26	–	–	–	5
South Africa	20	–	–	26	61	18
Total Africa	**20**	**26**	–	**55**	**61**	**32**
Asia:						
China, People's Republic of	384	509	291	552	45	380
Iran	–	158	–	110	–	43
Japan	968	575	183	264	35	412
Korea, South (ROK)	35	51	–	T	T	17
Saudi Arabia	130	1,090	–	293	–	300
United Arab Emirates	–	–	–	15	–	9
Total Asia	**1,535**	**2 432**	**475**	**1 234**	**80**	**1,173**
Oceania:						
Australia	25	–	–	–	–	4
New Zealand	25	–	–	–	–	3
Total Oceania	**50**	–	–	–	–	**7**
Western Hemisphere:						
Brazil	30	–	–	–	–	9
Colombia	88	20	–	11	–	34
Mexico	–	3	62	34	2	34
United States	1,255	913	563	597	170	787
Total Western Hemisphere	**1,388**	**981**	**625**	**643**	**172**	**876**
Total Barley:	**3,009**	**3,439**	**1,100**	**1,941**	**313**	**2,092**
Malt (Barley Equivalent)	**497**	**569**	**598**	**700**	**629**	**586**
Grand Total	**3,506**	**4,008**	**1,698**	**2,641**	**942**	**2,678**

T - Less than 500 mt.

Sources: CWB (2002/03 Statistical Tables: 15).

Table 2.9: U.S. Barley Production, Exports, and Imports, 1999 to 2003

Year	Production	Exports		Imports	
		Total	Malting Barley	Feed Barley	Malting Barley
	thousand mt				
1999	7,700	683	224	77	558
2000	6,140	592	201	31	558
2001	6,900	1,297	265	61	560
2002	5,400	563	165	9	445
2003	4,940	597	211	21	347

Source: Compiled by the CWB (2004).

Table 2.10: Consumption of Feed Barley and Malting Barley: United States and Canada, 1995 to 2003

Year	Feed Barley		Malting Barley	
	United States	Canada	United States	Canada
	thousand mt			
1995	3,987	9,396	3,671	922
1996	4,725	9,566	3,709	938
1997	3,135	10,560	3,706	929
1998	3,484	10,044	3,731	960
1999	2,830	9,891	3,694	1,058
2000	2,656	10,170	3,731	1,059
2001	1,916	8,903	3,689	973
2002	1,415	6,755	3,665	807
2003	1,415	8,583	3,659	948

Source: Compiled by the CWB (2004).

Table 2.11: Canada: Barley Supplies and Disposition, 1995/96 to 2002/03

Year	Production	Imports	Domestic Use		Exports		Ending Stocks
			Feed and Seed	Malting Barley	Barley Malt	Feed Barley	
			Thousand mt				
1995/96	13,033	10	9,848	922	1,426	910	1,740
1996/97	15,562	19	10,000	938	1,392	2,047	2,919
1997/98	13,357	12	10,960	929	1,276	851	2,459
1998/99	12,709	55	10,424	960	969	131	2,737
1999/00	13,196	33	10,338	1,058	1,152	575	2,838
2000/01	13,229	40	10,585	1,059	1,121	820	2,516
2001/02	10,846	112	9,356	973	956	136	2,048
2002/03	7,489	259	7,197	807	303	10	1,475

Source: Compiled by the CWB (2004).

Barley Exports and Credit Sales

The CWB exports barley under credit agreements. In the 1980s, these credit guarantees were sizeable. For example, in the early 1980s, credit guarantees were applied to roughly 2.75 mmt of Canada's feed-barley exports. The guarantees were largely for barley shipments to the FSU. However, beginning in the early 1990s, credit guarantees were given for less than 0.5 mmt of Canada's barley exports. From 1994/95 to 2002/03, however, Canada's total credit guarantees applied to less than 50,000 mt (Table 2.12). Therefore, in our analysis to follow later, we do not have to account for the impact of credit guarantees on the ability of the CWB to earn price premiums in domestic and international barley markets.

Barley Acreage: Canada and the United States

Total Barley Acreage: Canada and the United States

U.S. barley acreage has declined over time (Figure 2.3). On the other hand Canada's barley acreage has remained relatively stable throughout the 1987/88 to 2003/04 period.

Table 2.12: Canada's Wheat Board Exports of Barley Under Credit Agreements, Selected Years, 1994/95 to 2002/03

Country	1994/95	1996/97	1998/99	2000/01	2002/03	10-Year Average
			thousand mt			
People's Republic of China	–	–	59	21	–	37
Iran	–	47	–	–	–	10
Mexico	–	–	–	–	–	2
Total Credit Guarantees:	–	**47**	**59**	**21**	–	**49**

Source: CWB (2002/03 Statistical Tables: 17).

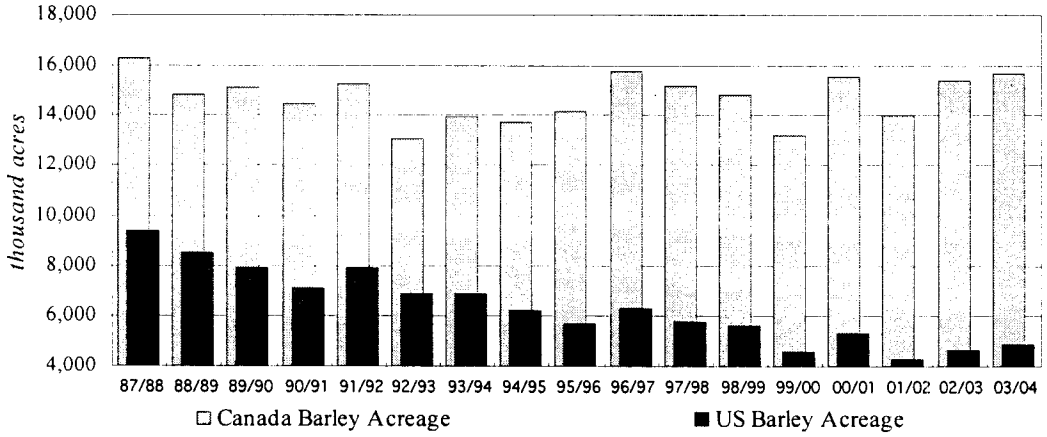

Figure 2.3: Canada and U.S. Barley Acreage, 1987/88 to 2003/04
Source: Sparks Companies, Inc. (2003: 34).

Malting Barley: 2-row and 6-row

The 2-row malting barley and the 6-row malting barley used for the production of malt in North America differ in both their agronomic properties (yield and disease resistance) and in their production areas. Montana and much of Western Canada grow primarily 2-row malting barley; North Dakota, Minnesota, and the Eastern Canadian Prairies grow primarily 6-row malting barley. Two-row malting barley yields more malt per bushel than its 6-row malting-barley counterpart, but is more prone to disease. The trend in malting varieties in both the United States and Canada has been toward increased areas of 2-row malting barley and reduced areas of 6-row malting barley. We reveal the annual acreages in each country for 2-row and 6-row malting barley (Figures 2.4 and 2.5).

For many years the production of 6-row malting barley far exceeded the production of 2-row barley in the United States and Canada, but now there is a more even split between the two malting-barley types. Minnesota and North Dakota are significant 6-row malting-barley producers. However, acreage has decreased because of Fusarium Head Blight, a fungal disease that lowers malting-barley quality. Meanwhile, 2-row malting-barley acreage is increasing because 2-row malting barley is much more resistant to this disease and because 2-row malting barley producers have benefited from increased demand from offshore markets.

The North American malting-barley industry is seriously concerned with Fusarium Head Blight, which produces toxins that render malting barley unsuitable for use as barley malt for brewing. Some new malting-barley varieties have been developed, primarily 2-row malting barley, which have somewhat better resistance to Fusarium Head Blight than do the earlier varieties. Even so, the U.S. malting-barley industry is focusing more on producing malting-barley in areas that are West of North Dakota in an effort to avoid the Fusarium Head Blight problem.

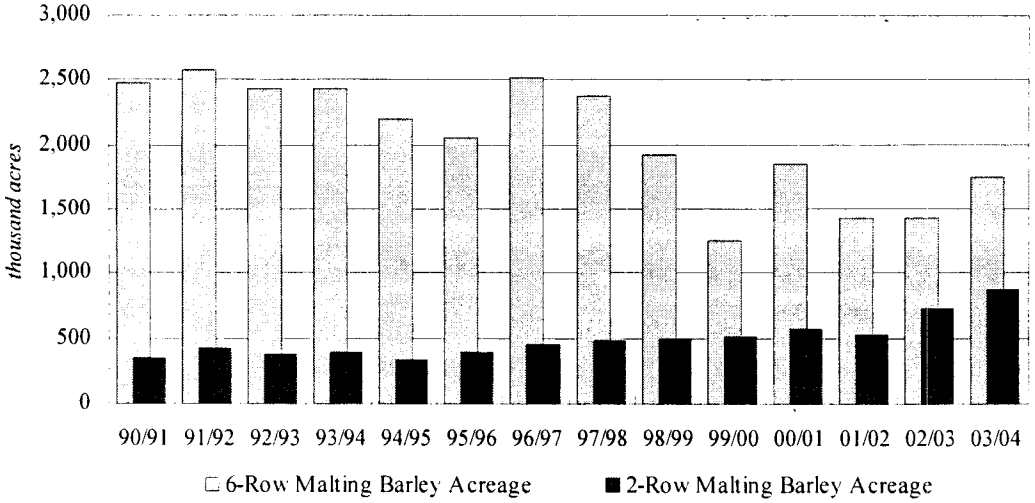

Figure 2.4: U.S. 2-Row and 6-Row Barley Acreage, 1990/91 to 2003/04
Source: Sparks Companies, Inc. (2003: 35).

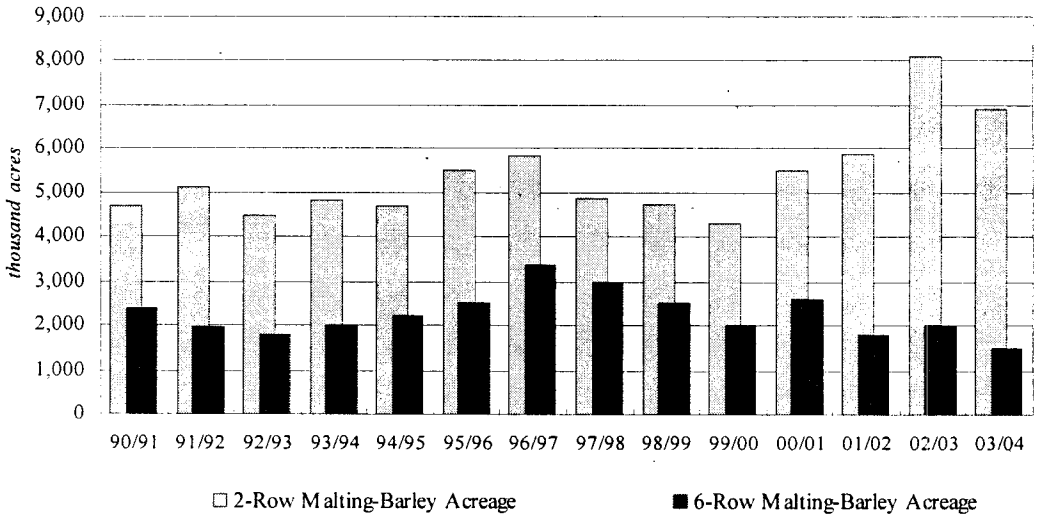

Figure 2.5: Canada's Malting-Barley Acreage: 2-Row and 6-Row, 1990/91 to 2003/04
Source: Sparks Companies, Inc. (2003: 6).

Policies and State-Trading Enterprises (STEs)

The dynamics of the world barley market are influenced heavily by political intervention and agricultural policy in some of the key barley-producing regions of the world, including those regions utilizing the CAP (European Union) and FSRIA (United States). Generally these policies have provided more support for barley production in the European Union and in the United States than has been the case in Canada where farm programs have been far less supportive of feed-grain production (Schmitz and Furtan 2004).

Common Agricultural Policy (CAP) and EU Enlargement

We show the area planted to spring barley in the European Union (Table 2.13). Acreage planted to barley has decreased over time and totalled 10.5 million hectares in 2003.

The CAP of the European Union has been in existence since the 1960s, and has maintained high and stabilized internal prices for unlimited quantities of most commodities produced within the European Union. Thus the European Union has accumulated a large surplus of grain. EU grain exports are competitive through the use of CAP's export-restitution payments. Similarly, EU imports are restricted through a tariff-rate quota (TRQ) that results in a significant difference between the low world grain prices and the high EU intra-trade grain prices.

Table 2.13: Plantings of Spring Barley in the European Union, 1995 to 2003

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003
					thousand hectares				
Austria	120	170	180	170	170	150	130	120	140
Belgium & Lux	10	10	10	10	20	10	10	10	5
Denmark	540	570	560	500	570	600	600	710	580
Finland	520	540	580	550	580	560	550	520	530
France	430	450	510	460	480	480	620	470	700
Germany	670	800	850	680	840	630	640	610	750
Greece	–	–	–	–	–	–	–	–	–
Ireland	180	190	190	190	190	180	180	180	190
Italy	–	–	–	–	–	–	–	–	–
Netherlands	30	30	40	40	60	50	60	50	50
Portugal	–	–	–	–	–	–	–	–	–
Spain	2,270	2,360	2,500	2,460	2,230	2,410	2,280	2,350	2,350
Sweden	420	440	460	430	480	400	370	400	350
United Kingdom	500	520	520	480	630	520	780	560	620
Total Spring	**5,690**	**6,080**	**6,400**	**5,980**	**6,250**	**6,000**	**6,220**	**5,980**	**6,270**
Total Winter	**5,370**	**5,340**	**5,500**	**5,380**	**4,690**	**4,760**	**4,510**	**4,530**	**4,250**
Grand Total	**11,060**	**11,420**	**11,900**	**11,360**	**10,940**	**10,760**	**10,730**	**10,510**	**10,520**

Source: CWB (1995 to 2003)

According to Rude and Annand (2002), the CAP is essentially an STE. As such, it should be disciplined under the WTO in a manner similar to the discipline received by the Canadian Wheat Board. But it is not.

Commitments under the Uruguay Round Agreement on Agriculture (URAA) have imposed limits on the ability of the European Union: (1) to support its agricultural sector, (2) to raise barriers to imports; and (2) to subsidize its exports. Agenda 2000 of the URAA, adopted in March 1999 in preparation for EU enlargement,[1] cut price supports for grain producers and beef producers and reduced payments to oilseed producers through 2006, which continued a policy shift away from price supports and toward income supports. The principal Agenda 2000 reforms are: (1) reduced intervention prices: Agenda 2000 required a 15% drop in the cereal-intervention price; (2) modified direct income support: direct payments for cereal producers have been increased by 9 Euros/mt to compensate for 50% of the decline in support due to intervention price cuts; and (3) reduced default land set-aside rates.

The increase of large agricultural entities through EU enlargement causes serious problems for the CAP in its current form and for reforms posed by Agenda 2000 of the URAA. On June 26, 2003, EU farm ministers adopted a fundamental reform of the CAP, and made changes in the way the EU supported its farm sector. Thus beginning in 2004, the new CAP will continue to focus on providing subsidies that are decoupled from the volume of EU production.

WTO limits on coarse-grain-export subsidies are applied to the aggregate rather than to individual coarse grains. Due to the decline of intervention prices and a strong Euro, barley continues to be exported with subsidies. EU reforms are expected to have a greater impact on barley production and trade than they do on other grains. EU farmers are expected to be more willing to remove coarse grains, particularly barley, from production because their yields are lower than those common for wheat.

U.S. Farm Security and Rural Investment Act (FSRIA) 2002

Under the FSRIA, the primary government programs affecting feed-grain markets in the United States are: (1) direct payments; (2) countercyclical payments; and (3) the marketing-assistance-loan program. Feed-grain farmers benefit from subsidized crop insurance, revenue insurance, trade-promotion programs, P.L. 480 food aid, export-credit guarantees, and emergency market-loss-assistance payments. Also, the Conservation Reserve Program, introduced in a previous Farm Bill was extended in the 2002 FSRIA.

(a) Direct Payments

U.S. direct payments under the FSRIA are based on fixed-payment rates on a per-unit basis for the entire life of the 2002 Farm Program. Total payments for all feed grains are fixed and are allocated to farmers based on their historical production. Since direct payments are decoupled from current market prices, they do not affect directly producers' cropping decisions. However, provisions that allow farmers to update periodically their base acres for program purposes may actually influence current

production decisions. If a producer expects to be able to update base acres at some point in the future, producers may have an incentive to continue to produce crops and/or to expand production in order to maximize future program payments. In Table 2.14, we provide the actual U.S. direct payment rates of the FSRIA of 2002 and the production flexibility payment rates of the 1996 U.S. Farm Program.

Table 2.14: Direct Payment Rates under the 2002 Farm Bill and the Production Flexibility Contract Payments under the 1996 Farm Bill

Commodity	PFC Payment Rates	Direct Payment Rates	
	1995/96 to 2001/02 Avg	2002	2002 to 2007
	U.S. $/bushel		
Wheat	0.620	0.460	0.520
Corn	0.320	0.260	0.280
Barley	0.260	0.200	0.240
Oats	0.028	0.022	0.024
Soybeans	n/a	n/a	0.440

Source: Westcott, Young, and Price (2002: 4).

Table 2.15: Target Prices under the 2002 Farm Bill

Commodity	2002/03	2004 to 2007
	U.S $/bushel	
Wheat	3.86	3.92
Corn	2.60	2.63
Grain Sorghum	2.54	2.57
Barley	2.21	2.24
Oats	1.40	1.44
Soybeans	5.80	5.80

Source: Westcott, Young, and Price (2002: 5).

(b) Countercyclical Payments

Countercyclical payments (CCPs) provide benefits to farmers for their production of commodities covered by the U.S. Farm Program whenever the market price for the commodity is less than its target price (Westcott, Young, and Price 2002). Target prices under the 2002 Farm Bill are given in Table 2.15. This program was re-introduced to replace most ad hoc market-loss-assistance payments that were provided by the United States from 1998 to 2001. Payments are based on historical area and historical yield, thus they are not tied to the current production of the commodity.

The 2002 FSRIA U.S. legislation established a target price for each crop covered. When the higher of the loan rate or the seasonal average price plus the direct-payment rate is below a target price that is set by U.S. legislation, a CCP is made at a rate equal to the difference between the two prices.

(i) Conservation Programs

Conservation and environmental programs provide cost-share, rental, and/or other direct payments to producers in return for the producers using specified environmentally beneficial farming practices or for the producers setting aside land for conservation usage. The FSRIA continues and in most cases expands almost every existing agri-environmental program. Under the voluntary Conservation Reserve Program (CRP), farmland owners submit bids to retire environmentally sensitive cropland from production for 10 to 15 years. Farmers receive a cost-share payment to establish a permanent cover crop and they receive annual per-acre rental payments for retiring land and maintaining specified conservation practices. To date there are about 3 million barley acres that have been set aside under this program.

(ii) Marketing Loans

Marketing Loans are nonrecourse loans made available to eligible producers who use their crop as collateral. Producers settle the loan either by forfeiting the collateral to the USDA/CCC at maturity with no penalty or by repaying the loan in full at the USDA/CCC repayment rate (i.e., the loan rate plus interest or the posted-county price, whichever is lower). Marketing-loan provisions take effect when commodity prices fall below the local loan rates. The amount of this difference multiplied by the quantity repaid is called a marketing-loan gain (MLG). Producers may also forgo taking out a loan and instead receive a loan deficiency payment (LDP) equal to the difference between the commodity price and the local loan rate multiplied by the quantity eligible for loan. Table 2.16 compares the U.S. marketing-loan rates for the top 5 major grains under both the 1996 and 2002 Farm Bills.

Table 2.16: Marketing-Assistance-Loan Rates under the 2002 Farm Bill Compared Loan Rates under the 1996 Farm Bill

Commodity	1996 Farm Bill	2002 Farm Bill	
	2001	2002/03	2004 to 2007
	$/bushel		
Wheat	2.58	2.80	2.75
Corn	1.89	1.98	1.95
Barley	1.65	1.88	1.85
Oats	1.21	1.35	1.33
Soybeans	5.26	5.00	5.00

Source: Westcott, Young, and Price (2002: 6).

In the simplest approach to using marketing loans, a producer receives a per-unit revenue equal to the loan rate by taking the marketing-loan benefit and immediately selling the crop, assuming the sales price equals the posted-county price. The marketing-loan benefit augments the market price to provide an effective floor price at the loan rate. In essence, the producer is paid partly from the marketplace and partly from the government.

In practice, farmers use this two-step process for paying off their loans that result in average per-bushel revenue that exceeds the loan rate. In the first step, the farmer decides when to take the marketing-loan benefit (i.e., the LDP or the MLG) if the crop is placed under loan. In the second step, the farmer decides when to sell the crop. Farmers tend to take the marketing-loan benefit when prices are lower; they tend to sell the crop at a later date when the market prices are higher. Because of the seasonality of prices, this two-step marketing procedure often results in marketing loans that provide per-bushel revenues that, on average, exceed the loan rate.

Acreage decisions for individual crops reflect the effects of marketing-loan benefits on absolute and relative net returns among cropping alternatives. In some cases, these cross-commodity effects reduce the acreage of crops that receive relatively low or no marketing-loan benefits.

Net per-acre revenue for malting barley grown in North Dakota is presented as an example. In Figure 2.6, we show the relative net per-acre revenue comparisons for North Dakota using the 2002 U.S. loan rate. Malting-barley revenue is quite low in comparison to most other crops, including major crops such as wheat, corn, and soybeans. However in Figure 2.7, we show the same comparisons for the same crops in North Dakota using the November 2002 cash off-Board market prices in the calculations instead of using the loan rate. Using this basis, malting barley provides the best net per-acre revenue of all the crops considered, which leads to the conclusion that loan economics plays less of a role in barley than it does for other crops. (Interestingly, data indicate that barley producers experience among the highest returns over the loan rate of all their eligible crops that use the above two-step process.)

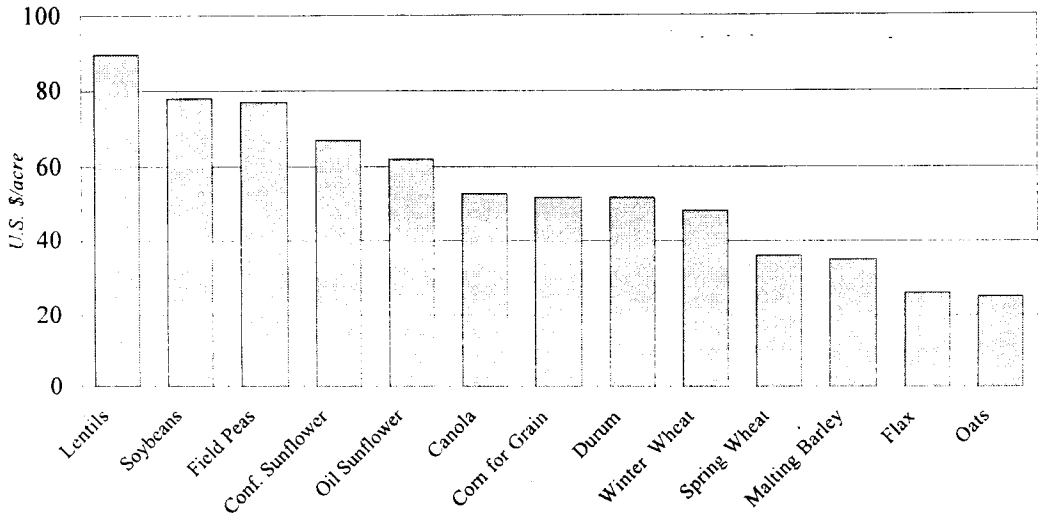

Figure 2.6: Per-Acre Revenue in North Dakota by Crop: 2002 Loan Rates
Source: Sparks Company, Inc. (2003: 24).

Generally, the U.S. farm legislation has not favoured barley production or corn production over other crops. Corn acreage has remained relatively stable but barley acreage has declined relative to the significant growth of soybean acreage, particularly in the late 1990s. Many have argued that a favourable loan rate for soybeans under the 1996 Farm Bill was largely responsible for this increase. Thus the 2002 FSRIA readjusted the soybean loan rate relative to other crops such as corn and wheat.

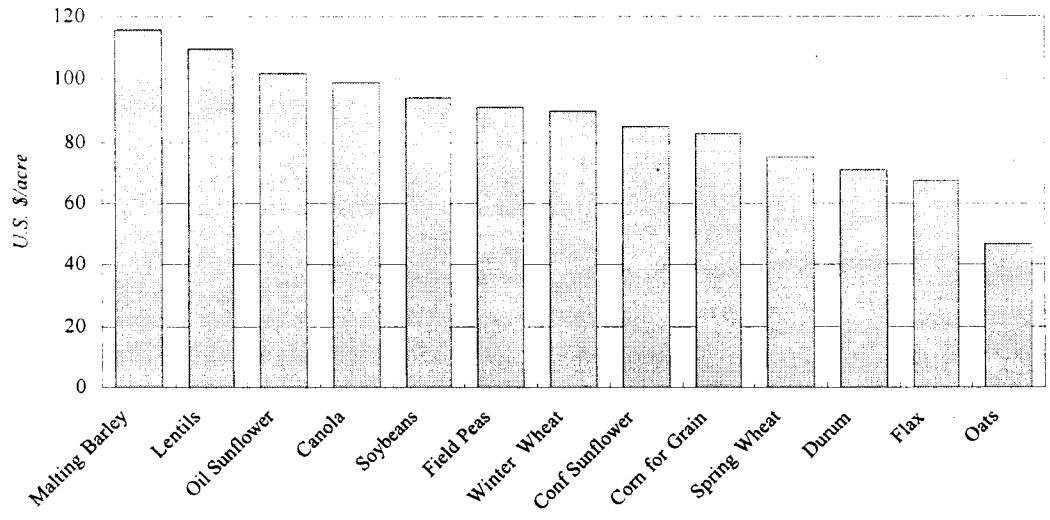

Figure 2.7: Net Crop Per-Acre Revenue in North Dakota Using November 2002 Cash off-Board Market Price
Source: Sparks Companies, Inc. (2003: 25).

Japan's Barley Policy

Barley was an important energy source within the Japanese diet following World War II. Although 80% of barley consumption in Japan is now used for animal feed, the Ministry of Agriculture, Forestry, and Fisheries (MAFF) still treats barley, wheat, and rice for import purposes as a "staple food" (USDA/FAS 2003).

Barley is imported into Japan in one of three ways:

- MAFF's Food Department Purchases Grains Based on Industry Requests: There is a TRQ placed on the amount of barley that can be imported under a 0% tariff for users of both feed and food, depending on supply and demand projections and on the availability of Japan's domestic barley. Under the TRQ, MAFF's Food Department imports barley duty-free on behalf of licensed processors.

- Simultaneous Buy and Sell (SBS) System: The SBS system was introduced in 2002 to allow buyers and sellers to communicate directly without going through MAFF's Food Department. Limited by quota, 800,000 mt of barley was imported through five SBS tenders in 2002, which comprised 60% of all imports. (The quota was expanded to 850,000 for 2003.) There is usually a spread between the buying price and the selling price of about ¥3,000/mt ($35/mt)[ii], which goes to the MAFF Food Department to cover expenses. The Japanese feed-manufacturing industry has been pressuring MAFF to allow all feed-barley imports through the SBS system.

- Commercial Imports: Barley-import quotas were converted to tariffs under the URAA, with an applied rate above a 1.369 mmt TRQ for barley and barley products of ¥39 per kilogram (kg), which is about $480/mt. Consequently, commercial imports are very limited.

Traditionally, barley has been an important alternative crop under Japan's rice land-diversion program, and farmers who produce barley on rice-paddy land receive subsidies of ¥830,000 per hectare (about $4,000 per acre). MAFF is concerned that even with these high subsidies, Japan's barley production will fall if markets are opened because imported barley is cheaper and of better quality than is Japan's domestic barley. On the other hand, MAFF wants to maintain duty-free barley imports to keep feed costs low for Japan's cattle producers.

By 2008, the Japanese government plans to phase out the government-controlled rice-land-diversion program and replace it with decoupled direct subsidies designed to support the permanent production of wheat and barley. Once this occurs, the pressure on MAFF to maintain control of barley imports may be eased. As the subsidies are removed, however, barley production could shrink dramatically since, without subsidies, Japan's domestic barley will not be competitive in either price or quality.

Dissolution of the USSR and Related Reforms

In the late 1970s and 1980s, the Soviet government of the Union of Soviet Socialist Republics (USSR) placed a high priority on increasing the supply of meat products, a strategy pursued until the dissolution of the USSR in 1992. In the drive to increase per-capita meat consumption, Soviet livestock herds expanded to such an extent that domestic grain production could not satisfy the increased feed demand. Thus the USSR and Eastern European satellite countries began to import substantial quantities of grain for feed from other countries. In 1992/93, just as the FSU governmental reforms began, net feed-grain imports by the USSR were 2.5 mmt or about 8% to 9% of the total global feed-grain imports; in 2000/01 countries making up the FSU countries imported only 0.48 mmt.

The USSR livestock-expansion policy also led to increased agricultural subsidies. By 1989, total USSR subsidies amounted to 13.5% of its gross domestic product (GDP), of which subsidies to agriculture accounted for 11%. The policy did raise per-capita meat consumption, which, in 1990, was equal to or higher than that in the United Kingdom, despite the fact that per-capita income in the United Kingdom was more than twice that of the USSR.

Following the FSU reforms in 1992, the subsidies supporting expanded-livestock inventories were removed that affected both FSU livestock and feed-grain production. Livestock inventories fell dramatically in all countries of the FSU and Eastern Europe; between 1992 and 2000, cattle inventories in Russia and the Ukraine fell from 78 million head to 38 million head. Average grain production in Russia and the Ukraine declined from 145 mmt (1988 to 1990) to 78 mmt (1998 to 2000).

These massive structural changes had a significant impact on agricultural trade in Russia and the Ukraine. The fall in livestock inventories led to a decrease in demand for feed grains that resulted in diminished feed-grain imports and increased feed-grain exports. In 2000, net feed-grain imports for Russia and the Ukraine were less than 1 mmt; in 2001 these two countries were net exporters of feed grains to the tune of about 8.3 mmt (Figure 2.8). These reforms resulted in Russia and the Ukraine becoming net exporters of feed grains.

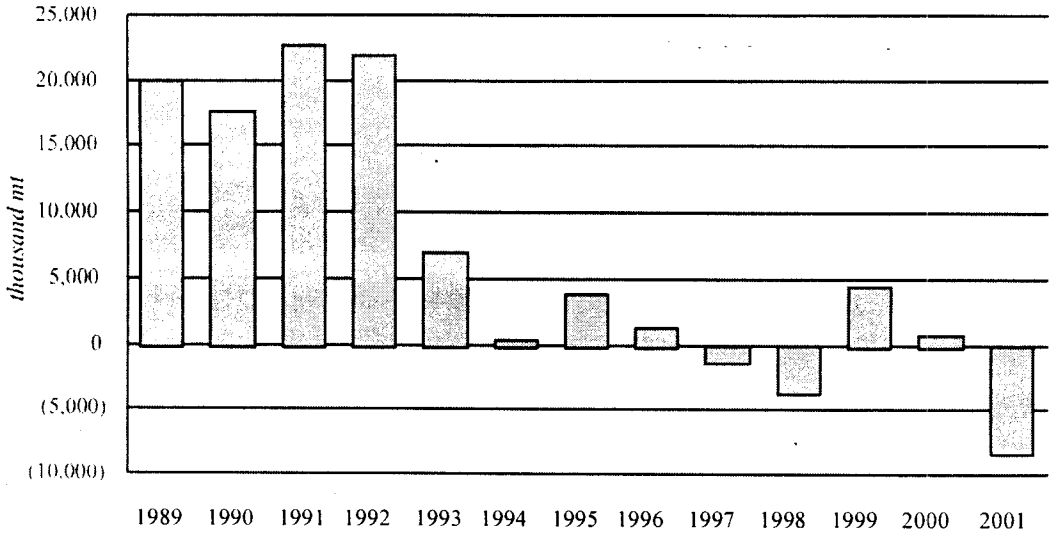

Figure 2.8: Russian and the Ukraine Net Feed Grain Imports, 1989 to 2001
Note: Negative numbers indicate exports.
Source: Sparks Companies, Inc. (2003: 28).

III. SELECTED PREVIOUS STUDIES

A Brief Survey

Most of the analytical work on the world barley market that took account of the predominant use of export subsidies on this product began in the early 1990s. The following provides a brief discussion of these studies.

Haley et al. (1992) demonstrate the importance of the U.S. Export Enhancement Program (EEP) on producer feed-barley prices and on market shares. This study: (1) evaluates the effect of the EEP program on U.S. and competitor barley-export volumes, prices, and U.S. welfare; (2) models the impact of EU subsidy retaliation; and (3) focuses on the 1986/87 and 1987/88 crop years. Haley et al. use a model developed by the U.S. Department of Agriculture (USDA) that has a static, partial-equilibrium, nonspatial modeling framework and conclude that EEP caused U.S. feed-barley prices to increase within a range of U.S. $6/mt to U.S. $11/mt in 1986/87 and within a range of U.S. $8/mt to U.S. $13/mt in 1987/88. The study also determines that EEP increases U.S. export revenue from U.S. $99 million to U.S. $166 million in 1986/87 and from U.S. $109 million to U.S. $180 million in 1987/88. The study did not examine the effect EEP had on malting-barley prices due to changes in the feed-barley prices.

Carter (1993) analyzes the impact of a CBM on Western Canada's feed-barley and malting-barley producers. Carter concludes that significant opportunities exist for Canada's expanded sales of both feed barley and malting barley to the United States. He concludes that these increased exports enhance Canada's producer revenue. His study also states that these opportunities exist under a CBM and are not exploited

under the single-desk-seller marketing system of the CWB. Overall, Carter estimates that a CBM raises annual producer revenue from barley by 17%. Carter uses various methods to arrive at this conclusion, including a revenue-maximizing spatial-equilibrium model (Canadian Regional Agricultural Model, CRAM) that breaks the Canadian Prairie region into 22 crop-producing regions.

A strong component of Carter's analysis is his separation of arguments about barley-price premiums earned by the CWB as opposed to the final barley price received by Canada's farmers. He argues that a CBM results in higher prices to farmers because of the alleged inefficiencies resulting from CWB operations. Carter's study, however, has several shortcomings. First, many of the benefits that he concludes accrue from a CBM are also attainable under the CWB single-desk-seller marketing system (Schmitz and Furtan 2000), including enhanced producer returns from growing high-yielding feed-barley varieties and lower marketing costs due to reduced elevation tariffs. Second, several of his price assumptions are questionable. For example, Carter's model assumes that price differentiation continues between the American and Canadian malting-barley markets under a CBM, which is inconsistent with the arbitrage conditions we find in a competitive environment. Third, Carter concludes that the CWB is unable to price discriminate in the world barley market. This conclusion, however, is based on a test using data that are inappropriate for this type of analysis. As Brooks (1993) points out in his critique of the Carter (1993) study, the Statistics Canada data used reflects public CWB price quotes rather than actual CWB contract-price quotes.

Schmitz, Gray, and Ulrich (1993) employ a four-country spatial-price-trade model for feed barley, in which the CWB exports feed barley to the United States, Japan, and the rest of the world (ROW) to evaluate the impact of a CBM. Further, the study estimates the impact of a CBM on malting-barley premiums. However, Schmitz, Gray, and Ulrich did not model the interaction and interrelationship that exists between feed-barley prices, malting-barley prices, and trade flows. Also, their study does not address the issue of whether or not marketing costs are lower under a CBM. Schmitz, Gray, and Ulrich conclude that a CBM reduces total barley revenue for producers by more than $20 million annually. The majority of this loss occurs because of a reduction in the premium for malting barley under a CBM.

Johnson and Wilson (1994) report several policy simulations using a detailed spatial-equilibrium analysis of the North American barley market. The base case corresponds to a CBM trade regime. Johnson and Wilson conclude that Canada has considerable potential for exporting barley to the United States. In the base-case scenario, Canada captures 43% of the U.S. feed-barley market and 24% of the U.S. malting-barley market. Like earlier studies, this study does not model formally the malting-barley market.

Schmeiser (1995) analyzes the impact of a CBM on Western Canada's barley producers using a spatial partial-equilibrium model that has 8 markets. Included are 4 markets for malting barley and 4 markets for feed barley. In the Schmeiser model, the CWB

maximizes producer revenue by allocating a fixed supply of barley across Canada's export markets for feed barley and malting barley so that the marginal revenue across all markets is equal. Based on the 1991/92 crop year, Schmeiser concludes that producer revenue for Canada's barley total falls by approximately $15 million to $17 million under a CBM. However, Schmeiser's analysis is limited to data for one crop year and focuses on a CBM rather than on the examination of the implications of a full dual market.

Clark (1995) uses cointegration analysis to evaluate the impact that the CBM, which was announced 3 June 1993, effective 1 August 1993, and removed 10 September 1993, had on Canada's feed-barley prices. He tests for structural breaks in the feed-barley price for June through September, and concludes that there is no change in the long-run equilibrium relationship in feed-grain prices as a result of the short-term CBM. According to Clark, this evidence is not supportive of the findings of Schmitz Gray and Ulrich (1993). Clark's analysis, however, has several shortcomings. First, cointegration analysis is not appropriate for looking at structural changes. Second, the U.S. barley price is not compared to close substitutes such as the U.S. corn price that, in 1993, increased significantly. Thus while the U.S. feed-grain price in general was increasing, the U.S. barley price was not, and the U.S. barley price was falling in relative value, which is not discussed or evaluated in the Clark study. Third, the appropriate starting point for the CBM analysis should have been 3 June 1993 when the CBM was announced, rather than the 1 August 1993 to 10 September 1993 time period Clark utilized in his study.

Carter and Loyns (1996) examine the costs and benefits of the CWB as a single-desk seller of Western Canada's wheat and barley. Using various arguments and supported by anecdotal evidence, the study concludes that the costs of the single-desk-seller marketing system of wheat and barley far outweigh the benefits. Carter and Loyns suggest that the associated industry costs of the CWB are roughly $20/mt in any given year. However, these costs are likely overstated. For example, their study concludes that delays in varietal development are due to the CWB, when in fact varietal registration is actually the responsibility of the Prairie Regional Recommending Committee on Grains, in which the CWB is only one of many players represented by this committee. Likewise, Carter and Loyns attribute high elevation costs to the CWB. Elevation rates were established previously by the Canadian Grain Commission (CGC), whereas elevation rates are now determined competitively. Finally, the Carter and Loyns analysis did not identify adequately the marketing costs associated with non-CWB crops like canola and flax. As Kraft et al. (1996) point out, the cost of buying and selling flax and canola on a margin basis is at least $5.53/mt higher than the cost of managing the transactions through the CWB wheat-pool account. Given the reality that non-CWB grains have higher marketing costs than do CWB grains, it is difficult to see how Carter and Loyns conclude that the costs associated with the marketing of CWB grains will fall if grains are marketed as non-CWB grains (Schmitz and Furtan 2000).

Mao, Koo, and Kraus (1996) determine how policy changes in major feed-barley-trading countries affect world feed-barley trade and net societal payoffs. Mao, Koo, and Kraus use a static spatial-equilibrium model based on a quadratic-programming algorithm. Included are 4 exporting regions and 9 importing regions. This model allows Canada's feed-barley producers to ship their barley directly to U.S. regions. For the other exporting countries, the study considers only offshore shipments of feed barley. The Mao, Koo, and Kraus study reaches several conclusions. For example, the elimination of the EEP in the United States reduced U.S. exports by 26%. Removing the Western Grain Transportation Act (WGTA) freight subsidy in Western Canada reduced Canada's offshore exports by 15%. The introduction of the North American Free Trade Agreement (NAFTA) increased Canada's feed-barley exports to the United States and Mexico. Under a world free-trade scenario, EU feed-barley exports will decline 48%. One of the limitations of the Mao, Koo, and Kraus study is that it considers only feed barley.

Stickland (1996) was commissioned by the Western Grain Marketing Panel, KenAgra Management Services Ltd. to conduct a qualitative assessment of malting-barley marketing and feed-barley marketing in Canada. He outlines the differences in the economic and political perspectives that are evident among barley producers in the debate concerning barley marketing, and outlines the reasons why they exist. Stickland highlights the issue of incomplete arbitrage between Western Canada's barley market and proximate U.S. barley markets, but he does not model or measure the impacts. He also examines many operational issues and provides examples of price and contract inefficiency. The Stickland study outlines alternative marketing structures and attempts to measure them qualitatively against economic and political criteria. The Stickland study does not conclude which alternative should be implemented but it does indicate that some movement to a multiple-seller marketing system for Western Canada's feed barley will be economically and politically acceptable.

Schmitz (1996a and 1996b) studies provide evidence for the 1994 Charter Case. He examines the extent to which the CWB is inefficient in marketing grain and concludes that many of the allegations brought against the CWB are not well founded.

Schmitz et al. (1997) develop a hybrid spatial-equilibrium model of the world barley trade to evaluate changes in feed-barley and malting-barley production and consumption under alternative domestic and agricultural-trade-policy regimes. A spatial equilibrium is established in which the CWB and the Australian Marketing Board behave as oligopolists in export markets under arbitrage conditions brought about by the export-subsidy policies of the United States and the European Union. The Schmitz et al. (1997) analysis disaggregates barley area and barley production into feed barley, 6-row malting barley, and 2-row malting barley in each of the 4 major barley-trading regions and evaluates both supply and demand responses to various policy changes in each country Canada exports to. However, although the selection rates for malting barley are determined

endogenously, the analysis assumes that changes in agricultural-policy regimes do not alter the price relationship between feed barley and malting barley.

Schmitz et al. (1997) and **T.G. Schmitz and Gray (2000)** develop economic models to determine the extent of price discrimination by the CWB in the world barley market and the resulting benefits derived by Western Canada's barley producers. Actual CWB contract-record data from every CWB sale of feed barley, 6-row malting barley, and 2-row malting barley for the 1985/86 to 1994/95 crop years were used by Schmitz et al. (1997). All prices were brought to a common basis point of either FOB Vancouver or Thunder Bay. The authors aggregated the sales data into the following 9 market segments: 1) Japan's feed-barley market; 2) the U.S. feed-barley market; 3) all other offshore feed-barley markets; 4) Canada's domestic 6-row malting-barley market; 5) U.S. 6-row malting-barley market; 6) offshore 6-row malting-barley markets; 7) Canada's domestic 2-row malting-barley market; 8) U.S. 2-row malting-barley market; and 9) offshore 2-row malting-barley markets.

The authors incorporate the market power of the CWB in the world barley market by assuming that the CWB allocates its sales in order to simultaneously maximize the CWB/RTP across world feed-barley markets, domestic and world 6-row malting-barley markets, and domestic and world 2-row malting-barley markets. The equilibrium domestic feed-barley price is assumed to be equal to the weighted CWB/APR exports of feed barley to relevant markets. The CWB single-desk-seller marketing system is compared to a hypothetical multiple-seller marketing system of selling Canada's barley by assuming that multiple sellers behave competitively in both the feed-barley and malting-barley markets. Under this assumption, the law of one price must hold across all feed-barley markets and also must hold across all malting-barley markets.

The key difference between the CWB single-desk-seller marketing system and a multiple-seller marketing system is the ability of the CWB to price discriminate. In the absence of constraints on the quantity of feed barley, 6-row malting barley, and 2-row malting barley available for sale by Canada's producers, the law of one price must hold for all international and domestic barley sales in a multiple-seller marketing system. In the Schmitz et al. (1997) model, multiple sellers are assumed to be fully competitive, and this competition results in one market price for feed barley and one market price for malting barley at any given point in time, which is a characteristic of all competitive markets.

The impact of the introduction of a multiple-seller marketing system into Canada's feed-barley and malting-barley markets and into Canada's-producer RTP totals are calculated for each crop year from 1985/86 to 1994/95. Overall, the RTPs from the CWB single-desk-seller marketing system are significantly higher than would be the returns from a multiple-seller marketing system. On average, producer returns under the CWB are $72 million above what a multiple-seller marketing system would have generated. In addition to the empirical findings, Schmitz et al. (1997) provide an overview and a detailed

critique of the many barley studies that have been completed prior to 1997.

Carter, Loyns, and Berwald (1998) use arguments from previous works to demonstrate why the CWB may not be maximizing the CWB/RTP. They argue that the characteristics of the CWB fit a model of bureaucratic decision-making and they model the CWB as supplying excess marketing services to farmers. They argue that allowing the market to determine the quantity of marketing services results in lower marketing costs and in presumably higher farm incomes.

Brooks and Schmitz (1999) illustrate the high degree of price discrimination existing in the Canada-U.S. feed-barley-export market. This is due in part to the operations of the CWB in Canada and to the presence of EEP in the United States.

Schmitz and Furtan (2000) in their book *The Canadian Wheat Board: Marketing in the New Millennium*, provide information on: (1) the major Canadian and American players of both the wheat trade and the barley trade; (2) the regulatory dimensions of the grain industry in the United States and Canada; (3) agricultural policy as it affects the grain trade in each country; (4) the issues surrounding the barley debate, grain transportation, the economic performance of the CWB, the alleged CWB cost inefficiencies, and the cost of marketing of flax and canola in Canada.

In addition, Chapter 9 of the Schmitz and Furtan (2000) book provides an overview of the Charter Case, which was heard in Calgary, Alberta in 1996 but was filed initially in 1994. In June 1994, Ron Archibald and several other farmers along with the Alberta Barley Commission and the Western Canadian Barley Growers Association sued the CWB, arguing that the *Canadian Wheat Board Act* breached the rights of individual farmers whose rights are guaranteed under Canada's Charter of Rights and Freedoms (Archibald 1994). Based on testimony of several experts, the Honourable Mr. Justice Muldoon ruled in April, 1997, in favour of the CWB on the grounds that: (1) the *Canadian Wheat Board Act* does not breach the individual rights of the plaintiffs; (2) the Charter of Rights and Freedoms does not protect the individual's economic or commercial aspirations; and (3) the *Canadian Wheat Board Act* and the CWB monopoly are valid in the eyes of the law. According to Honourable Mr. Justice Muldoon, the Charter of Rights and Freedoms is not the proper instrument to use to fix what is quintessentially a political problem.

A. Schmitz and Gray (2000) provide evidence in the countervail complaint brought by the Ranchers-Cattlemen Action Legal Foundation (R-CALF) through the U.S. court system against Canada's cattle industry. They argue that Canada's cattle were fed cheap barley because of alleged inefficiencies of the CWB, which gave Canada's cattle feeders an unfair barley-price advantage over their American counterparts. A. Schmitz and Gray contend this is not the case. Based on the A. Schmitz and Gray findings and on other evidence, the U.S. court ruled in favour of Canada.

Dong and Stiegert (2003) quantify the welfare, price, and volume impacts of a change from the CWB single-desk-seller marketing system to a multiple-seller marketing system with regard to barley.

They find that the U.S. import volume will be higher under a multiple-seller marketing system. They also find that the U.S. import price and the price paid to U.S. barley producers will decrease. With regard to welfare changes, Dong and Stiegert find that Canadian and American producers will be worse off while consumers in both countries will benefit.

Sparks Companies, Inc (2003) conduct a study, *The Canadian Barley Industry in Transition: A Study for Alberta Agriculture, Food, and Rural Development*, which is highly critical of the CWB. This report provides a comprehensive overview of worldwide barley production, trade, and agricultural policies that influence agricultural marketing. However, the Sparks' study offers neither a history of the debate over barley marketing nor how their findings relate to the findings of previous authors. The Sparks' study does not have a formal model to evaluate, theoretically or empirically, about what would happen to producers if a multiple-seller marketing system replaced the CWB single-desk-seller marketing system. Other concerns about the Sparks' study include:

- Unlike the contention in the Sparks' report, Canada's brewing industry is not forced to source its barley malt or its malting barley solely from Canada's malting-barley industry. Although there is a TRQ in place for barley-malt imports into Canada, the TRQ does not apply to NAFTA countries. Essentially an unlimited quantity of U.S. malt can flow into Canada legally under NAFTA guidelines. If CWB pricing to Canada's maltsters is too high, one will expect Canada's domestic maltsters to import barley from elsewhere in North America. Likewise, Canada's brewers may also choose to import malt from other NAFTA countries. Canada did import malting barley in 2002/03 from Denmark, when Canada's maltsters could not meet some of their contract-quality specifications using only barley sourced in Canada. Given the very high reported price of imported barley, the maltsters had room to pay a very high premium to secure Canada's domestic barley supplies. The fact that they chose instead to import malting barley from elsewhere is further proof that the necessary malting-barley quality was not available from Canadian sources.

- Sparks' contention that the CWB is inefficient when marketing barley in the domestic market did not consider the large Canadian imports of U.S. corn entering Canada when Canada had a barley shortage in 2001/02. In an integrated North American barley market, one would expect this to be the case because of the drought. Allowing corn imports to flow into Canada from the United States adds to the feed-grain availability in Canada, and in so doing, facilitates price arbitraging in the North American feed-grain markets. As discussed later, the barley market is linked to the U.S. corn market, thus Canada's feedlots at times will supplement their feed-grain demands with imported corn.

In terms of Canada's pricing of feed grains, the Winnipeg Commodity Exchange (WCE) is a

major price-discovery mechanism that is used by feedlots as a price guide for what to pay for feed barley. Feedlots buy very little feed barley from the CWB. To put this into perspective, in the last several years, less than 1% of Canada's barley production that was marketed by the CWB was sold to feed-barley end users (see Table 7.2 and Table 7.3). In this context, surely the barley-price forecasts made by the CWB are not the only factors used when a farmer decides to sell his barley to the CWB instead of to the open market. Because of the small CWB feed-barley pool account, one wonders why price comparisons are made between CWB barley prices and open-market prices for areas such as Winnipeg MB. Also, Sparks contends that CWB barley prices in Red Deer AB are much lower than they are in the open-market prices (at times more than $1 per bushel lower). If this is true, we question why feedlots will not buy more barley from the CWB until arbitrage occurs between the CWB and the open-market barley prices.

- Unlike the arguments in the Sparks report, removing the CWB from involvement in barley marketing does not increase export prices for barley. The additional value for barley created by the CWB relative to a multiple-seller marketing system has been estimated at $72 million for the period 1985/86 to 1994/95 (Schmitz et al. 1997).

- The Sparks' study seems to imply that, because of the CWB, there is lack of flexibility in both the exportation of barley and in the functioning of Canada's feed-barley market. As we will show later in this study, there is considerable price arbitrage within both Canada's malting-barley and the feed-barley markets. Canada imports sizeable amounts of corn when there is a barley shortage in Canada. Also because of a malting-barley shortage in Canada in the 2002/03 crop year, Canada imported malting barley. And, to increase market efficiency, the CWB has made policy changes over time, including a cash off-Board market-price-payment option.

- Often the CWB is criticized for unfair pricing due to credit guarantees to buyers by the Canadian government. During the period of our study, the 1995/96 to 2003/04 crop years, credit guarantees were small and on average were applied to less than 50,000 mt of barley.

Overview

There is a lack of agreement over the costs and benefits of the CWB as a single-desk-seller marketing system, but a number of studies conclude the system has substantial benefits. Other studies that do not support these results argue that while price premiums may exist, they are small relative to the added marketing costs associated with the CWB single-desk-seller marketing system.

When modeling the behaviour of the CWB, the functioning of feed-grain markets must be integrated with malting-barley markets. A major limitation of many of the studies, which have compared the CWB to a multiple-seller environment, is that the feed-grain

market is treated separately from the malting-barley market. Schmitz et al. (1997) formally develop a model that integrates both markets. Also, one cannot *a priori* assume that a single-desk-seller marketing system acts in a manner similar to a multiple-seller marketing system. In view of Haley's (1995) work on the impact of the EEP on trade of Canada's wheat, one has to determine whether the CWB has market power. (Market power and the nature of competition are important factors to keep in mind when modeling the world barley market.) As Johnson and Wilson (1994) point out, if one assumes competitive behaviour (i.e., no market power), one misses the major argument in the current debate over barley marketing. However, determining whether the CWB has market power is difficult empirically, unless actual CWB contract pricing data are available for use. (These contract-price data were made available from the CWB and are used in the study.)

Why does confusion exist in the current barley-marketing debate? Part of the confusion appears to result because a distinction is not being made between the price premiums earned by the CWB and the total efficiency (including marketing costs) of the CWB as a single-desk-seller marketing system. For example, it is theoretically possible for the CWB to earn price premiums on barley sales and still have a situation in which producers could be worse off under the CWB single-desk-seller marketing system than they would be under a multiple-seller marketing system. However, being worse off will occur only if the CWB system results in higher costs that more than offset the positive price premiums of the barley. To highlight this point, the Kraft et al. (1996) study on wheat concludes that the CWB single-desk-seller marketing system earns significant price premiums over what a multiple-seller marketing system could earn. However, Kraft et al. calculate price premiums FOB Vancouver BC and not at the farm gate. If the marketing and other associated costs under the CWB are at least as low as they would be under a multiple-seller marketing system, farmers could profit more under the CWB system. However, Carter and Loyns (1996) contend that even though the CWB may earn premiums, there are added costs imposed by the CWB single-desk seller marketing system over what would exist under a multiple-seller marketing system, and these added costs outweigh the premiums earned. Kraft et al. (1996) find that marketing costs for CWB wheat are less than marketing costs are for non-Board grains. In our opinion, the same arguments apply to barley (Schmitz and Furtan 2000).

IV. THE THEORY OF A SINGLE-DESK-SELLING

Overview

The CWB operates within the context of the *Canadian Wheat Board Act.* The CWB is set up to operate as a producer-marketing board to maximize RTPs of wheat and barley. The CWB acts as the producers' agent through which all sales and payments are made. The theory of producer-marketing boards has been discussed in several works, including Bieri and Schmitz (1974), Just, Hueth, and Schmitz (1982), Just, Schmitz, and Zilberman (1979); McCalla and Josling (1981), and Schmitz et al. (1981). The CWB is a form of collective action by Canada's grain producers who use the CWB as a marketing board in their attempt to maximize RTPs by jointly producing marketing services and providing countervailing power against large MTNs.

Loyns and Kraut (1995) state that the CWB can take advantage of economies of scale in marketing:

> The ability to organize and commit large amounts of uniform quality product with a guaranteed price for up to a year at a time provides an advantage to the CWB. Information is not perfect in the marketplace. That may work in the Board's favour usually, because, like some major grain companies, they have a good market intelligence network. (22–25)

The CWB is a producer-marketing agent. It is not a middleman (i.e., a firm that attempts to exploit both producers and consumers) nor is it a monopsonist (i.e., a firm that exploits producers). Thus the RTPs earned from sales by the CWB are returned directly to producers (i.e., producers are likened to shareholders of the CWB).

A major feature of the international barley market is that marketing boards such as the CWB and the Australian Barley Board sell into a market in competition with other STEs, including the EU Cereals Management Committee and the USDA/CCC. Together these four players represent the vast majority of the world grain trade.

The marketing of grain in the United States is very different from the marketing of CWB grains. As Hill (1992) points out, large MTNs still dominate the export stage of the U.S. grain-marketing system. The dominant MTNs involved in the exportation of U.S. grain are U.S.-based Cargill, which has expanded its operations by purchasing Continental; U.S.-based Archer Daniels Midland, which has a joint export venture with the German-based Toepfer; New-York based Bunge; French-based Louis Dreyfus, and several subsidiaries of large Japanese corporations whose headquarters are in the United States. All of these companies source grain from the United States and other origins. In essence, the U.S. MTNs behave as middlemen with respect to the buying and selling of U.S. and other-origin grains. The MTNs buy grain from optional origins and sell the grain to foreign buyers.

The large MTNs, including Cargill, Louis Dreyfus, and Bunge, control more than 80% of the total volume of barley exports from the United States. Many of these MTNs trade within their specific

niche regions and/or niche commodities. For instance, Toepfer controls a large portion of the international feed-barley trade. From a world-trading perspective, only a few MTNs are principal grain dealers in 70% to 80% of the world trade in feed barley. To the extent that these MTNs can earn profits from market power, the returns go to the MTN shareholders rather than to the grain producers themselves.

There has been considerable debate as to the effectiveness of the principle of a multiple-seller marketing system as opposed to a single-desk-seller marketing system. However, the following outlined by Schmitz (1996a and 1996b) is important to keep in mind when examining this issue. To put the multiple-seller marketing system and the single-desk-seller marketing-system debate into perspective, if one believes that the CWB has market power in world-grain markets (be it oligopoly power due to a relatively large market share or monopolistic competitive power due to product differentiation), then all else remaining equal, the CWB must perform better than would a multiple-seller marketing system. This is because the CWB has control over a large volume of grain that can be allocated to maximize total revenue on all sales of Canadian grain among markets. That is, it can capture additional economic rents through an optimal pricing strategy.

Because of the CWB, some have gone as far as to suggest that there is a lack of buying competition at the farm gate. In order for this statement to be true, one has to view the CWB as a monopsonist power with respect to the purchase of grain for domestic consumption and export. (A monopsony is defined as the mirror image of a monopoly: a market in which there is a single buyer or a buyer's monopoly.) While the CWB is the sole buyer of grain for Canada's consumption and export, it does not exert monopsony pricing power over its suppliers. (A monopsonist exerts control over its suppliers by limiting the quantities that it purchases below competitive levels in order to maximize its own profits.) However, one of the mandates of the CWB is to maximize revenue accruing to producers, not to the CWB itself. This objective contradicts the assertion that the CWB is a monopsonist. The CWB is a marketing board set up for Canada's grain producers who ultimately receive additional revenue obtained by the CWB as part of their annual final crop-year payment. Hence, the CWB cannot be construed as a monopsonist, and any reference to efficiency losses due to the lack of buying competitiveness on the part of the CWB is incorrect. Within this context, why would the existence of a number of smaller Canadian firms increase the competitiveness or the revenue received by Canadian producers at the farm gate?

As Harold and Rossmiller (1991) state:

> In effect, the CWB will not take advantage of the producer, while the private grain traders have few qualms about the lowering of the price offered to the producer and the raising of the price offered to the consumer in order to increase the grain traders' profit margin. (43)
> One possible outcome should the CWB be removed will be that the MTNs in the United States could take over the job of marketing Canada's grain. These firms already

have well-established offices in countries all over the world, including Canada. It would not be that difficult for these MTNs to expand their purchasing activities to include Canada. Remember that these large MTNs purchase most of their grain from cooperative agencies in the United States who in turn procure grain from local producers. In the absence of governmental regulation, the country-elevator system currently in place in Canada could be used by U.S. MTNs in the same way the MTNs currently use local cooperative organizations in the United States. (66–67)

When referring to the CWB and the world barley trade within the context of economic theory, one must keep in mind several economic concepts and the degree to which these concepts apply to the CWB. A monopoly is a market structure in which a commodity is supplied by only one firm. Several authors have referred to the CWB as a monopoly. The CWB is not a monopolist because it is not the sole seller of barley within the global marketplace. It is, however, the sole supplier of Western Canada's barley production that enters into the international grain market; therefore it is a monopolist only in the same sense that Ford Motor Company has a monopoly over the Ford vehicles it sells. It is also important to stress the fact that the CWB is not a pure monopoly because it does not restrict the overall supply of grain marketed by its competitors internationally.

The role the CWB has in the pricing of wheat in international markets has been the subject of many investigations, but little research has been conducted on barley per se. Several investigators view international grain markets in an oligopolist framework. (An oligopoly is a situation of imperfect competition in which an industry is dominated by a small number of suppliers.) An oligopolist is not a price taker. It has some market power since it can affect prices by controlling the quantity it sells into each market, but an oligopolist does not have as much market power as a pure monopolist.

Even if one views the CWB as a monopolistic competitor, it could still earn increased revenue above what will exist in a perfectly competitive environment. Monopolistic competition is defined as a market structure in which there are a large number of sellers supplying goods that are close but are not perfect substitutes. In such a market, each firm can exercise some influence on its price. The CWB is a monopolistic competitor in the sense that its grain is a close but not a perfect substitute for grain from other countries and that it competes with many other grain companies.

Price Discrimination

The clearest case in which a single-desk-seller marketing system can extract additional revenue from the market over a multiple-seller marketing system is through price discrimination. The gain from a single-desk-seller marketing system is the additional revenue that can be earned from charging different customers different prices as compared to the multiple-seller marketing system in which all buyers of Canada's barley will buy the barley at the same price. A single-desk-seller of a product that faces

demand in more than one market can increase revenue above that received by a multiple-seller of the same product: (1) if it reduces quantity and charges a higher price in markets that are less price sensitive (inelastic); or (2) if it increases quantity and charges a lower price in markets that are more price sensitive (elastic). Revenue is at a maximum when the marginal revenue derived from the excess demand curve in each market is equal across all markets. In the case of competition in a multiple-seller marketing system, full arbitrage of prices will occur at a single price for a single point in time to clear the market (i.e., the law of one price must hold in a competitive-market environment). Given the inability of individual organizations in a multiple-seller marketing system to price discriminate, the returns from the multiple sellers' single price must be lower than the returns are when they are attained by an organization that has the ability to price discriminate.

The only exception is in markets where the single-desk seller is unable to determine either price or quantity sold. This is true for the CWB in the case of Canada's domestic feed-barley market in which the CWB does not have single-desk-seller marketing authority and where price and quantity sold is a function of the expected pool return (EPR) for feed barley.

The CWB is the single-desk-seller marketing system used for selling Western Canada's barley for domestic human consumption and export. To the extent that each CWB customer has a downward-sloping demand curve for Canada's barley, the CWB can adjust quantities on each demand curve to maximize revenue across all markets. For instance, suppose the Pacific Northwest (PNW) barley price is $120/mt and the CWB is negotiating a sale of barley to Japan. If the CWB tries to sell 300,000 mt of barley over the next 6 months to Japan, the Japanese Food Agency will be willing to pay $130/mt for the barley. If the CWB wants the Japanese buyer to agree to purchase 600,000 mt of barley, the CWB will have to offer a lower price (e.g., $115/mt) to close the deal, which pressures the PNW barley price to also be lower. However, instead of selling 600,000 mt of barley at $115/mt, a single-desk seller instead will choose to sell 300,000 mt to a price-inelastic Japanese customer at $130/mt and sell the remaining 300,000 mt at $120/mt into a price-elastic market. This strategy for selling the barley results in an average CWB/RTP for the barley of $125/mt instead of an average CWB/RTP of $115/mt. In this way, the CWB can influence the price received in each market by adjusting the quantity sold in each market. What is unique about the CWB as a single-desk seller is that it does not have to fear being undercut by another company offering to sell Canada's barley, which allows the CWB to price discriminate and to charge different prices to different customers. Also, a single-desk seller can influence the amount of barley it sells as either malting barley or feed barley based on how much barley the CWB selects for malt. Given the limited demand for malting barley, not all malting barley grown in Western Canada must be sold through the CWB as malting barley, instead it can be sold into Canada's domestic or international market as feed barley (Schmitz, Gray, and Ulrich 1993).

We illustrate the above argument in Figure 4.1. Suppose two markets both demand 50 mt of barley at a price of $100/mt. If there are multiple sellers in this market with 100 mt of barley in total to sell, the price will be $100/mt in both markets because of the law of one price and total sales revenue will be $10,000. As long as the price in one market is less sensitive to quantity than is the other market, revenue can be increased through price discrimination. If the barley demand in Market 1 is more inelastic than is the demand for barley in Market 2, a single-desk seller will shift 10 mt of barley sales away from Market 1 into Market 2 to increase revenue through price discrimination.

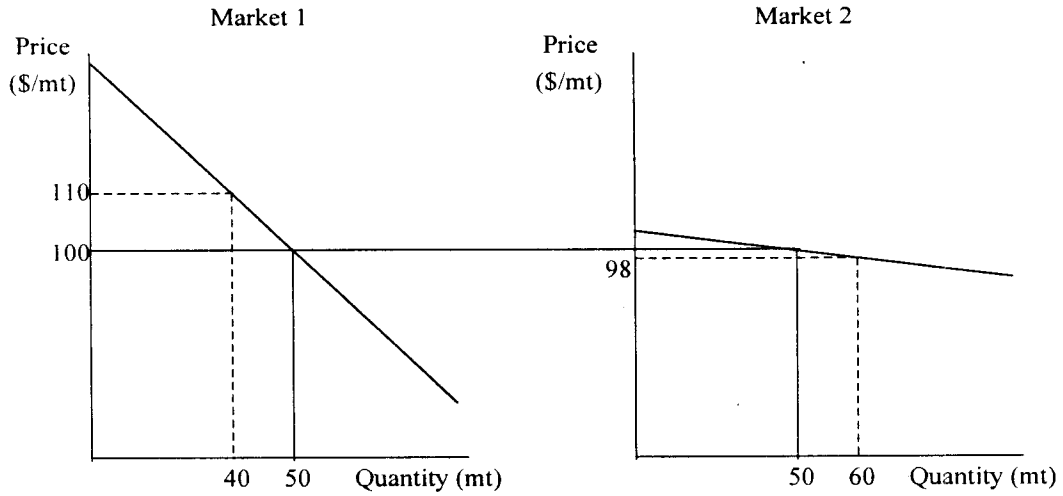

Figure 4.1: Returns from Price Discrimination

Suppose the barley demand curves are such that a 10 mt shift from Market 1 to Market 2 would result in a$10/mt increase in the price of barley in Market 1 and would only result in a $2/mt reduction in the price in Market 2, Canada's market revenue will now be:

$$\$110/\text{mt} \cdot 40\ \text{mt} + \$98/\text{mt} \cdot 60/\text{mt} = \$4{,}400 + \$5{,}880 = \$10{,}280.$$

For these demand curves, the single-desk seller would be able to increase the average price received from $100/mt to $102.80/mt.

The CWB is the single-desk seller of Canada's feed-barley exports, and is the single-desk seller of Canada's 6-row malting barley and 2-row malting barley to all markets. In some ways, it can behave similarly to a price-discriminating monopolist. However, the CWB does not behave as a pure monopolist. First, it cannot price discriminate directly between the domestic feed-barley market and the feed-barley export market. Second, the objective of the CWB is not to maximize the sum of profits accruing to all Canada's barley producers across all barley markets. Instead, the CWB functions as a marketing board whose

objective is to maximize the CWB/RTP from the sale of all barley that is available in the pool.

The CWB receives all malting barley produced by Western Canada's farmers and selected by maltsters and the trade, and places the barley in the designated barley pool. However, the CWB does not receive all feed barley produced by Western Canada's farmers. If the CWB/EPR is lower than the price in the domestic market, the farmer will sell feed barley into Canada's domestic market rather than selling it to the CWB. Therefore, the CWB faces an acquisition constraint with respect to the total quantity of feed barley available in the pool.

The CWB maximizes the RTP with respect to the quantities of malting barley sold to Canada's domestic and foreign markets, and with respect to the quantities sold to export feed-barley markets subject to the acquisition constraint described above. As part of this process, the CWB can influence the selection rate for Canada's barley. That is, within a certain range, the CWB influences the percentage of the total amount of Canada's barley that is actually sold as malting barley based on overall market demand for malt barley. Canada's producers seed both malting-barley varieties and feed-barley varieties. However, not all malting varieties planted can be used for malt purposes after the harvest due to poor quality. There exists some portion of barley produced in Canada that is marginal in malt quality. That is, it could be sold as barley malt in years when the average quality of the barley crop around the world is poor. In these years, importers will reduce their quality specifications on barley malt, such that this marginal quantity has the opportunity to be sold to these markets. However, in years when the average quality of the barley crop around the world is good, the marginal barley will be sold as animal feed. To sell malting barley as feed barley is a joint decision made by the selectors, the importers, and the CWB. Because feed barley can be substituted for malting barley on the margin, the marginal revenue for malting barley must be equal to the marginal revenue for feed barley that includes selection, storage, and quality-maintenance costs. Hence as a single-desk seller, the CWB can not only price discriminate across different markets for the same type of barley, it can also price discriminate across all feed-export markets, 6-row malting-barley markets, and 2-row malting-barley markets. This results in different prices being charged to different customers in all markets into which the CWB sells barley.

The objective of the CWB is to maximize the RTP. As long as the CWB sales strategy is consistent with revenue-maximizing behaviour, it is possible to deduce considerable information about the demand curve the CWB faces in each market by observing the actual pricing and sales behaviour. To do so, however, requires the availability and use of confidential CWB sales data.

There are additional reasons why the CWB may be able to increase revenue above what would exist under a multiple-seller marketing system. One suggested by Carter (1992) is that the steady supply of grain guaranteed by the CWB spreads the risk companies encounter when purchasing grain. If the CWB did not exist, higher variability in

quantity, quality, and price might force these companies to incur higher risk-management costs. Hence the presence of the CWB may be a lower-cost solution to these companies than is the alternative spreading of risk, such as the use of futures-market options. The CWB may be able to extract premiums from many of these companies (especially maltsters and brewers who purchase malting barley) that are willing to pay for this lower risk. It may also be the case that the CWB can obtain premiums simply because the MTNs may charge higher margins in a system in which they do not have to deal with the CWB.

Single-Desk-Seller versus a Multiple-Seller Marketing System

A much more complicated model of price discrimination is presented in Figure 4.2. This model illustrates graphically the multiple-seller versus the single-desk-seller equilibrium. Figure 4.2 consists of Panel A, Panel B, Panel C, and Panel D. Panel A is the domestic demand for malting barley D. Vertical line Q^*Q^* represents the total amount of malting barley produced. For the purpose of this discussion, consider the malting-barley market.

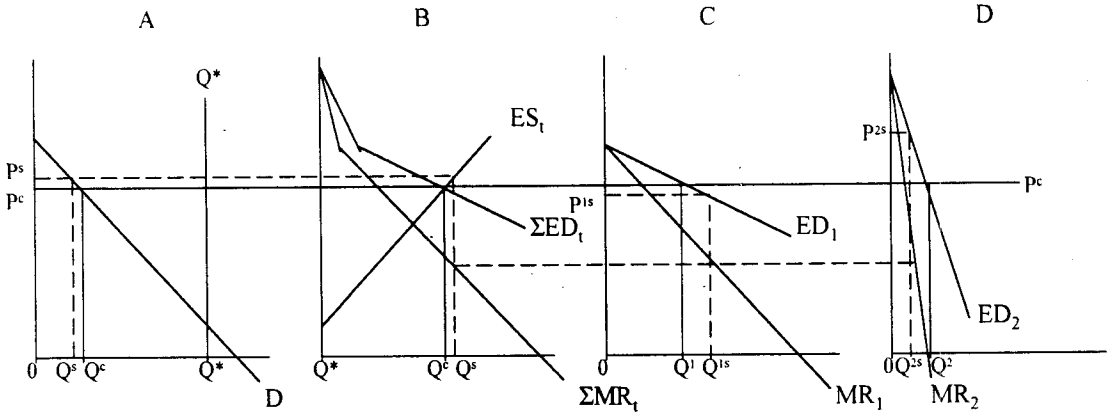

Figure 4.2: Multiple Sellers versus the Single-Desk-Seller Equilibrium for Malting Barley

Panel B gives the excess supply ES_t of malting barley available for export from Canada. This curve represents the portion of the malting-barley crop that is produced but not consumed domestically in Panel A (i.e., exported) at any given price, and has the same slope as Canada's domestic demand curve for malting barley in Panel A. For example, the quantity of malting barley exported from Panel A at price P^c, which is the competitive equilibrium price, will be equivalent to the difference between quantities Q^c and Q^*. The competitive equilibrium price P^c is derived in Panel B at that point where the excess demand curve ED_t intersects the excess supply curve ES_t. ED_t is the total excess demand for Canada's malting barley and is the sum of the excess demand curves for Canada's malting barley exhibited in Panel C and Panel D, which are two regions with different elasticities of demand for Canada's malting barley. ED_1 is the excess demand curve for

malting barley in Panel C, and ED_2 is the excess demand curve for malting barley in Panel D. At the competitive-equilibrium price P^c, Panel C will demand quantity Q^1 and Panel D will demand quantity Q^2. Quantities Q^1 and Q^2 will sum to the level of total exports from Canada (i.e., the difference between Q^c and Q^*.) The quantity of malting barley consumed domestically is Q^c. The point to note is that the price of malting barley is the same across all markets in the competitive equilibrium.

Given that the elasticity of demand in Panel C is different than the elasticity of demand in Panel D, it is clear that a single-desk-seller marketing system can out perform a multiple-seller marketing system through price discrimination. The maximum revenue that a single-desk-seller can generate occurs at that point where the marginal revenues in Panel C and Panel D are equal for the given quantity of barley it has to sell. What makes the CWB single-desk-seller marketing system interesting is that the amount of barley the CWB is able to market depends on the weighted-average price the CWB obtains in its export-barley market. Therefore, if the CWB is able to obtain a higher overall price in the export-barley market through price discrimination, the CWB will be faced with marketing additional barley. This in turn limits the increase in the weighted-average price the CWB is able to obtain in the export market. The price P^s that is reflected back to producers under the single-desk-seller equilibrium should still be greater than the price that would exist under a multiple-seller system (i.e., the competitive equilibrium price P^c).

At the single-desk-seller equilibrium price, quantity Q^s is consumed domestically at price P^s and the difference between quantity Q^s and Q^* is exported. The corresponding quantities that are demanded in Panel C and Panel D are Q^{1s} and Q^{2s}, respectively. In Panel C the price P^{1s} is below the competitive equilibrium price, and in Panel D the price of P^{2s} is above the competitive equilibrium price. The weighted-average prices P^{1s} and P^{2s} are above the competitive equilibrium price (as illustrated earlier in Figure 4.1) and are equal to P^s.

In the empirical work of Section V, the model from Figure 4.2 is modified to incorporate both malting-barley markets and feed-barley markets and the interrelationships existing between the two markets. We incorporate several dimensions into our analysis, including the ability of the CWB to vary the selection rates for malting barley. In addition, we account for cases in which the CWB cannot price discriminate within Canada's domestic market.

Summary

A principal argument in support of the CWB is that it can practice price discrimination, producing higher pooled prices and higher RTPs. The amount of revenue that can be generated from price discrimination is a function of the marketplace. Because of the nature of the world barley market, there is little doubt that price discrimination is possible. There may be other reasons why the CWB may be able to increase revenue above what would exist under a multiple-seller marketing system (e.g., Carter 1992). The real test, however, is

whether the CWB has been able to charge different prices in different markets. If the CWB has been able to charge different prices in different markets, how much additional revenue has the CWB been able to generate for its producers? In Section V, we provide evidence that the CWB does price discriminate. Our estimates of the returns to price discrimination by the CWB are based on actual CWB sales-transaction data for the 1995/96 to 2003/04 crop years.

V. EMPIRICAL MODEL AND RESULTS

Introduction

We first present a simple test for market power illustrating that the CWB practices price discrimination when selling Canadian-grown barley. The results of this simple test for market power are based on earlier work by Brooks and Schmitz (1999).[iv] Since previous studies have established that the CWB practices price discrimination when selling barley, we do not test for this again. The following section on market power summarizes the findings of Brooks and Schmitz (1999). We then give a detailed description of the economic model used to measure the effects of price discrimination. We present and discuss the estimated revenue received from the CWB single-desk selling of barley and compare it to the revenue that would exist under a hypothetical multiple-seller marketing system.

Test for Market Power

A key consideration in the debate surrounding feed-barley marketing in Canada is whether or not the CWB can price discriminate in the world market. Carter (1993) tests price discrimination using the Knetter equations' test on data compiled by Statistics Canada. On the basis of this analysis, Carter concludes that there is no evidence that the CWB exercises market power in Canada's feed-barley market. As pointed out earlier, the critical problem with the Carter study is that it utilizes Statistics Canada export-revenue data. These data are inappropriate for this analysis because they reflect CWB published or card prices, and not the actual CWB contract prices. Published or card prices are the prices the CWB publicly offers but not necessarily the prices at which the CWB actually sells barley. As the CWB card prices are the same regardless of destination, Carter's (1993) test results test results indicate that there are no differences in the prices received by the CWB in different markets (i.e., no differential pricing and no market power).

Brooks and Schmitz (1999) provide results on the extent to which the CWB is able to price discriminate in the international feed-barley market using actual 1980/81 through 1994/95 CWB sales-contract data for feed barley. The contract prices for sales made during this period and shipped via Canada's West Coast ports were aggregated on a FOB vessel basis for the following regions: (1) Japan, (2) the United States, and (3) the ROW and sales are aggregated to a weighted-average price per month for each market. The data were not verified universally but Brooks and Schmitz (1999) conducted a random spot check of actual CWB contracts. Each of the selected contract-sales values matched the reported data.

Brooks and Schmitz (1999) take a simple difference between the market prices for every observed sales month over this time period in Japan, the United States, and Canada (i.e., Japan minus United States, Japan minus the ROW, and United States minus the ROW). A mean-difference test is then conducted to examine whether the differences between market prices for crop years 1980/81 to 1994/95 are statistically significant from zero. Of interest is whether the presence of EEP during the intense subsidy grain-trade war period had an impact on the degree of price discrimination by the CWB. For this reason, the test also is run separately on the 1980/81 to 1984/85 and the 1985/86 to 1994/95 crop years.

The results indicate that statistically significant differences exist between the FOB contract prices within the 3 market pairs—Japan and the United States, United States and the ROW, and Japan and the ROW (Table 5.1). This indicates clearly that the CWB uses price discrimination between the markets and that the law of one price does not hold for Canada's feed-barley exports over all time periods tested. The average price difference of $25.29/mt between CWB contract prices for Japan and the United States from crop years 1980/81 to 1994/95 is significant (Table 5.1). The average difference between the CWB contract prices for the United States and the ROW of $4.46/mt is also significant as is the $20.73/mt difference between Japan and the ROW. The average price differences reported above for these 3 market pairs are not comparable directly because the sales data used to derive the above results are not standardized by the date of sale. That is, the dates that the CWB had for sales to Japan and to the United States did not correspond to the timing of sales made to either to the Japan and the ROW market pair or to the United States and the ROW market pair.

Table 5.1: A Test of Market Power on CWB Export Sales of Feed Barley

	Japan – United States	United States - ROW	Japan - ROW
		1980/81 to 1994/95	
FOB price difference ($/mt)	25.29	4.46	20.73
Standard error ($/mt)	1.56	1.95	1.63
T-statistic	16.19*	2.28*	12.70*
Number of observations	49	36	121
		1980/81 to 1984/85	
FOB price difference ($/mt)	1.46	4.32	13.99
Standard error ($/mt)	2.05	1.83	2.81
T-statistic	0.71	2.36	4.97*
Number of observations	3	3	37
		1985/86 to 1994/95	
FOB price difference ($/mt)	26.84	4.47	23.70
Standard error ($/mt)	1.37	2.12	1.92
T-statistic	19.57*	2.10*	12.34*
Number of observations	46	33	84
	Analysis for months with sales to all market segments		
		1985/86 through 1994/95	
FOB price difference ($/mt)	23.86	4.47	28.33
Standard error ($/mt)	1.23	2.12	1.86
T-statistic	19.45*	2.10*	15.23*
Number of observations	33	33	33

*Statistically significantly different than zero with a probability greater than 95%.
Source: Brooks and Schmitz (1999: 319).

To address the issue of the comparability of the results for the 3 market pairs made above, a second set of mean-difference tests was performed using only those months when the CWB made sales to all 3 markets (i.e., Japan, the United States, and the ROW). These results are shown in the bottom section of Table 5.1. Only the results from crop years 1985/86 to 1994/95 are reported in this section of Table 5.1, given that a limited number of observations were available for the 1980/81 to 1984/85 crop years under this restricted data set. Using this data, the average price difference for each of the 3 market pairs was significantly different from zero with an average price difference of $28.33/mt between CWB sales to Japan and the ROW, $4.47/mt between CWB sales to the United States and the ROW, and $23.86/mt between CWB sales to the United States and the ROW.

Also, the ability of the CWB to price discriminate was dependent on the size of the EEP subsidy used by the United States. In the pre-EEP 1980/81 to 1984/85 crop years, the contract prices between Japan and the United States were not significantly different from one another whereas they were during the 1985/86 to 1994/95 crop years (Table 5.1). However, the price difference between Japan and the ROW was statistically significant. The average price difference between CWB sales to Japan and the ROW increased from $13.99/mt pre-EEP to $23.70/mt during the export-subsidy period. The average price difference between CWB sales to Japan and CWB sales to the United States increased from $1.46/mt in the early 1980s to $26.84/mt during the grain-trade war period of 1985/86 to 1994/95. In general, the price difference

for each market pair from crop years 1985/86 to 1994/95 was significantly higher than during the early 1980s, which indicates that the export subsidies of the United States and the European Union had a major impact on the export pricing of Canada's feed barley by the CWB.

In summary, this analysis shows clearly that the CWB uses its market power as a single-desk seller of Canada's malting barley and feed barley for export to price discriminate among markets. Also, the exercising of market power by the CWB increased during the EEP period. Even for the non-EEP period, however, the CWB was still able to price discriminate among markets, but to a lesser extent.

Comparison of the CWB to Multiple Sellers of Canada's Barley

Data Description

The CWB provided detailed contract data on feed-barley sales, 6-row malting-barley sales, and 2-row malting-barley sales from 1995/96 through 2003/04. All prices were brought to a common point FOB basis Vancouver or St. Lawrence. Daily sales data were aggregated into 9 distinct markets and categorized as follows: 1) the Japanese feed-barley market; 2) the U.S. feed-barley market; 3) all other offshore feed-barley markets; 4) Canada's domestic 6-row malting-barley market; 5) the U.S. 6-row malting-barley market; 6) the offshore 6-row malting-barley market; 7) Canada's domestic 2-row malting-barley market; 8) the U.S. 2-row malting-barley market; and 9) the offshore 2-row malting-barley market. Data for Canada's domestic 2-row and 6-row malting-barley markets included only barley consumed domestically. The 2-row and 6-row malting barley that was processed domestically into barley malt and/or beer and was subsequently exported to the United States or offshore, were included as sales to these respective markets. The data for each of the aforementioned 9 markets was aggregated over the crop year from August 1 through July 31 based on the date of sale (this approximates the RTP but does not necessarily match perfectly because of differences between the timing of sales relative to deliveries of grain to the pool). The yearly quantity sold into a particular market was computed as the simple sum of all sales into that market for the crop year. The yearly average price received from each market was computed as the weighted average of all sales into that market over a crop year. The total quantity of barley available for sale in Western Canada in a given crop year was estimated as the total volume of CWB barley sales plus Canada's domestic feed-barley-consumption estimate reported by Statistics Canada.

Theoretical Considerations

A key issue in the debate over barley marketing in Canada is the extent to which the degree of market power exerted by the CWB in world barley markets benefits Western Canada's barley producers. To determine the economic impact of the CWB on Canada's barley producers, we must distinguish between the current pricing behaviour of the CWB and the pricing behaviour that would prevail under an alternative marketing system. We develop two economic models of the international barley-market structure.

The first model considers the behaviour (or objectives) of the CWB with respect to actual sales of Canada's feed barley, 6-row malting barley, and 2-row malting barley in domestic and world markets. The second model considers the behaviour of the above barley sales in Canada if the CWB is replaced by a hypothetical multiple-seller market.

CWB Objectives

The objective of the CWB is to allocate the total quantity of barley it receives from producers in a given crop year across different markets, both domestically and internationally, in order to maximize total revenue. Given the total amount of barley produced in a given year, Canada's barley producers have options: (1) they can sell 6-row barley or 2-row barley as malting barley, in which case they must deliver the barley to the CWB or (2) they can sell 6-row barley or 2-row barley as feed barley, in which case they have the option to deliver the barley to the CWB or to Canada's domestic feed-barley market. Mathematically this objective can be written as

$$\text{Maximize RTP} = TR_{FE} + TR_{6M} + TR_{2M}$$
$$\text{with respect to } Q_1,\ldots,Q_9. \qquad (5.1)$$

In Equation 5.1, TR_{FE} divides the total revenue from Canada's feed-barley-market export sales into Markets 1, 2, and 3; TR_{6M} divides the total revenue from all sales of Canada's 6-row malting barley for malt purposes into Markets 4, 5, and 6; and TR_{2M} divides the total revenue from all sales of Canada's 2-row malting barley for malt purposes into Markets 7, 8, and 9. Q_1 through Q_9 represents the quantity of barley sold into each indexed market, respectively.

When we define $P_1(Q_1),\ldots,P_9(Q_9)$ as the prices received by the CWB for sales into each of the above 9 markets in a given year, Equation (5.1) becomes

$$\text{Maximize RTP} = \sum_{i=1}^{9} P_i(Q_i)Q_i$$
$$\text{with respect to } Q_1,\ldots,Q_9. \qquad (5.2)$$

The price that a farmer eventually will receive for feed barley is determined by the weighted-average price the CWB receives for all feed-barley exports in a given year. In equilibrium, this pooled feed-barley price must be equal to the domestic feed-barley price because if it is not, Canada's barley producers could do better by selling more feed barley into the highest-priced market until the price in that market is driven down to the lower-priced market. Mathematically we express this condition as

$$P_0(Q_0) = \frac{\sum_{i=1}^{3} P_i(Q_i)Q_i}{\sum_{i=1}^{3} Q_i}, \qquad (5.3)$$

in which P_0 is Canada's domestic feed-barley price and Q_0 is Canada's domestic feed-barley consumption. The term on the right hand side represents the pooled price for feed barley, which equals the weighted-average price received by the CWB from: (1) the Japanese feed-barley market; (2) the U.S. feed-barley market; and (3) all other offshore feed-barley markets.

The solution to Equation (5.2) determines the sales behaviour of the CWB. The optimality conditions can be solved simultaneously using the method

of Lagrangian multipliers. Formally, the Lagrangian is written as

$$L = \sum_{i=1}^{9} P_i(Q_i)Q_i + \lambda\left[\bar{Q}_B - \sum_{i=1}^{9} Q_i(P_i) - Q_0(P_0)\right], \quad (5.4)$$

in which Q_B is the total (fixed) quantity of barley delivered to both Canada's domestic market and the CWB in a given year, and λ is the shadow value that measures the additional revenue accruing to Canada's barley producers if they sell one more bushel of barley at the margin. We proceed by assuming that the demand curves in Equation (5.4) take the form

$$P_i(Q_i) = \alpha_i - \beta_i Q_i \text{ for } i = 0,\ldots,9. \quad (5.5)$$

$P_0(Q_0)$, $P_4(Q_4)$, and $P_7(Q_7)$ are Canada's domestic demand curves for feed barley, 6-row malting barley, and 2-row malting barley, respectively. $P_1(Q_1)$ is the Japanese excess demand curve for Canada's feed barley. $P_2(Q_2)$, $P_5(Q_5)$, and $P_8(Q_8)$ are the U.S. excess demand curves for Canada's feed barley, Canada's 6-row malting barley, and Canada's 2-row malting barley, respectively.

$P_3(Q_3)$, $P_6(Q_6)$, and $P_9(Q_9)$ are the excess demand curves in the ROW for Canada's feed barley, Canada's 6-row malting barley, and Canada's 2-row malting barley, respectively. These curves contain implicitly the effects of domestic agricultural policies and export subsidies of foreign competitors (e.g., the European Union, Australia, and the United States), and the reactions of these competitors to Canada's sales decisions.

Under the above assumptions, the first-order conditions can be derived from Equation (5.4) and Equation (5.5).

It is perhaps simplest to start with the malting-barley markets (Market 4 through Market 9). The first-order conditions in each of these markets can be derived by taking the first derivative of the Lagrangian with respect to Q_i and by setting the expression equal to 0. In simplified form, these conditions are

$$\lambda = SMR_i = \alpha_i - 2\beta_i Q_i$$
for malting-barley markets $i = 4,\ldots,9$, (5.6)

in which SMR_i refers to the standard marginal-revenue curve derived from a linear demand curve.

Now consider the markets for Canada's feed barley (Market 0 through Market 3). The CWB has indirect control over only the total quantity of barley available in the pool because it is not a single-desk seller with respect to the domestic feed-barley market. In addition, it is constrained by the fact that it must sell all of the barley delivered to the pool and by the fact that there is only a certain amount of Canada's barley produced in a given year. This constraint can be taken into account by taking the first derivative of the Lagrangian with respect to λ and setting the expression equal to 0. Mathematically, this condition is expressed as

$$\bar{Q}_B = \sum_{i=1}^{9} Q_i(P_i) - Q_0(P_0). \quad (5.7)$$

Under this constraint, the first-order conditions of the CWB in Market 1

through Market 3 can be derived by taking the first derivative of the Lagrangian with respect to Q_i. In simplified form, these conditions are

$$\lambda = \frac{SMR_i}{1 + \frac{P_0(Q_0) - SMR_i}{\beta_0 \sum_{i=1}^{3} Q_i}}, \qquad (5.8)$$

in which,

$$P_0(Q_0) = \frac{\sum_{i=1}^{3} P_i(Q_i) Q_i}{\sum_{i=1}^{3} Q_i} \qquad (5.9)$$

is the weighted-average price or pooled price $P_0(Q_0)$ the CWB receives for Canada's feed-barley exports that, in equilibrium, must be equal to Canada's domestic feed-barley price. In Equation (5.8), if the bottom expression is equal to 1 it implies that $P_0(Q_0)$ is equal to the standard marginal revenue condition for a price-discriminating monopolist, the CWB objective with respect to feed-barley export markets will be the same in Market 1 through Market 3 as it is for the malting-barley in Market 4 through Market 9. In general, however, this is not the case. It is important to recognize that the CWB does not maximize the RTP with respect to farmers' sales into the domestic feed-barley market directly.

In summary, the equilibrium conditions across all barley markets in the presence of the CWB are the solutions to the simultaneous system of equations given in Equation (5.5) through Equation (5.9). Eliminating the constant λ and assuming that the intercept parameters α_i and slope parameters β_i are known, the resulting system contains 9 equations and 9 unknowns. The 9 unknowns are the quantities of barley sold into Market 1 through Market 9 that have the quantity sold into Canada's domestic feed-barley market (Market 0) determined endogenously. This system of equations, which defines the behaviour of the CWB in the world marketplace, is different from the system of equations that defines the behaviour of a pure monopolist operating across all 10 markets (Market 0 through Market 9) in 2 important ways: (1) the CWB is constrained by the total quantity of barley available in a given year. A pure monopolist would choose the optimal quantity of barley produced, as well as the optimal allocation of that quantity across all markets; (Equation 5.7), and (2) the CWB does not maximize revenue across all 10 markets. A pure price-discriminating monopolist sets marginal revenue equally across all markets, including Canada's domestic feed market, in which case the system of equations would look like Equation (5.6), but would hold across all 10 markets, (i.e., $i = 0,\ldots,9$).

In general, the intercepts and slopes are unknown and they may vary from year to year. However, using actual CWB sales data for crop years 1995/96 to 2003/04, and using actual domestic feed-barley consumption data provided by Statistics Canada, one can derive indirectly these parameters by working backwards. That is, given the actual prices and quantities in Market 1 through Market 9, and given the total quantity of barley produced in Canada in a given year, one can infer these parameters using the system of equations defined by Equations (5.5) through (5.9).

The elasticity of demand for Canada's barley into a given market is defined as the percentage change in the marginal quantity of Canada's barley sold into that market, a percentage change in the price of barley in that market. Given the demand curves defined by Equation (5.5), the elasticity of Canada's barley into market i is

$$\varepsilon_i = \frac{\partial Q_i}{\partial P_i}\frac{P_i}{Q_i} = -\frac{P_i}{\beta_i Q_i}.$$

In addition, the intercept parameter α_i for market i can be recovered from the price P_i and the elasticity ε_i through the relationship $\alpha_i = P_i(1-1/\varepsilon_i)$.

Using these elasticity relationships and inserting them into Equations (5.5) through Equation (5.9) gives the following system of equations, the solution to which will determine the demand elasticity for Canada's barley sold in each market

$$P_0 = \frac{\sum_{i=1}^{3} P_i Q_i}{\sum_{i=1}^{3} Q_i} \text{ for market 0.} \qquad (5.10)$$

$$\lambda = \frac{P_i(1+1/\varepsilon_i)}{1+\frac{\varepsilon_0 Q_0}{P_0\sum_{i=1}^{3} Q_i}[P_i(1+1/\varepsilon_i)-P_0]}$$

for markets $i = 1,\ldots,3.$ (5.11)

$\lambda = P_i(1+1/\varepsilon_i)$ for markets $i = 4,\ldots,9.$ (5.12)

The above system contains only 10 equations but has 12 unknowns. Thus, two demand elasticities for any 2 markets must be provided exogenously in order to solve the system.

Multiple Seller Objectives

To measure the impact of a multiple-seller marketing system on barley prices and quantities in Canada, a comparison must be made between the market structure that has been observed under the influence of the CWB, and the prices and quantities that could have existed if the market had multiple sellers. Given a fixed supply of total Canadian barley in any given year, and in the absence of additional distributional constraints with respect to the availability of feed barley, 6-row malting barley, and 2-row malting barley in that year, the law of one price must hold for all sales of Canada's barley into all markets under a multiple-seller equilibrium. As the theory discussed earlier illustrates, multiple sellers are assumed to behave in a perfectly competitive fashion with respect to sales of Canada's barley, and this competition results in one market price for all buyers at any point in time, which is a characteristic of all competitive markets. Kraft et al. (1996) described the law of one price as follows:

> In a market that does not have barriers to entry or exit, only one price will clear the market at any particular point in time, and all participants in that market (whether they are buyers or sellers) will have to meet that price. Markets that are separated by distance will have a transport cost that will reflect the cost of moving the product between

areas. Similarly, if the product moves from one currency to another then the exchange rate difference will be present in the market. If situations ever exist such that prices are different by more than the cost of freight, or exchange rate conversions, arbitrage quickly takes place to move prices back in line.

One way to think of the "law of one price" is to suppose that the United States is exporting wheat to a country at $100 per mt free on board (FOB) out of the Gulf ports and this is the lowest price market serviced by the United States. This means that in the absence of the EEP, a grain company is able to source grain in the interior of the United States, and transport it to the Gulf port, such that it can sell it for $100 per mt and not lose money. If one company can do this, then all companies in the same area must also offer grain out of the Gulf ports at $100 per mt. Many customers would likely be willing to pay more than the $100 per mt, but they do not have to given the sellers will compete for all the business they can get at the $100 per mt level. No buyer need pay more and no buyer can pay less. Prices only vary by quality and transportation costs between regions. This is essentially how all competitive markets operate and how the U.S. grain market operated prior to the introduction of EEP. (28–29)

In the absence of constraints placed on Canada's quantity of 6-row malting barley and 2-row malting barley available for sale as barley malt, the objectives underlying the behaviour of multiple sellers under perfect competition can be specified as

$$\text{Maximize } TR = \sum_{i=0}^{9} P_i(Q_i)Q_i$$

$$\text{with respect to } Q_i \text{ for all } i = 0,\ldots,9, \tag{5.13}$$

Subject to:

$$\text{supply constraint:} \quad \bar{Q}_B = \sum_{i=0}^{9} Q_i(P_i) \tag{5.14}$$

$$\text{feed arbitrage:} \quad \left[P_{\neg_i}(Q_i) - P_j(Q_j)\right] \cdot Q_i = 0 \text{ for all } i, j \in \{0,\ldots,3\} \tag{5.15}$$

$$\text{6-row arbitrage:} \quad \left[P_{\neg_i}(Q_i) - P_j(Q_j\right] \cdot Q_i = 0 \text{ for all } i, j \in \{4,\ldots,6\} \tag{5.16}$$

$$\text{2-row arbitrage:} \quad \left[P_{\neg_i}(Q_i) - P_j(Q_j)\right] \cdot Q_i = 0 \text{ for all } i, j \in \{7,\ldots,9\} \tag{5.17}$$

$$\text{6-row cross arbitrage: } P_i(Q_i) + \Delta = P_j(Q_j), i \in \{0,\ldots,3\} \text{ and } j \in \{4,\ldots,6\} \tag{5.18}$$

$$\text{2-row cross arbitrage: } P_i(Q_i) + \Delta = P_j(Q_j), \; i \in \{0,\ldots,3\} \text{ and } \; j \in \{7,\ldots,9\} \tag{5.19}$$

in which Δ is an exogenous parameter that captures the average cost difference between growing feed barley and growing malting barley. Notice that unlike the objectives of the CWB in Equation (5.1), the objective of multiple sellers in Equation (5.13) involves the allocation of Canada's barley across all

The solution to the above set of mathematical equations, which approximates the behaviour of the CWB, can be used in order to estimate demand parameters in the potential markets for CWB barley (Schmitz et al. 1997). One can infer these parameters by specifying two price elasticities of demand for Canada's barley in any two arbitrary markets and by solving for an equilibrium in the remaining markets. The price elasticity of demand for Canada's barley into a given market is defined as the percentage change in the quantity of Canada's barley sold into that market, which results from a percentage change in the price of barley in that market. In this study, the authors' specify a fixed-price elasticity of demand for Canada's feed barley in the ROW in each year.

However, in order to derive the intercept and slope of the demand equations in the remaining markets, we must also specify the price elasticity of demand for Canada's feed barley in the domestic market. In the model described below, the price elasticity of demand for Canada's feed barley in the domestic market is adjusted in each year, which is based on corn imports using the procedure described below.

In the model developed and estimated by Schmitz et al. (1997), the price elasticity of demand for Canada's feed barley in the domestic market was fixed at -0.53 for crop years 1985/86 to 1994/95. This -0.53 elasticity was taken from estimates in a previous paper developed by Schmitz and Koo (1996). Canada's corn imports were much lower from 1985/86 to 1994/95 when compared to the imports in the 1995/96 to 2003/04 crop years (Figure 5.1). The existence of large volumes of corn imports (especially in 2001/02 and 2002/03) has a significant impact on the price elasticity of demand for Canada's feed-grain market because corn can be used as a substitute for feed barley in most instances. The years that corn imports were extremely high are correlated with the years in which feed-barley exports were extremely low (Figure 5.1).

In the years Canada imports large quantities of feed corn, small changes in quantities of feed barley sold in Canada's domestic market have almost a negligible impact on Canada's domestic price for feed grain, because the United States has an extremely high volume of corn to export on the world market. From Canada's perspective, the price elasticity of Canada's domestic demand for U.S. feed-corn exports is extremely elastic during time periods when the United States exports large quantities of corn to Canada, because small changes in the amount of feed barley sold will have a negligible effect on the price of feed grains sold into Canada's market under these same circumstances.

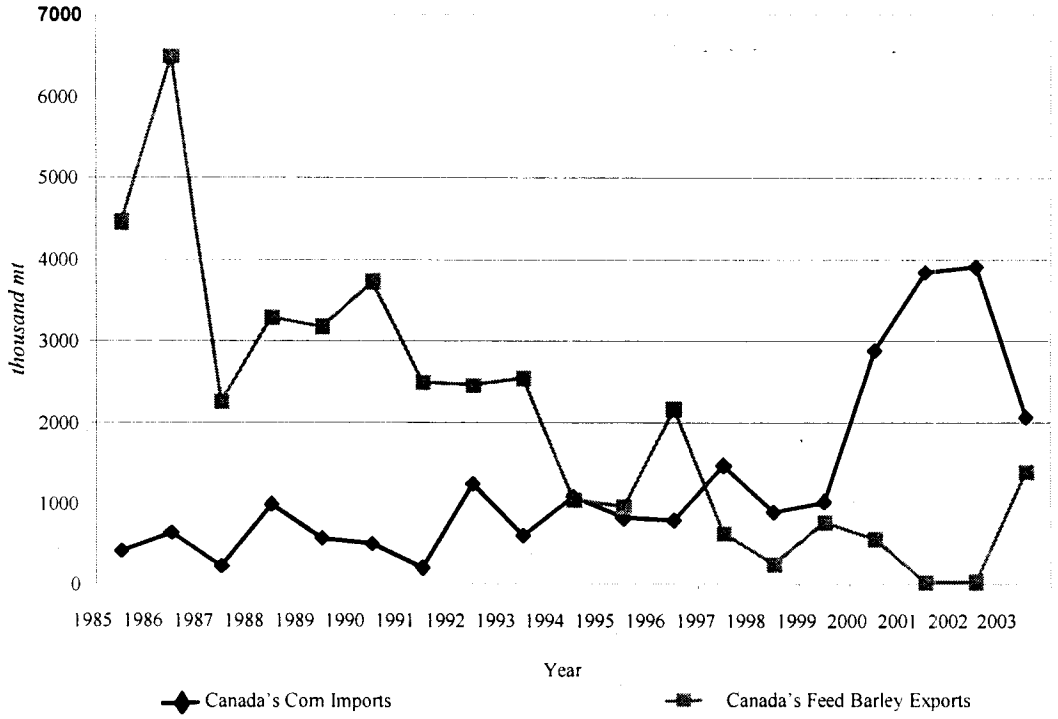

Figure 5.1: Canada's Feed-Barley Exports vs. Canada's Corn Imports, 1985/86 to 2003/04
Source: CWB (1995 to 2003/04).

In the following analysis, the price elasticity of domestic demand for Canada's feed barley is specified as a linear function of corn imports from the United States. Specifically, only two points are required in order to recover the intercept and slope parameters of a line. In the base model, the first point is specified as the 9-year average (646,400 mt) of Canada's corn imports from the United States from 1998/96 to 2003/04 along with the corresponding price-demand elasticity for feed barley of –0.53 from Schmitz et al. (1997). The second point is specified as the two-year average (3,874,000 mt) of Canada's corn imports during 2001/02 and 2002/03 that were years in which only negligible amounts of feed barley were exported from Canada along with a corresponding price demand elasticity of –20.0 that represents a highly elastic feed market and is also the same value that is used for the price elasticity of demand for Canada's feed-barley exports to the ROW. Once the intercept and slope of this line have been derived, the price elasticity of domestic demand for Canada's feed barley in each year is specified explicitly as an increasing function of the quantity of corn imported by Canada from the United States in that year.

Results Under the CWB Market Structure

For purpose of illustration, we provide the derived elasticities resulting from the above model for the 2000/01 crop year (Table 5.2). For the base case, the elasticity of excess demand for Canada's feed barley in the ROW is assumed to be

-20.0 in every year. This value is reasonable given that the CWB does not have a large effect on the price in that market because of the sizeable quantities of feed barley sold by its competitors. In Table 5.2, the price elasticity of domestic demand for Canada's feed barley, which is adjusted based on corn imports as described above, becomes -13.96. This elasticity is associated with the 2000/01 U.S. corn imports of 2.87 mmt.

It is assumed that the Canada's domestic feed-barley price is equal to the weighted-average price from Japan, the United States, and the ROW (Table 5.2). The 10 markets available to Canada's barley producers are listed in Table 5.2, Column 1. The CWB sells into all of the markets shown in Table 5.2, Column 1, but feed barley sales into the domestic market are negligible.[v] The weighted-average FOB price received by the CWB in each market is shown in Table 5.2, Column 2. The quantity sold by the CWB into each market in 2000/01 is shown in Table 5.2, Column 3. The RTP that accrued to the CWB in 2000/01 is shown in Table 5.2, Column 4. It is clear that the CWB was able to price discriminate across feed markets, 6-row malting-barley markets and 2-row malting-barley markets. For example, the difference between the feed price received by the CWB in Japan and the ROW was $15.04/mt. The difference between the 6-row malting-barley price received by the CWB in Canada and the ROW was $5.94/mt. The difference between the 2-row malting-barley price received by the CWB in the United States and the ROW was $19.83/mt. The weighted-average price received by the CWB in 2000/01 for each type of barley is shown at the bottom of Table 5.2. The CWB/RTP prices received by the CWB were $151.49/mt for feed barley, $210.15/mt for 6-row malting barley, and $224.13/mt for 2-row malting barley.

Now consider Table 5.2, Column 5, which shows the demand elasticities generated by Equation (5.1) to Equation (5.6). Notice that the elasticity of demand for Canada's feed barley in the United States was -18.31 in 2000/01 and the elasticity of demand for Canada's feed barley in Japan was -7.18. The elasticities for the malting-barley markets are all around -1.03, which seems plausible given the fact that they are excess demand elasticities into individual markets for Canada's malting barley only. The elasticities do not include, for example, Australia's malting-barley exports. Hence a change in the price of Canada's malting barley in a certain market affects the quantity of Canada's malting barley sold into the market more severely than does the quantity of all malting barley sold by all exporting countries into that market. In addition, the price elasticity of demand for Canada's sales of malting barley in different markets is much lower under a multiple-seller market structure because the volume of barley sold for use as malting barley will likely increase.

Table 5.2: Barley Markets under the CWB in 2000/01

Market	FOB Price	Quantity Sold	Market Revenue	Demand Elasticity
	CDN $/mt	*thousand mt*	*CDN $ million*	
		Feed-Barley Markets		
Japan	160.19	241	39	−7.18
United States	145.86	7	1	−18.31
Rest of the World	145.15	324	47	−20.00
Canada Domestic	151.49	10,179	1,542	−13.96
		6-Row Malting-Barley Markets		
Canada Domestic	208.35	83	17	−1.03
United States	209.25	531	111	−1.03
Rest of the World	214.29	152	32	−1.03
		2-Row Malting-Barley Markets		
Canada Domestic	218.95	229	50	−1.03
United States	239.36	452	108	−1.03
Rest of the World	219.53	1,237	272	−1.03
		Totals		
Feed-Barley Exports	151.49	571	87	−14.58
All Feed	151.49	10,750	1,629	−13.99
6-row Malting Barley	210.15	765	161	−1.03
2-row Malting Barley	224.13	1918	430	−1.03
All Barley	165.20	13,433	2,219	−1.40

The elasticity of demand for Canada's feed barley in the rest of the world is set at −20.0.
The malting-barley price remains at a $15/mt premium to feed barley.
Source: Authors' calculations.

Results under a Multiple-Seller Market Structure

To measure the impact of a multiple-seller market structure on barley prices and quantities in Canada, we compare the market structure observed under the influence of the CWB and the prices and quantities that would have existed if the market had multiple sellers. As discussed earlier, the law of one price must hold for all sales of Canada's barley into all markets under a multiple-seller equilibrium. That is, under multiple sellers, feed barley sold into all 4 feed markets would be sold for the same price, 6-row malting barley sold into all three 6-row markets would be sold for the same price, and 2-row malting barley sold into all three 2-row markets would be sold for the same price. As discussed earlier, we assume that the price of malting barley remains at a premium to feed barley, given the additional management and costs required to grow malting barley and the lower yield of malting-barley varieties relative to feed-barley varieties in some areas of Western Canada.

Given the elasticities for the excess demand curves in each of the barley markets available to the CWB (Table 5.2, Column 5) the prices and quantities that would have resulted under a multiple-seller market structure in each year can be estimated. We provide the results of the multiple-seller market structure in the 2000/01 crop year (Table 5.3). Under the multiple-seller market

structure, the equilibrium market price for all sales of Canada's feed barley would have been $151.96/mt, the price received for sales of 6-row malting barley would have been $166.96/mt, and the price received for sales of 2-row malting barley would have been $166.96/mt.

Table 5.3: Barley Markets under Multiple Sellers in 2000/01

Market	FOB Price	Quantity Sold	Market Revenue	Demand Elasticity
	$/mt	*thousand mt*	*$ million*	
		Feed-Barley Markets		
Japan	151.96	329	50	−4.98
United States	151.96	2	0	−81.41
Rest of the World	151.96	20	3	−340.32
Canada Domestic	151.96	9,737	1,480	−14.63
		6-Row Malting-Barley Markets		
Canada Domestic	166.96	99	17	−0.68
United States	166.96	642	107	−0.68
Rest of the World	166.96	186	31	−0.65
		2-Row Malting-Barley Markets		
Canada Domestic	166.96	285	48	−0.63
United States	166.96	592	99	−0.55
Rest of the World	166.96	1,541	257	−0.63
		Totals		
Feed-Barley Exports	**151.96**	**351**	**53**	**−24.38**
All Feed	**151.96**	**10,088**	**1,533**	**−14.97**
6-row Malting Barley	**166.96**	**927**	**155**	**−0.67**
2-row Malting Barley	**166.96**	**2,418**	**404**	**−0.61**
All Barley	**155.70**	**13,433**	**2,092**	**−11.40**

The elasticity of demand for Canada's feed barley in the Rest of the World is set at −20.0.
The malting-barley price is assumed to retain a minimum of a $15/mt premium to feed barley in the multiple seller environment.
Source: Authors' calculations.

In equilibrium in the multiple-seller market structure in 2000/01, 6-row malting-barley sales would have been 927,000 mt and 2-row malting-barley sales would have been 2.418 mmt. Malting-barley sales in 2000/01 would have been higher in the multiple-seller market structure than under the CWB, and malting-barley prices would have dropped in the multiple-seller market structure (Table 5.3). This implies lower demand elasticities for Canada's malting barley in the multiple-seller market structure (e.g. –0.63 for the Canada's domestic 2-row malting-barley demand elasticity in Table 5.3, Column 5). In addition, the drop in the price received by Canada's producers for exports of feed barley to Japan in the multiple-seller market structure in 2000/01would have reduced the Japanese excess demand elasticity for Canada's feed barley to –4.98. However, the increase in feed-barley prices received from CWB sales to the United States in 2000/01 would have increased the excess demand elasticities for Canada's barley in those markets.

Impact of Replacing the CWB with Multiple Sellers

We present the impact on prices and revenue of replacing the CWB with multiple sellers of feed barley, 6-row malting barley and 2-row malting-barley prices for each year from 1995/96 to 2003/04 (Table 5.4). The results in Table 5.4 assume that the price elasticity of demand for Canada's feed barley in the ROW is fixed at –20 each year and that the price elasticity of domestic demand for Canada's feed barley is adjusted based on corn imports and varies between –0.53 and –20.0.

First, consider the 6-row malting-barley market prices (Table 5.4, Column 3). The annual average price increase earned by the CWB for 6-row malting barley relative to what the multiple-seller market structure would have been from crop years 1995/96 to 2003/04 is $35.25/mt. We computed this number as the simple average of the difference in the RTP price of 6-row malting barley under the CWB market structure versus the equilibrium price of 6-row malting barley generated by the multiple-seller market. For example, the 2000/01 price difference is $43.19/mt and is equal to the difference between the RTP price of 6-row malting barley under the CWB and the weighted-average price of 6-row malting barley under the multiple-seller market structure. The CWB market structure relative to the multiple-seller market structure is estimated to have captured higher prices on sales of 6-row malting barley in all years except 1995/96.

Table 5.4: Impact of Replacing the CWB Marketing System with Multiple-Sellers 1995/96 to 2003/04

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	4.23	0.48	(34.27)	(21)	−1.57
1996/97	1.47	(18.59)	(41.21)	(43)	−1.43
1997/98	1.06	(43.59)	(44.70)	(88)	−5.51
1998/99	2.33	(49.30)	(26.75)	(42)	−2.02
1999/00	1.62	(60.96)	(45.64)	(78)	−2.80
2000/01	0.47	(43.19)	(57.17)	(128)	−13.96
2001/02	0.26	(24.39)	(32.27)	(51)	−19.82
2002/03	0.28	(57.45)	(61.82)	(48)	−20.18
2003/04	0.36	(20.27)	(19.64)	(33)	−9.08
Average	1.34	(35.25)	(40.39)	(59)	−8.48

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at −20.0.
The malting-barley price is assumed to retain a minimum of a $15/mt premium to feed barley in the multiple seller environment..
Source: Authors' calculations.

Consider the 2-row malting-barley market prices (Table 5.4, Column 4). The calculated annual average price difference between the CWB market structure and the multiple-seller market structure on sales of 2-row malting barley for the 1995/96 through 2003/04 periods is $40.39/mt. Relative to multiple sellers, the CWB is estimated to have captured higher prices in 2-row malting-barley markets in every year considered here. The lowest price advantage for 2-row malting barley is $19.64/mt in 2003/04 and the highest price advantage was $61.82 in 2002/03.

The impact on producer revenue from replacing the CWB with multiple sellers of Canada's barley is given in Table 5.4, Column 5. For example, the introduction of multiple sellers of Canada's feed barley and malting barley in 2000/01 would have caused Canadian barley producers to lose $128 million in total revenue. Over the 1995/96 to 2003/04 crop years, the introduction of multiple sellers would have resulted in an annual average loss of $59 million in revenue accruing to Canada's barley producers. Multiple sellers of Canada's barley would have caused losses in revenue to Canada's barley producers in every year considered here.

When adjusted for the varying levels of corn imports, the price elasticity of the domestic demand for Canada's feed barley, adjusted based on corn imports when the elasticity is allowed to vary between −0.53 and −20.0 (Table 5.4, Column 6). Canada's corn imports were relatively low from 1995/96 to 1999/2000, which is reflected in the table by demand elasticities ranging from −1.43 to −5.51. However, Canada's corn imports were relatively high from crop years 2000/01 to 2003/04 as reflected by demand elasticities that

range from –9.08 to –20.18 throughout that same period.

Sensitivity analyses were performed using different values for the price elasticity of demand for Canada's feed barley in the ROW and the price elasticity of domestic demand for Canada's feed barley. The results of these analyses are provided in the Appendices, Table B.1, Table B.2, and Table B.3. The price impact from introducing multiple sellers of Canada's barley under an elasticity of demand for Canada's feed barley in the ROW of –5.0 is provided in Table B.1. The price impact from introducing multiple sellers of Canada's barley under an elasticity of domestic feed-barley demand allowed to vary between –0.53 and –5.0 is provided in Table B.2. The price impact from introducing multiple sellers of Canada's barley under an elasticity of demand for Canada's feed barley in the ROW of –5.0 and an elasticity of domestic feed-barley demand allowed to vary between –0.53 and –5.0 is provided in Table B.3. Over the 1995/96 to 2003/04 crop years, the introduction of multiple sellers would have resulted in an annual average loss of between $36 million and $58 million in revenue accruing to Canada's barley producers under these different scenarios.

The change in barley-trade-flows under the replacement of the CWB by multiple sellers of barley in each year from 1995/96 through 2003/04 is shown in Table 5.5. In most years, multiple sellers would have sold more of the marginal barley into the 6-row and 2-row malting-barley markets than the CWB would have sold. If available, multiple sellers would have reallocated some barley that the CWB sold as feed barley into the malting-barley markets because they could receive a higher price for malting barley.

Table 5.5: Trade Flows under Multiple Sellers 1995/96 to 2003/04

Crop Year	Domestic Feed Barley Consumption	Export Feed Barley Sales	6-Row Malting Barley Sales	2-Row Malting Barley Sales
	thousand mt			
1995/96	(262)	(302)	(7)	570
1996/97	(111)	(620)	188	543
1997/98	(380)	(124)	133	370
1998/99	(334)	(45)	125	255
1999/2000	(304)	(273)	161	417
2000/01	(442)	(220)	162	500
2001/02	(240)	4	42	195
2002/03	(203)	12	49	141
2003/04	(151)	(84)	42	194
Average	(270)	(184)	99	354

Source: Authors' calculations.

However, this increase in the volume of malting-barley sales into the malting-barley markets would have decreased the malting-barley price because of the relatively inelastic nature of malting-barley demand. At the same time, the

decrease in the sales of feed barley in the feed-barley markets would have increased the price of feed barley. This additional flow of malting barley would have reduced the malting-barley price to the point where the total revenue received by Canada's barley producers would have been lower than that under the CWB (Table 5.2 and Table 5.3). For example, on average, over the 1995/96 through to 20034/045 crop years, multiple sellers would have exported on average 270,000 mt less feed barley than did the CWB. They would have increased the average amount of 6-row malting barley sold by 99,000 mt and increased the average amount of 2-row malting barley by 354,000 mt. However, overall revenue would have been on average $59 million lower.

The quantity of barley selected for malt purposes under the CWB versus what would have been selected under a multiple-seller marketing system is shown in Table 5.6. All numbers are given as selection rates and are in percentage units. The selection rate shown in Table 5.6 is equal to the amount of Canada's 6-row or 2-row barley sold as malting barley and is shown as a percentage of the entire production of all Canada's barley in a given year.

Consider a year such as 2000/01 (see also Table 5.3 and Table 5.4), in which the CWB sold 5.7% of all Canada's barley as 6-row malting-barley. Under a multiple-seller marketing system, 6.9% of all Canada's barley would have been sold for 6-row malting-barley purposes. Also in 2000/01, the CWB sold 14.28% of all Canada's barley a 2-row malting barley. Under a multiple-seller marketing system, 18% of all Canada's barley would have been sold as 2-row malting barley. In the absence of quality data for the 1995/96 to 2003/04 crop years, it cannot be determined whether or not there actually was enough marginal barley that could have been sold for malt purposes as 6-row or 2-row malting barley.

Sensitivity analyses were performed in which the malting-barley-selection rate for 6-row and 2-row barley under multiple sellers was constrained so that they could not exceed 110% of their original value. This was accomplished by replacing constraints (5.18) and (5.19) with constraints (5.20) and (5.21), respectively. Thus multiple sellers were allowed only an increase of 10% in the amount of 6-row and 2-row malting barley originally sold by the CWB that could be sold for malt purposes. These two constraints result in different prices for feed barley, 6-row malting barley, and 2-row malting barley. However, the law of one price still holds within each of the markets. That is, under a multiple-seller marketing structure, feed barley sold into all 4 feed markets would be sold for the same price under multiple sellers, 6-row malting barley sold into all three 6-row markets would be sold for the same price under multiple sellers, and 2-row malting barley sold into all three 2-row markets would be sold for the same price under multiple sellers

Table 5.6: Malting-Barley Selection Rates 1995/96 through 2003/04

Crop Year	6-Row Malting Barley		2-Row Malting Barley	
	CWB Selected	Multiple Sellers	CWB Selected	Multiple Sellers
	%			
1995/96	6.18	6.13	16.09	20.37
1996/97	5.93	7.28	9.78	13.68
1997/98	4.73	5.70	13.01	15.73
1998/99	4.06	5.06	13.94	15.97
1999/00	3.90	5.16	12.59	15.85
2000/01	5.70	6.90	14.28	18.00
2001/02	3.63	4.01	13.50	15.30
2002/03	3.03	3.67	8.32	10.16
2003/04	2.93	3.27	14.05	15.67

The selection rate equals the amount of 6-row or 2-row barley sold as malting barley and is shown as a percentage of the entire production of all Canada's barley in a given year.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at –20.0.
The malting-barley price is assumed to retain a minimum of a $15/mt premium to feed barley in the multiple seller environment.
The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –1.43 and –20.2.
Source: Canadian Wheat Board.

The results of the sensitivity analyses are provided in Table B.4 and Table B.5. In Table B.4, the multiple-seller-selection rates are restricted and it is assumed that the elasticity of demand for Canada's feed barley in the ROW is set at –20.0. In Table B.5, the multiple-seller-selection rates are restricted and it is assumed that the elasticity of demand for Canada's feed barley in the ROW is set at –5.0. Over the 1995/96 through 2003/04 crop years, the introduction of multiple sellers would have resulted in an annual average loss of between $17 million and $28 million in revenue accruing to Canada's barley producers under these different scenarios.

Multiple Sellers: 1995/96 to 2003/04 Versus 1985/86 to 1994/95

The impact of replacing the CWB with multiple sellers of Canada's barley as estimated by Schmitz et al. (1997) for the 1985/86 to 1994/95 crop years are reproduced in Table 5.7 for comparison purposes. On average, over the 1985/86 to 1994/95 crop years, the revenue to producers of Canada's barley would have been reduced by $72 million per year under multiple sellers of Canada's barley. This number is higher than the $59 million per year estimated for the 1995/96 to 2003/04 crop years in this study (Table 5.4).

Table 5.7: Impact of Introducing Multiple Sellers on Canada's Feed-Barley and Malting-Barley Prices and on Total Canadian Producer Revenue, 1985/86 to 1994/95

Crop Year	Feed Barley Price	6-Row Malting-Barley Price	2-Row Malting-Barley Price	Total Producer Revenue[1]
	$/mt			*$ million*
1985/86	(4.91)	(95.70)	(80.93)	(104)
1986/87	(4.46)	(63.16)	(30.08)	(96)
1987/88	(11.36)	(84.08)	(13.18)	(156)
1988/89	1.10	(72.63)	(59.20)	(35)
1989/90	0.86	(37.18)	(47.90)	(19)
1990/91	(7.89)	(28.28)	(2.50)	(102)
1991/92	(8.20)	(9.48)	(19.54)	(99)
1992/93	(4.68)	(12.50)	(36.05)	(66)
1993/94	(2.62)	1.23	(16.05)	(48)
Average	**(3.56)**	**(42.05)**	**(34.09)**	**(72)**

Note: Brackets indicate a loss for multiple sellers.

[1]Includes the impact on the domestic feed barley market.

Base Case:

Assumes the elasticity of demand for Canada's feed barley in the Rest of the World is –20.0.

Assumes that Canada's domestic feed-demand elasticity is –0.53.

Assumes the malting-barley price remains at a $15/mt premium to feed barley.

Source: Authors' calculations.

There are three major reasons for the differences between the two studies: (1) Canada was a significant net importer of feed grains (barley and corn combined) in several years over the 1995/96 to 2003/04 crop years (especially 2001/02 and 2002/03) whereas Canada was not a net importer of feed grains during any year over the 1985/86 to 1994/95 crop years; (2) there are several years over the 1995/96 to 2003/04 crop-year period in which the ROW feed-barley-export market was not the lowest priced market. This was not the case for the 1985/86 to 1994/95 crop years, which could have implications for the results due to the fact that the price elasticity of demand for Canada's feed barley exports to the ROW is set at a relatively high level (i.e., –20.0 used in the base results); (3) the lack of EEP subsidies by the United States in the 1995/96 to 2003/04 crop years diminishes the ability of the CWB to price discriminate (i.e. the CWB market structure can add more value relative to a multiple-seller market structure when EEP is being used).

Model Limitations

The model estimates are consistent with the assumptions used to represent the reality of the domestic and international barley market. However, these assumptions can also be viewed as limitations to our study. Before discussing the limitations, two important points are worth noting: (1) our analysis does not have benefits that Canada's producers would have received when sales returns from the government's guarantee on initial payment, less costs of marketing, would have been below the initial payment made by the CWB. For the 1995/96 to 2003/04 crop years, there were no deficits in the CWB barley account; and (2) we do not have to account for credit guarantees, since over period of the study, there were few or no guarantees placed on CWB barley sales:

- The aggregation of sales data into only 10 market segments biases downwardly our estimates of the benefits from market power exerted by the CWB.

- Supply responses under alternative market structures were not integrated into this analysis. However, if we had allowed a supply response by Canada's producers, total production would have decreased under a multiple-seller marketing system in most years. The decrease in production would have lowered the amount of barley available for sale by multiple sellers, which would have decreased export revenue even further.

- The difference in price observed across all markets, except in the domestic feed-barley market, represent a CWB revenue-maximizing strategy. It is assumed that the CWB had knowledge of how competitor prices would have responded to additional quantities offered for sale in each market, and that it uses this information in its sales decisions.

- The inverse demand functions are approximated as linear over the range of actual and simulated competitive prices and quantities. If the actual demand functions had been nonlinear, there would have been small changes (either positive or negative) in the calculated differences between the model results and the actual outcomes.

- The timing of sales throughout the year is assumed to be the same as that which would have occurred in a multiple-seller environment. Both the gains and losses that could have accrued under different timing of sales were not captured in the analysis.

- The empirical analyses do not account for the potential interest lost by those producers receiving an initial payment from the CWB and then were forced to wait up to 18 months to receive their final payment. The advent of a multiple-seller marketing system would have allowed all producers to receive immediate full payment, similar to those producers that currently sell off-Board feed barley. Our estimates of the benefits of market power exerted by the CWB are biased upwardly due to the exclusion of this loss of potential interest on the farmers' money.

- It is assumed that the price elasticity of domestic demand for Canada's feed barley is a linear function of Canada's corn imports. These elasticities range between –0.53 and –20.0. If the actual relationship between the price elasticity of domestic demand for Canada's feed-barley and corn imports were nonlinear, there would have been small changes (either positive or negative) in the calculated differences between the model results and the actual between the model results and the actual outcomes.

VI. CWB SINGLE-DESK SELLING WITH ANNUAL POOLING

Section V identified the additional revenue from barley sales that the CWB was able to derive from the marketplace through price discrimination for crop years 1995/96 to 2003/04. However, there remains the issue of added costs associated with the CWB as a single-desk seller marketing system. Carter (1993) and Stickland (1996) identify price pooling and the lack of a clear price signal as costs to Western Canada's feed-grain industry. Also, Carter and Loyns (1996) state that the added costs due to the single-desk selling of barley by the CWB are roughly $37/mt. These cost estimates are examined at length by Schmitz et al. (1997) and by Schmitz and Furtan (2000), who find these added costs have been grossly exaggerated, and that many of the estimated costs would exist even in the absence of the CWB.

In Section VI, we discuss the degree of variability in feed-barley prices between Canada and the United States. Also, we present absolute price differences for feed-barley prices in both countries and show that Canada's feed-barley prices are consistently higher than are those in the United States. We then discuss the importance of Canada's feed-grain imports and provide an analysis of CWB barley marketing during the extreme drought of 2002 that affected barley marketing for the 2002/03 crop year.[vii]

Price Variability in Feed-Barley Markets

From a livestock-producer's perspective, the impact of the CWB on price stability focuses on 2 major concerns: (1) the fluctuation in the price of barley itself; and (2) the variability in the barley basis or the change in barley prices relative to corn prices. We use two measures to examine the first type of variability: (1) a "within crop-year-price variation" which is the standard deviation in monthly average prices around the crop-year mean; and (2) the average absolute difference between monthly average prices and prices in each of the subsequent six months.

Based on the above measures of variability, Canada and the United States from crop years 1988/89 to 1995/96 experienced similar degrees of feed-barley price instability and basis variability (Table 6.1). From this examination, there is little evidence to support the notion that Canada's feed-barley users over the above time period faced more or less price variability than have their U.S. counterparts.

Table 6.1: Variability of Monthly Average Cash Off-Board Feed Barley and Corn Prices, 1988/89 through 1995/96

	Crop Year standard dev.	Subsequent 6 Months[a] standard dev.	PNW Corn-barley basis Standard dev.
	$/mt	*$/mt*	*$/mt*
Lethbridge AB Barley	7.88	6.48	11.19
Great Falls MT Barley	7.88	6.04	10.72
Devil's Lake ND Barley	7.23	5.57	11.62
Great Lakes Corn	11.08	9.24	3.14
PNW Barley	11.32	7.98	11.34
PNW Corn	11.45	8.95	0.00
Duluth MN Superior Barley	13.79	9.19	15.95

[a]The absolute average of the difference between the average feed-barley price in each month relative to the average feed-barley price in the subsequent 6 months.
Source: Authors' Calculations.

Feed-Barley Prices and Variability; Lethbridge AB and Great Falls MT

There is considerable debate over the level of feed-barley prices in Great Falls MT and those at Lethbridge AB (A. Schmitz and Gray 2000). Some authors argue that feed-barley prices at Lethbridge AB have been significantly below those at Great Falls MT. But as A. Schmitz and Gray (2000) show, when EEP is accounted for, average prices at both locations are roughly the same. These arguments were based on data prior to the year 2000. However, using 1999 to 2003 CWB crop-year data, we show that feed-barley prices at Lethbridge AB are consistently and significantly above those in Great Falls MT.

The local Lethbridge AB area is a feed-barley-deficit region while Great Falls MT continues to be a surplus feed-barley-producing region. As a result of having to transport barley into Lethbridge AB from the United States, the average cash off-Board market price of barley in Lethbridge AB has been consistently higher than the Great Falls MT price (Table 6.2). This effect was somewhat evident in 1999 and 2000 when exports of feed barley were flowing from both Canada and the United States. As shown in Figure 6.4 the effect became very pronounced when there was a deficit of feed grains in the Canadian Prairies because of the 2002 and 2003 droughts. In this case, when corn was being imported in large quantities into Canada, the feed-grain prices in Canada became U.S. heartland prices plus the cost of rail transport. This major shift in the direction of grain flow caused an increase in Canada's domestic barley prices to be nearly equal to the port prices, rather than the usual situation of Canada's domestic barley prices being port prices minus the cost of transport.

The variation in feed-barley prices at Lethbridge AB is greater than the variation in feed-barley prices at Great Falls MT (Figure 6.1). Also, feed-barley prices in Lethbridge AB are higher than those in Great Falls MT. Prices in Canada become more volatile in years of increased imports of corn from the United States that supply part of the feed-grain needs of the Canadian livestock industry. The additional price volatility and the higher feed-barley

prices in Western Canada that result when cattle-feeding regions are in a feed-deficit situation should be a concern for the future development of the livestock industry. It should be noted that the increase in volatility and the higher prices in Canada are due to the feed-deficit situation and cannot be attributed to the CWB.

Table 6.2: Feed Barley Prices and Variability at Lethbridge AB and Great Falls MT, 1999 to 2003[1]

	Lethbridge AB		Great Falls MT	
Year	Average price	Within year Price Variation	Average price	Within year Price Variation
	$/mt	*%*	*$/mt*	*%*
1999	112.84	4.6	99.40	2.85
2000	114.75	6.7	105.78	7.96
2001	145.50	9.7	118.65	6.55
2002	170.97	9.4	142.21	7.85
2003	147.40	13.8	135.06	7.30
5 Year Average	**138.29**	**8.9**	**120.22**	**6.5**

**The within year price variation is the standard deviation of monthly average prices divided by the mean annual price.

[1]All prices have been converted to Canadian dollars.

Source: Authors' Calculations.

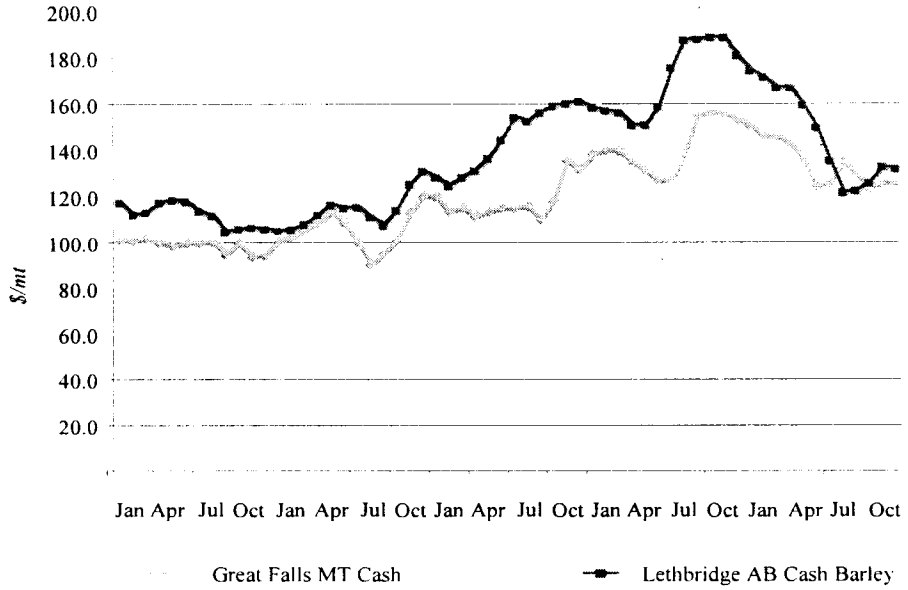

Figure 6.1: Great Falls MT and Lethbridge AB Feed-Barley Cash Prices, January 1999 to October 2003

Canada as an Importer of Feed Grains

It is important to recognize that Canada both imports and exports feed grains (Figure 6.2). The value of Canada's corn imports from the United States in 2002 exceeded the value of Canada's wheat exports to the United States. This was due in large part to Canada's drought during which corn was imported from the United States, which is the largest corn producer in the world, as a substitute for barley in cattle feeding.

As discussed in Section V, when modelling the impact of the CWB on barley prices, the fact that Canada is both an importer and an exporter of feed grains is important. The domestic demand for feed barley becomes much more elastic when large quantities of corn are imported. Because of the flow of corn from the United States into Canada, it is necessary to distinguish between Canada's demand for feed barley and Canada's demand for feed grain, which also includes feed wheat and corn.

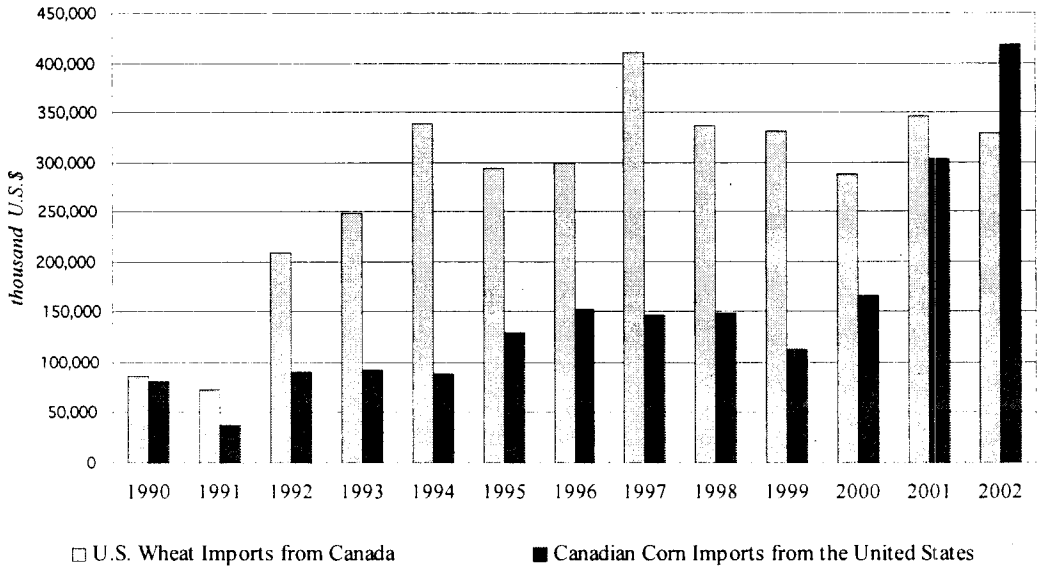

Figure 6.2: Grain Flows: Canada and the United States, 1990 to 2003
Source: Schmitz and Furtan 2004 (215).

Freight Rates and the Western Grain Transportation Act (WGTA)

When the freight-rate subsidy on export grain shipments was reduced and then eliminated nearly a decade ago, economists argued that the loss of the WGTA will reduce grain production (particularly the low-valued grains) and will increase the incentive for livestock feeding (Schmitz and Gray 2000; Schmitz, Highmoor, and Schmitz 2002). These impacts were very slow to develop initially but have gained momentum in recent years. There has been a significant growth in the feeding of beef, particularly in Southern Alberta, and an increase in the quantity of hog

production, particularly in Southern Manitoba. At the same time, more than one million acres of agricultural land was shifted to the production of forage and to continued diversification away from wheat and barley production, primarily in Saskatchewan. The impact of the change in freight rates will continue to increase as Canada's agricultural industry slowly makes the capital investments required to adjust to these economic pressures. The result will be a shrinking of the exportable surplus of feed grains in Western Canada. However, these statements have to be viewed with caution in view of the outbreak of Bovine Spongiform Encephalopathy (BSE) in 2003 from which the negative effects are still unknown.

While the growth in domestic demand for feed grain and the shift away from grain production are both slow processes, their impact on prices can be sharp and abrupt. Thus when Canada is in a net surplus feed-barley position, prices of feed barley in Western Canada are equal to the Vancouver BC price minus transportation and handling costs. When Canada is in a feed-barley-deficit situation, the feed-barley price must increase to equate supply and demand, which means that the feed-barley price must increase to the point where it is possible to import corn into Canada from the United States at the same barley-equivalent price. While some corn can flow into Western Canada from the United States by taking advantage of cheap back-haul opportunities for potash shipments to the United States from Canada, large volumes of corn imports into Western Canada from the United States require that Canada's feed-barley prices must escalate to the equivalent price of corn in the Northwestern U.S. Corn Belt plus the cost of rail transportation, which requires a reduction in the price of feed-barley's normal export basis. This shift in basis, which erodes the competitive position of Canada's livestock industry, will occur whenever Canada becomes significantly deficient in feed grains. If the incidence of feed-grain deficits increases, the erosion in the basis for barley becomes a source of feed-grain-price volatility in Canada.

Barley producers respond to feed-grain deficits in Canada in a number of ways. First, the probability of a feed-barley deficit will change the farmers' barley-price expectations of those farmers who respond to the change of barley basis by seeding more feed grains when barley stocks are low. Second, if feed-grain-deficit situations appear more likely to happen, the deficits will change the expectations of livestock producers and of potential livestock producers. Thus the expectation of livestock producers will be more reticent to rely on feed-barley surpluses. Finally, both livestock and grain producers will find ways of dealing with financial risk, including more forward pricing and more grain storage. The combinations of these measures reduce the probability of a feed-barley deficit and will make the deficits more manageable when and if they recur.

VII. DROUGHT AND VOLATILE BARLEY MARKETS

The 2002 Drought (2002/03 Crop Year)

Sparks Companies, Inc. levied a major criticism of the CWB in 2003. They alleged that the CWB was not able to give proper price signals to producers when marketing barley as malting barley and/or feed barley, especially for the 2002/03 crop year. Using the following chronology, it is argued that the price signals given by the CWB clearly reflected that the malting-barley market, rather than Canada's domestic feed-barley market was the highest-priced marketing outlet. The fact that Canada imported malting barley that year was in large part due to the drought that limited Canada's malting-barley production.

In 2002/03, Western Canada experienced the worst drought in history. As a result, barley production fell to record lows. Like the Canadian Prairies, Australia also experienced a severe drought in 2002, which is described by some as the worst drought in 100 years. Barley production in Western Canada in 2002 was 56% lower than it was in 2001 (IGC 2003). This production decline reduced Canada's supplies of malting barley available for export, which was also responsible for the increase in Australia's malting-barley prices. Australia's barley exports were 35% lower in 2002 than in 2001.

Chronology of Events

April 24, 2002: Statistics Canada released its March Intentions of Principal Field Crop Areas report. The intended area to be seeded to barley in Western Canada was pegged at 12.505 million acres, which is an increase of 8% over 2001.

May 2002: Western Canada's July futures contract for barley closed at $132.90/mt in Lethbridge AB on May 1. Denmark's 2-row malting-barley prices were approximately $190/mt FOB Europe.

May 23, 2002: The CWB decreased its Standard Select 2-row malting barley PRO from $179/mt to $175/mt, and decreased the feed-barley PRO from $144/mt to $134/mt. Western Canada's July futures contract barley closed at $143/mt, which is about $10 higher than the May 1 levels. Denmark's 2-row malting-barley prices were about $10/mt lower in May than they were in April, and about $15/mt lower than they were in March. Also, the use of export subsidies on feed barley by the European Union added negative pressure to global values.

June 27, 2002: The CWB decreased its Standard Select 2-row malting-barley PRO by $5/mt to $170/mt and increased the feed-barley PRO by $2/mt to $136. Western Canada's October barley futures contract closed at $156.70/mt, which was about $13.50 higher than the May 23 levels. Denmark's 2-row malting-barley prices were also slightly weaker in June than they were in May.

June 28, 2002: Statistics Canada released is Preliminary Estimates of Principal Field Crop Areas report. This report estimated the area seeded to barley in Western Canada at 11.435 million acres.

July 2002: It is estimated by sources in the trade that the 27,356 mt of Denmark's 2-row malting barley that was to be imported into Canada in November was booked by Canada's maltsters in July. Concerns over the size and quality of Canada's domestic crop and the potential difficulty in sourcing malting barley from farmers was due to rising feed-barley prices factored into the decision to import malting barley. The Canadian maltsters were concerned that Canada's barley would not meet the protein specifications required for their sales contracts. Also, offshore malting-barley prices had not yet increased to the same extent that Canada's domestic-feed prices had increased. Denmark's 2-row malting-barley prices (FOB Europe) averaged about $200/mt (U.S. $126/mt) in July. Offshore barley prices would later explode and Denmark's 2-row prices would eventually climb to nearly $300/mt (U.S. $188/mt) by the time the barley was actually imported into Canada in November 2002.

July 25, 2002: The CWB increased its Standard Select 2-row malting-barley PRO and its feed-barley PRO by $32/mt to $202/mt and $168/mt, respectively. Western Canada's barley futures closed at $182.10/mt, about $25/mt higher than the June 27 levels. Denmark's malting-barley prices averaged about $13 higher in July than in June.

August 9, 2002: In a mid-month PRO, the CWB increased its Standard Select 2-row PRO another $15/mt and its feed-barley PRO another $13/mt. Western Canada's October barley futures contracts were about $2.50 higher than were the July 25 levels. Concerns over the availability of Canada's barley for export, and over the potentially smaller crops in Europe and Australia were cited by the CWB in the PRO commentary.

August 22, 2002: The CWB left Canada's barley PROs unchanged relative to the August 9 mid-month PRO. Western Canada's October 2002 barley futures contract closed at $190, about $5.50 higher than August 9 levels.

August 2002: U.S exports of corn to Western Canada in August 2002 were 254,118 mt, which is nearly 9 times higher than the average corn imports for August over the 1997/98 to 2000/01 period.

August 23, 2002: Statistics Canada released its July 31, 2002 Estimate of Production of Principal Field Crops report. Canada's barley production was estimated to be the lowest since 1968. Western Canada's 2002 barley production was estimated at 6.75 mmt, which was expected to result in a feed-barley deficit in Western Canada. Harvested area was forecasted to be 8.055 million acres, which was 32% lower than was the seeded area, largely because a high percentage of barley was either cut for silage, used for cattle grazing, or was abandoned.

August 2002: Western Canada's October barley futures contract closed at $187.70 on August 30th, which was up nearly $55/mt since May 1. By comparison, offshore malting-barley

prices averaged about $220/mt FOB Europe in August, which is an increase of only $30/mt since May.

September 12, 2002: In a mid-month PRO, the CWB increased its Standard Select 2-row malting-barley PRO by $13/mt and left its feed-barley PRO unchanged. Western Canada's barley futures closed at $192.10, which was about $8 higher than were the August 9 levels.

September 26, 2002: The CWB raised its malting-barley PRO a further $8, which was based on the strengthening global malting-barley prices resulting from production difficulties in North America and from crop deterioration in Australia. Denmark's 2-row malting-barley prices averaged about $35/mt higher in September relative to July. Western Canada's barley futures were unchanged basically from September 12, 2002.

October 4, 2002: Statistics Canada released its September Estimate of Production of Principal Field Crops. Western Canada's production was reduced another 160,000 mt, and harvested area was reduced 140,000 acres to 7.915 million acres. On October 16, the CWB and the Malting Industry Association of Canada (MIAC) announced a program through which the maltsters could pay at least 95% of the CWB/PRO for designated CWB barley upon delivery. This program was intended to make it easier for the value-added Canada's domestic barley-malt industry to access supplies in the presence of strong feed-barley prices.

October 24, 2002: The CWB left its barley PROs unchanged from the September 26 estimate.

November 2002: U.S. corn exports into Western Canada peaked at 315,706 mt for November, which is more than 13 times the average November corn import amounts were for the 1997/98 to 2000/01 crop years.

November 27, 2002: 27,356 mt of malting barley was imported into Vancouver from Denmark. This barley was imported for quality reasons. Had the supplies been available domestically, Canada's malting-barley industry would have been able to pay significant premiums directly to Canada's barley producers in order to access supplies, given the difference between the reported landed price of the imported barley and the CWB selling price at that time. Statistics Canada data shows that for the entire 2002/03 crop year, about 198,000 mt of U.S. barley, 29,000 mt of U.K. barley, and about 31,000 mt of Denmark's barley was imported into Canada.

November 28, 2002: The CWB increased its malting barley PRO (Standard Select 2-row) by $9/mt to $247/mt and left its feed-barley PRO unchanged. Western Canada's barley futures were basically the same as those were on September 26. At $299/mt (U.S. $188/mt), Denmark's malting-barley prices averaged about $63/mt higher in November than they did in September.

December 5, 2002: Statistics Canada released its November Estimate of Production of Principal Field Crops. Western Canada's barley production was reduced another 400,000 mt to 6.189

mmt. Harvested area was reduced an additional 700,000 acres to 7.220 million acres, which is only 61% of the area seeded to barley in Western Canada in 2002.

Barley Prices and Correlations

Barley Prices

To put the above chronology of the events of the 2002/03 crop-year drought in perspective, consider barley-price movements for the crop years 2000/01 to 2003/04 (Figure 7.1). There were significant price changes for barley sold from Australia, Denmark, and Canada. The price of malting barley increased sharply beginning in 2002. For example, the price of Australia's malting barley nearly doubled between August 2002 and February 2003 while Canada's malting-barley prices increased by more than 50%. The price of Canada's domestic feed barley also increased sharply beginning in August 2002, but these prices began to decline in late 2002 when large quantities of corn were imported into Canada from the United States.

Canada's feed-barley prices and malting-barley prices are plotted for June, 2002 through June, 2003 (Figure 7.2). Note that while both prices increased from June through September 2002, feed-grain prices began to decline after that period and malting-barley prices continued to rise. In late 2002, Canada imported malting barley from Denmark and imported large quantities of corn from the United States. Under this situation, Canada's barley producers who were storing malting barley surely would have had the incentive to sell their barley into the malting-barley market rather than into the feed market because of the higher prices they would have obtained for malting barley. CWB market signals indicated clearly that this was the correct marketing choice, if indeed producers had malting barley to sell.

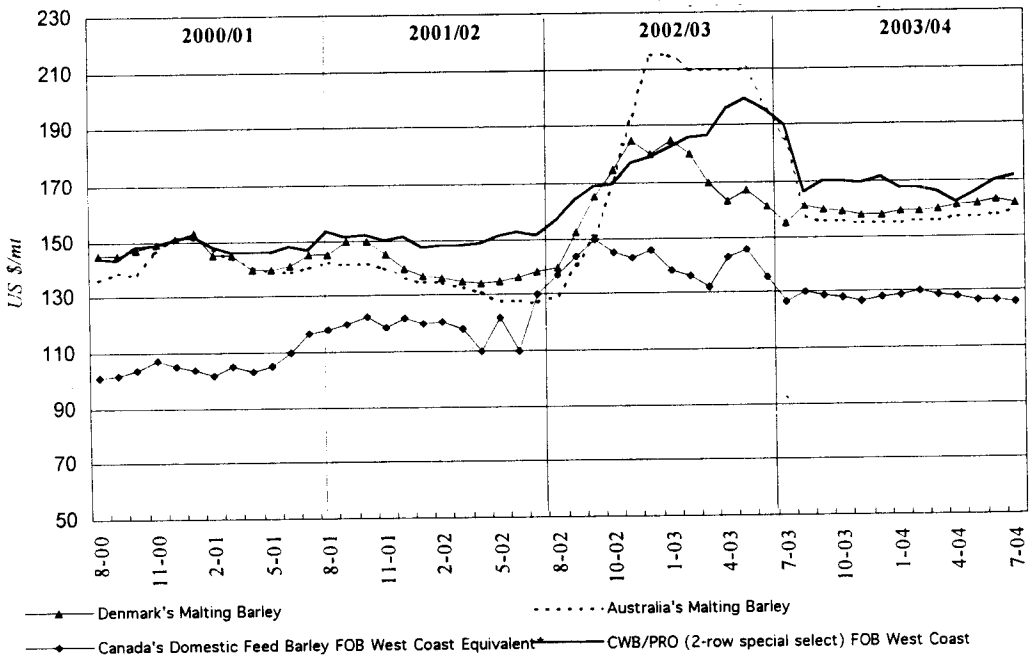

Figure 7.1: Feed- and Malting-Barley Prices FOB, 2002 to 2004
*Calculated by taking Edmonton area feed-barley prices to a FOB west coast basis by adding primary elevation and cleaning, rail freight and fobbing.
Source: CWB (2000/01 to 2003/04).

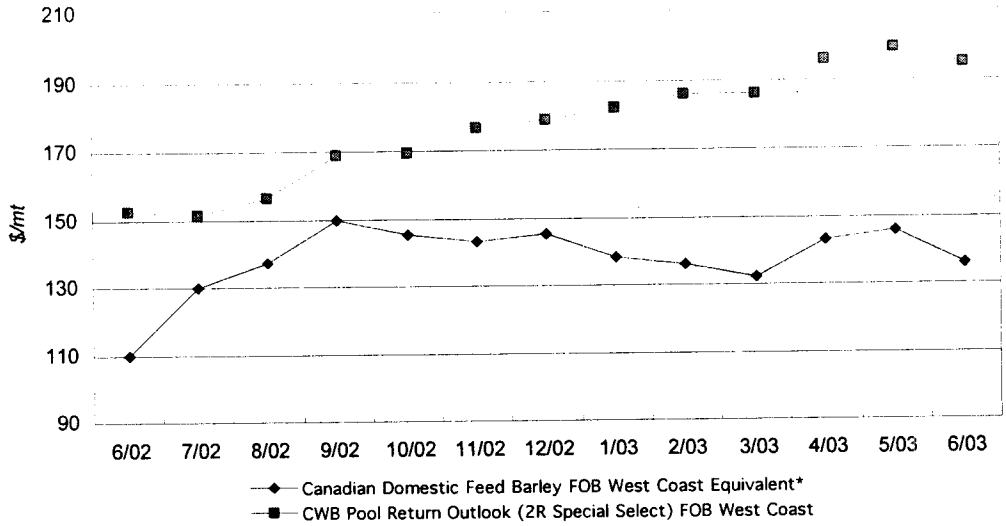

Figure 7.2: Canada's Barley Prices: June, 2002 to June, 2003
*Calculated by taking Edmonton area feed-barley prices to a FOB west coast basis by adding primary elevation and cleaning, rail freight and the FOB.
Source: CWB (2004).

Price Correlations

We present the price correlations between Denmark's, Canada's, and Australia's barley (Table 7.1). Note the high correlation among the malting-barley prices of the 3 countries. Also note that, over time, there is also a strong correlation between Canada's feed-barley prices and malting-barley prices.

In Perspective

Many of the arguments levied against the CWB focus on Canada's marketing of domestic feed barley. During the last several years there has been very little marketing of feed barley domestically by the CWB (Table 7.2). For example, for the years 2001/02 and 2002/03, less than 1% of Canada's barley production was sold by the CWB domestically as feed-grain barley, which is in sharp contrast to the size of the CWB feed-barley pool in the 1980s when, for example, in 1988/89 the barley pool exceeded 4 mmt.

Annually, Canada's feed-barley customers change significantly. For example, in 2000/01 Saudi Arabia was the largest importer of Canada's feed barley, followed by Japan and Iran (Table 7.3). However in 2001/02 Canada's largest feed-barley market was Canada followed by Japan and the United Arab Emirates.

Table 7.1: Price Correlations among Australia's, Denmark's, and Canada's Barley

Paired Correlations	Correlation Coefficients
Denmark's malting barley – Australia's malting barley	0.846616
Denmark's malting barley – CWB/PRO	0.785840
Australia's malting barley – CWB/PRO	0.884614
Canada's Domestic feed barley – CWB/PRO	0.774085
Canada's Domestic feed barley – Australia's malting barley	0.604440
Canada's Domestic feed barley – Denmark's malting barley	0.665123

Source: Authors' Calculations.

Table 7.2: CWB Feed-Barley Pool, Selected Years: 1987/88 to 2002/03

Crop Year	Barley Delivered to the CWB Pool	Crop Year	Barley Delivered to the CWB Pool
	mt		*Mt*
1987/88	2,224,961	**1995/96**	1,267,781
1988/89	4,035,425	**2000/01**	454,073
1991/92	1,994,574	**2001/02**	54,373
1992/93	3,328,087	**2002/03**	39,698
1994/95	1,059,655		

Source: CWB Annual Reports (1995/96 o 2002/03).

Table 7.3: CWB Feed-Barley Customers 2000/01 to 2001/02

2000/01 Crop Year		2001/02Crop Year	
Customers	**Feed Barley**	**Customers**	**Feed Barley**
	thousand mt		*thousand mt*
Saudi Arabia	293	Canada	30
Japan	232	Japan	13
Iran	110	United Arab Emirates	10
United States	43	United States	1
United Arab Emirates	15		

Source: CWB (2000/01 and 2001/02).

Summary and Policy Implications

Because of the small size of CWB feed-barley sales in Canada's domestic market and the size of Canada's corn imports from the United States, the cost of incomplete price arbitrage from price pooling may be over emphasized. Our data show that there is a significant degree of price correlation between both feed-barley markets and malting-barley markets. Also, price discovery in Canada's feed-barley market is likely related more to the Winnipeg feed-barley futures market than to price predictions of the CWB. Furthermore, the tools the CWB has at its disposal, such as the ability to cash-purchase barley, could reduce the losses from incomplete arbitrage in years in which markets escalate dramatically after the commencement of the crop year. The recently announced split of the crop year into two pooling periods is another positive move that also will improve price signals and will reduce pooling losses.

The implications of an on-again off-again feed-deficit situation create some real challenges for the CWB when managing feed-barley exports. When Canada's domestic feed-barley-export situation becomes tight, the CWB has difficulty finding export opportunities that are more profitable than selling CWB barley to Canadian producers. The instability in the barley basis also creates potential risk for the pool account. The recent move by the CWB to split its crop year into two pooling periods helps manage this risk. There are years, such as 2004, when feed supplies could be abundant. When this situation occurs, the CWB must scramble to find customers for the product. If the CWB is unsuccessful, feed-grain prices will be low and these low feed-grain prices will push producers away from feed-grain production, which will create increased potential for feed deficits in the future. The CWB will have to spend resources to ensure they have the sales personnel to allow them to respond quickly to changes in market conditions when making few sales one year but being able to find and work with new customers quickly when needed. The development of pricing options is important to provide incentives and to give the producer instruments that help deal with grain-price risk. The CWB in turn must manage the risks created by these transactions.

VIII. SUMMARY AND CONCLUSIONS

Issues and Objectives

Introduction

The operation of the CWB as the single-desk seller of Western Canada's feed barley and malting barley for export and for Canada's domestic human consumption is at the centre of ongoing debate and controversy in Western Canada. Key issues raised in the debate include: (1) whether or not the CWB delivers higher returns to Western Canada's feed-barley and malting-barley producers than would be the case in a multiple-seller environment; and (2) whether or not there are additional marketing costs that are unique to the operation of the CWB as a single-desk-seller of Canada's grains.

Recent public studies that have examined the economic issues surrounding barley marketing in Western Canada and North America have focused primarily on feed barley, with less emphasis on malting barley. The lack of focus on the interrelationship between these two different barley markets has limited the usefulness of earlier studies when determining the implications of various possible marketing arrangements for barley producers, the livestock industry, and the malt industry. In addition, these studies have had major data limitations because they have had little or no access to actual CWB sales prices and contract terms. Finally, although problems of arbitrage within Western Canada's domestic feed-barley market have been identified in some of these studies, very little research has been done to formalize the concept of arbitrage in the context of CWB price pooling and to quantify the effects within a formal economic framework.

Price Discrimination in the Feed Barley Market

There is considerable debate regarding the CWB's ability to provide benefits to producers. Brooks and Schmitz (1999) address this issue using actual CWB feed-barley contract data by import market and sales date from 1980/81 to 1994/95. The sales data specified for Canada's West Coast ports during this period were aggregated on an FOB vessel basis for the following regions: 1) Japan; 2) the United States; and 3) the ROW. A mean difference test was then conducted to examine whether the differences in prices among these regions were significantly different from zero over the time period.

The test indicated that statistically significant differences did exist between the FOB contract prices obtained by the CWB in these markets. This is evidence that the CWB has been able to price discriminate between markets which allowed the CWB to capture a higher price than would otherwise exist if there were multiple sellers of Western Canada's barley. Ultimately, Western Canada's feed-barley producers have benefited. The average difference between CWB contract prices for Japan and the United States over the 1980/81 to 1994/95 crop years was significant and averaged $25.29/mt. The difference between CWB contract prices for the U.S. markets and the ROW markets was also significant, with an average price difference of $4.46/mt. The difference between CWB contract prices to Japan

and the ROW markets was significant and averaged $20.73/mt.

The mean difference test also shows that the introduction by the United States of EEP and the resulting feed-barley-trade war between the United States and the European Union increased the magnitude of CWB price discrimination in these markets. The average barley price difference between Japan and the United States rose from $1.46/mt in the early 1980s to $26.84/mt in the trade-war period. Similarly, the average barley price difference between Japan and the ROW increased from $13.99/mt in the early 1980s to $23.70/mt when U.S. and EU feed-barley-export subsidies were generally available.

As a single-desk seller of Canada's grain, the CWB is able to price discriminate among markets. The results also illustrate that the magnitude of price discrimination by the CWB increased in the EEP and trade war period but it was not absent in the non-EEP and non-trade war period.

Single-Desk Seller versus Multiple Sellers of Canada's Barley

In this study, data were used from every CWB sale of feed barley, 6-row malting barley and 2-row malting barley for the period 1995/96 through 2003/04. The data were compiled from CWB contract records. All prices were brought to a common basis point of either FOB Vancouver or FOB St. Lawrence. The sales data were aggregated into the following 9 market segments: 1) Japanese feed-barley market; 2) U.S. feed-barley market; 3) all other offshore feed markets; 4) Canada's domestic 6-row malting-barley market; 5) U.S. 6-row malting-barley market; 6) offshore 6-row malting-barley markets; 7) Canada's domestic 2-row malting-barley market; 8) U.S. 2-row malting-barley market; and 9) offshore 2-row malting-barley markets.

The objective of CWB marketing was modeled as the allocation of the total quantity of barley that it receives from producers in a given crop year across the above 9 markets in such a way as to maximize total sales revenue. In order to measure the impact that multiple sellers of Canada's feed barley and malting barley would have had on returns and trade flows, a comparison was made between the actual market structure (i.e., prices and quantities) observed under the CWB and the prices and quantities that would have existed if there were multiple sellers of Canada's feed barley and malting barley.

The key difference between the CWB single-desk seller system and what a multiple-seller marketing system would be is the ability of the CWB to price discriminate. In the absence of constraints on the quantity of feed barley, 6-row malting barley, and 2-row malting barley available for sale by Canadian producers, the law of one price must hold for all international and domestic barley sales in a multiple-seller environment. In the model, multiple sellers are assumed to be fully competitive, and this competition results in one market price for feed barley and one market price for malting barley at any point in time, which is a characteristic of all competitive markets.

Impact of Replacing the CWB with Multiple Sellers

The impact on prices and revenue of replacing the CWB with multiple sellers of feed barley, 6-row malting barley and 2-row malting barley for each year from 1995/96 through 2003/04 are depicted in Table 8.1. The results in Table 8.1 assume that the price elasticity of demand for Canada's feed barley in the ROW is fixed at -20.0 each year and that the price elasticity of domestic demand for Canada's feed barley is adjusted based on corn imports and varies between -1.43 and -20.18.

Consider the 6-row malting-barley-market prices (Table 8.1, Column 2). Over the 1995/96 to the 2003/04 crop years, the annual average price increase earned by the CWB for 6-row malting barley relative to what the multiple seller structure would be is $35.25/mt. This number was computed as the simple average of the difference in the weighted-average price of 6-row malting barley under the CWB versus the equilibrium price of 6-row malting barley generated by the multiple-seller model. For example, the 2000/01 price difference is $43.19/mt and is equal to the difference between the weighted-average price of 6-row malting barley under the CWB and the weighted-average price of 6-row malting barley under multiple sellers. The CWB, relative to multiple sellers, is estimated to have captured higher prices on sales of 6-row malting barley in all years except 1995/96.

Table 8.1: Impact of Replacing the CWB Marketing System with Multiple-Sellers 1995/96 to 2003/04

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	4.23	0.48	(34.27)	(21)	−1.57
1996/97	1.47	(18.59)	(41.21)	(43)	−1.43
1997/98	1.06	(43.59)	(44.70)	(88)	−5.51
1998/99	2.33	(49.30)	(26.75)	(42)	−2.02
1999/00	1.62	(60.96)	(45.64)	(78)	−2.80
2000/01	0.47	(43.19)	(57.17)	(128)	−13.96
2001/02	0.26	(24.39)	(32.27)	(51)	−19.82
2002/03	0.28	(57.45)	(61.82)	(48)	−20.18
2003/04	0.36	(20.27)	(19.64)	(33)	−9.08
Average	1.34	(35.25)	(40.39)	(59)	−8.48

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at -20.0.
The malting-barley price remains at a $15/mt premium to feed barley.
Source: Authors' calculations.

The calculated annual average price difference between the CWB and the multiple-seller structure on sales of 2-row malting barley for the 1995/96 to 2003/04 period is $40.39/mt (Table 8.1, Column 3). The CWB, relative to

multiple sellers, is estimated to have captured higher prices in 2-row malting-barley markets in every year considered here. The lowest price advantage for 2-row malting barley was $19.64/mt in 2003/04 and the highest price advantage was $61.82 in 2002/03.

The impact on producer revenue from replacing the CWB with multiple sellers of Canada's barley is given in Table 8.1, Column 4. For example, the introduction of multiple sellers of Canada's feed barley and malting barley in 2000/01 would have caused Canadian barley producers to lose $128 million in total revenue. Over the 1995/96 to 2003/04 crop years, the introduction of multiple sellers would have resulted in an annual average loss of $59 million in revenue accruing to Canada's barley producers. Multiple sellers of Canada's barley would have caused losses in revenue to Canadian barley producers in every year considered here.

The price elasticity of the domestic demand for Canada's feed barley adjusted based on corn imports when the elasticity is allowed to vary between −1.43 and −20.18 is shown in Table 8.1, Column 6. Canada's corn imports were relatively low from 1995/96 to 1999/2000, which is reflected in the table by demand elasticities ranging from −1.43 to −5.51. However, Canada's corn imports were relatively high from 2000/01–2003/04 as reflected by demand elasticities that range from −9.08 to −20.18 throughout that same period.

Results were derived using different values for the price elasticity of demand for Canada's feed barley in the ROW and the price elasticity of domestic demand for Canada's feed barley. Over the 1995/96 to 2003/04 period, the introduction of multiple sellers would have resulted in an annual average loss of between $36 million and $58 million in revenue accruing to Canada's barley producers. Also, the effect of different selection rates was determined. Over the 1995/96 through 2003/04 period, the introduction of multiple sellers would have resulted in an annual average loss of between $17 million and $28 million in revenue accruing to Canada's barley producers.

Multiple Sellers: 1985/86 to 1994/95 Versus 1995/96 to 2003/04

The impact of replacing the CWB with multiple sellers of Canada's barley was estimated by Schmitz et al. 1997 for the 1985/86 through 1994/95 crop years. On average, over this period, the revenue accruing to producers of Canada's barley would have been reduced by $72 million per year under a multiple-seller marketing system of Canada's barley. This number is higher than the $59 million per year estimated for the 1995/96 through 2003/04 crop years in this study. There are at least three major reasons for the differences between the two studies. The first is that Canada was a significant net importer of feed grains (barley and corn combined) in several years over the 1995/96 to 2003/04 crop years (especially 2001/02 and 2002/03) whereas Canada was not a net importer of feed grains during any year over the 1985/86 to 1994/95 period. The second is that there are several years over the 1995/96 to 2003/04 crop years in which the ROW feed-barley-export market was not the lowest priced market, which was not the case for the 1985/86 to 1994/95 crop years. This could have implications for the results due to the fact that the

price elasticity of demand for Canada's feed-barley exports to the ROW is set at a relatively high level (i.e. –20.0 associated with the base results). The third is that the CWB was able to price discriminate to a greater degree under EEP.

Costs of Single-Desk Selling

The CWB exercises market power to the benefit of Western Canada's farmers. Some authors argue that the single-desk-seller marketing system has greater costs than would a multiple-seller marketing system of selling Canada's grain. While most of the costs they identify are present in the Canadian system, they are not unique to CWB grain marketing. Most, if not all, of the costs that earlier studies identified would be incurred in the absence of the CWB as a single-desk seller and likely in the same order of magnitude. This does not mean these costs should be disregarded in attempting to improve the efficiency of CWB marketing. Ways in which Canada's grain-marketing system can be made more efficient need to be examined constantly. Policies that would result in a reduction in these costs should be explored further.

Comparative Price Variability in Feed-Barley Markets

To compare barley-price variability, Lethbridge AB cash off-Board market feed-barley prices were compared to the U.S. feed-barley price at Great Falls MT and Devil's Lake ND, as well as other U.S. points. The average annual standard deviation in the Lethbridge AB cash off-Board market price for the 1988/89 to 1995/96 crop years was $7.88/mt. This means that the average September cash off-Board market price in Lethbridge AB was on average $7.88/mt above or below the average price for the CWB sales for the crop year. This compares to $7.88/mt and $7.23/mt measured at Great Falls MT and Devil's Lake ND respectively. Comparisons between Canadian and American feed-barley prices for each month relative to the subsequent six months for the 1988/89 to 1995/96 crop years display similar levels of variability. As well, substantial differences do not appear to exist in the variability of Canadian and American feed-barley prices relative to U.S. corn prices in the PNW.

Lengthy debates surround price comparisons between feed-barley prices in Great Falls MT and those at Lethbridge AB (A. Schmitz and Gray 2000). Some argue that feed-barley prices at Lethbridge AB have been significantly below those at Great Falls MT. When EEP is accounted for, A. Schmitz and Gray (2000) show that average prices at both locations are roughly the same. However, using more recent data, feed-barley prices at Lethbridge AB are significantly above those in Great Falls MT (Table 8.2).

When updating the analysis, it is important to recognize that the local Lethbridge AB area is a feed barley-deficit region while Great Falls MT continues to be a surplus feed barley-producing region. As a result of having to transport barley into Lethbridge AB from the United States, the average cash off-Board market price of barley in Lethbridge AB has been consistently higher than the Great Falls MT price (Table 8.2). This effect was somewhat evident in 1999 and 2000 when exports of feed barley were flowing from both Canada and the United States. As shown

in Figure 6.1 the effect became very pronounced when there was a deficit of feed grains in the Canadian Prairies because of the 2002 and 2003 droughts. In this case, when corn was being imported in large quantities into Canada, the feed-grain prices in Canada became U.S. heartland prices plus the cost of rail transport. This major shift in the direction of grain flow caused an increase in Canada's domestic barley prices to be nearly equal to the port prices, rather than the usual situation of Canada's domestic barley prices being port prices minus the cost of transport.

The variation of feed-barley prices at Lethbridge AB is greater than the variation in feed-barley prices at Great Falls MT (Figure 6.1). Also, feed-barley prices in Lethbridge AB are higher than those in Great Falls MT. Prices in Canada become more volatile in years of increased imports of corn from the United States to supply part of the feed-grain needs of the Canadian livestock industry. The additional price volatility and the higher feed-barley prices in Western Canada that result when cattle-feeding regions are in a feed-deficit situation should be a concern for the future development of the livestock industry.

Table 8.2: Feed Barley Prices and Variability at Lethbridge AB and Great Falls MT, 1999 to 2003[1]

	Lethbridge AB		Great Falls MT	
Year	Average price	Within year Price Variation	Average price	Within year Price Variation
	$/mt	*%*	*$/mt*	*%*
1999	112.84	4.6	99.40	2.85
2000	114.75	6.7	105.78	7.96
2001	145.50	9.7	118.65	6.55
2002	170.97	9.4	142.21	7.85
2003	147.40	13.8	135.06	7.30
5 Year Average	**138.29**	**8.9**	**120.22**	**6.5**

**The within year price variation is the standard deviation of monthly average prices divided by the mean annual price.

[1]All prices have been converted to Canadian dollars.

Source: Authors' Calculations.

Drought and Volatile Barley Markets

Sparks Companies, Inc. levied a major criticism of the CWB in 2003. They alleged that the CWB was not able to give proper price signals to producers when marketing barley as malting barley and/or feed barley, especially for the 2002/03 crop year. Using the chronology outlined in Section VII, we show that that the price signals given by the CWB reflected that the malting-barley market, rather than Canada's domestic feed-barley outlet, was the highest priced marketing outlet. The fact that Canada imported malting barley that year was in large part due to the drought that limited Canada's malting-barley production.

In 2002/03, Western Canada experienced the worst drought in history. As a result, barley production fell to record lows. Like the Canadian Prairies, Australia also experienced a severe drought in 2002, which is described by some as the worst drought in 100 years. Barley production in Western Canada in 2002 was 56% lower than it was in 2001 (IGC, World Grain Statistics 2003). This production decline reduced Canada's supplies of malting barley available for export, which was also responsible for the increase in Australia's malting-barley prices. Australia's barley exports were 35% lower in 2002 than in 2001.

To put the events of the 2002/03 crop-year drought in perspective, consider barley-price movements for the crop years 2000/01 to 2003/04. There were significant price changes for barley sold from Australia, Denmark, and Canada. The price of malting barley increased sharply beginning in 2002. For example, the price of Australia's malting barley nearly doubled between August 2002 and February 2003 while Canada's malting-barley prices increased by more than 50%. The price of Canada's domestic feed barley also increased sharply beginning in August 2002, but these prices began to decline in late 2002 when large quantities of corn were imported into Canada from the United States.

In perspective, many of the arguments levied against the CWB focus on Canada's marketing of domestic feed barley. During the last several years there has been very little marketing of feed barley domestically by the CWB (Table 8.3). For the years 2001/02 and 2002/03 crop year, less than 1% of Canada's barley production has been sold by the CWB domestically as feed-grain barley, which is in sharp contrast to the size of the CWB feed-barley pool in the 1980s when, for example, in 1998/99 the barley pool exceeded 4 mmt.

Annually, Canada's feed-barley customers change significantly. For example, in 2000/01 Saudi Arabia was the largest importer of Canada's feed barley, followed by Japan and Iran (Table 8.4). However in 2001/02 Canada's largest feed-barley market was Canada followed by Japan and the United Arab Emirates.

Table 8.3: CWB Feed-Barley Pool, Selected Years: 1987/88 to 2002/03

Crop Year	Barley Delivered to the CWB Pool	Crop Year	Barley Delivered to the CWB Pool
	mt		*mt*
1987/88	2,224,961	**1995/96**	1,267,781
1988/89	4,035,425	**2000/01**	454,073
1991/92	1,994,574	**2001/02**	54,373
1992/93	3,328,087	**2002/03**	39,698
1994/95	1,059,655		

Source: CWB Annual Reports (1995/96 o 2002/03).

Table 8.4: CWB Feed Barley Customers 2000/01to 2001/02

2000/01 Crop Year		2001/02Crop Year	
Customers	**Feed Barley**	**Customers**	**Feed Barley**
	thousand mt		*thousand mt*
Saudi Arabia	293	Canada	30
Japan	232	Japan	13
Iran	110	United Arab Emirates	10
United States	43	United States	1
United Arab Emirates	15		

Source: CWB (2000/01 and 2001/02).

Conclusions

This study clearly establishes that the CWB single-desk-seller barley-marketing system creates more sales revenue for Western Canada's farmers than will result in the presence of a multiple-seller marketing system because of the ability of the CWB to exercise market power on behalf of Western Canada's farmers. The magnitude of the additional revenue created varies by year depending upon a number of factors, including the occurrence and degree of export subsidization in the feed- and malting-barley markets.

Given the significance of the CWB as the marketer of malting barley in a relatively small world malting-barley market, it is not surprising that the benefits of the single-desk-seller status of the CWB are largest for malting barley. The CWB has become a small player in the world feed-barley market and as a result its ability to exercise market power through price discrimination.

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APPENDIX A: GLOBAL BARLEY PRODUCTION

Table A.1: Global Barley Production

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
USA	11343	9314	9796	9169	10102	9905	8369	8162	7825	9544	7935	7687	8103	5925	6421	4942
Canada	13916	10328	11794	13441	11617	11032	10472	11990	13093	15692	13527	12709	13196	13172	10349	7293
Mexico	510	442	450	543	560	577	473	543	417	614	350	410	450	770	767	770
Brazil	195	140	346	210	110	150	110	112	120	242	345	310	200	283	283	280
Argentina	290	317	343	302	565	500	485	360	385	530	920	535	419	575	521	554
Other Latin America	509	543	624	542	576	707	568	394	529	630	563	547	431	649	483	545
EU-15	56386	58672	65937	65206	56906	47457	47039	43987	43713	51716	62803	61607	49276	51860	48360	48340
Other West Europe	942	973	1077	1186	1109	989	1174	947	986	1145	1015	1011	997	997	963	1052
Central Europe	11601	12736	13831	13712	14072	11531	10901	11124	11291	9620	11966	10696	9686	7462	6793	9312
Russia	26107	19418	22201	27035	22174	26999	26303	27000	15600	15900	20500	9800	10600	14100	19500	18700
Ukraine	12190	9751	13090	9159	6047	10136	12563	14508	9633	6735	7407	5870	6426	6972	10168	10350
Other Former USSR	15049	12376	12696	15171	11312	15198	14305	11924	7013	7732	7910	5410	5408	6513	6565	6214
FSU-15	53346	40545	44857	52274	41534	52333	54765	53432	32446	29956	35817	21080	22433	27482	36251	35264
Japan	352	396	371	346	266	366	271	225	216	230	199	144	205	214	209	217
Taiwan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Korea	516	756	716	578	488	449	450	324	423	412	266	157	400	229	383	300
China	5096	5196	4652	4903	4522	4866	4327	4411	4099	4030	4000	2686	2970	2848	2993	3470
Thailand	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
India	1659	1577	1722	1488	1840	1700	1519	1312	1730	1510	1462	1680	1470	1447	1482	1500
Indonesia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pakistan	134	112	123	131	142	140	158	146	164	174	150	174	140	160	165	165
Malaysia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey	6000	7000	4900	6800	6800	6600	7300	6500	6900	7200	7300	7500	6800	7400	6900	7400
Other Asia	686	646	612	722	617	564	575	362	535	650	745	675	664	524	527	700
Australia	8477	3306	4121	4164	4926	5460	6969	2913	5503	8696	5462	5647	5032	6743	8423	3500
South Africa	290	137	291	262	170	266	233	275	330	178	162	216	91	154	167	183
North Africa & Middle East	7500	11631	9456	13043	11336	9429	6046	10330	9128	12974	8758	9139	5762	3129	6860	6269
Other Africa	1139	1218	1282	1309	1174	1414	1110	1471	1548	1720	1635	1097	1452	1707	1563	1542
TOTAL (million tonnes)	174.8	152.4	165.4	175.5	160.0	169.0	159.1	151.0	141.7	152.6	154.4	135.6	127.9	133.2	142.0	132.6

APPENDIX B: SENSITIVITY ANALYSIS

Table B.1: Price Impact from Introducing Multiple Sellers (ROW Feed Demand Elasticity is –5.0)

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	3.31	(0.44)	(35.18)	(37)	–1.57
1996/97	2.86	(17.19)	(39.81)	(29)	–1.43
1997/98	1.15	(43.51)	(44.62)	(87)	–5.51
1998/99	2.33	(49.30)	(26.75)	(42)	–2.02
1999/00	2.29	(60.30)	(44.98)	(70)	–2.80
2000/01	0.65	(43.01)	(56.99)	(125)	–13.96
2001/02	0.24	(24.40)	(32.29)	(51)	–19.82
2002/03	0.27	(57.47)	(61.84)	(48)	–20.18
2003/04	0.41	(20.22)	(19.59)	(33)	–9.08
Average	**1.50**	**(35.09)**	**(40.23)**	**(58)**	**-8.48**

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at –5.0.
The malting-barley price remains at a $15/mt premium to feed barley.
The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –0.53 and –20.0.
Source: Author's Calculations.

Table B.2: Price Impact from Introducing Multiple Sellers (Domestic Feed Demand Elasticity Varies up to –5.0)

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	6.82	3.06	(31.68)	15	–0.77
1996/97	2.29	(17.76)	(40.38)	(30)	–0.74
1997/98	3.41	(41.24)	(42.35)	(55)	–1.67
1998/99	4.89	(46.73)	(24.18)	(10)	–0.87
1999/00	3.75	(58.84)	(43.52)	(49)	–1.05
2000/01	1.80	(41.86)	(55.85)	(109)	–3.61
2001/02	0.97	(23.67)	(31.55)	(43)	–4.96
2002/03	1.00	(56.74)	(61.11)	(43)	–5.04
2003/04	1.07	(19.56)	(18.93)	(23)	–2.49
Average	**2.89**	**(33.70)**	**(38.84)**	**(39)**	**-2.36**

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at –20.0.
The malting-barley price remains at a $15/mt premium to feed barley.
The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –0.53 and –5.0.
Source: Author's Calculations.

Table B.3: Price Impact from Introducing Multiple Sellers (Domestic Feed-Barley Demand Elasticity Varies up to –5.0 and ROW Feed-Demand Elasticity is –5.0)

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	5.52	1.77	(32.98)	(7)	–0.77
1996/97	4.34	(15.72)	(38.34)	(8)	–0.74
1997/98	3.43	(41.22)	(42.33)	(56)	–1.67
1998/99	4.78	(46.85)	(24.29)	(12)	–0.87
1999/00	5.23	(57.36)	(42.04)	(33)	–1.05
2000/01	2.38	(41.28)	(55.26)	(102)	–3.61
2001/02	0.93	(23.71)	(31.59)	(43)	–4.96
2002/03	1.05	(56.69)	(61.05)	(42)	–5.04
2003/04	1.32	(19.30)	(18.68)	(22)	–2.49
Average	**3.22**	**(33.37)**	**(38.51)**	**(36)**	**-2.36**

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at –5.0.
The malting-barley price remains at a $15/mt premium to feed barley.
The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –0.53 and –5.0.
Source: Author's Calculations.

Table B.4: Price Impact from Introducing Multiple Sellers (Multiple Seller Selection Rates Restricted to 110% of CWB Rates)

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	1.25	(2.51)	(13.20)	(9)	–1.57
1996/97	(0.60)	(8.49)	(10.76)	(20)	–1.43
1997/98	0.36	(21.08)	(21.68)	(39)	–5.51
1998/99	1.31	(20.66)	(18.81)	(24)	–2.02
1999/00	0.23	(18.95)	(18.19)	(26)	–2.80
2000/01	0.07	(20.44)	(22.10)	(45)	–13.96
2001/02	0.20	(22.88)	(24.33)	(39)	–19.82
2002/03	0.14	(27.51)	(28.01)	(19)	–20.18
2003/04	0.30	(17.16)	(17.13)	(28)	–9.08
Average	**0.36**	**(17.74)**	**(19.36)**	**(28)**	**-8.48**

Note: Brackets indicate a loss for multiple sellers.
The elasticity of demand for Canada's feed barley in the Rest of the World is set at –20.0.
The quantity of 6-row and 2-row malting barley sold under multiple sellers is restricted to 110% of what was actually sold by the CWB.
The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –0.53 and –20.0.
Source: Author's Calculations.

Table B.5: The Introduction of Multiple Sellers (Multiple Seller Selection Rates Restricted to 110% of CWB Rates, Domestic Feed-Barley Demand Elasticity Varies up to –5.0, and ROW Feed-Demand Elasticity is –5.0)

Crop Year	Feed Barley Price	6-Row Malting Barley Price	2-Row Malting Barley Price	Total Producer Revenue	Domestic Demand Elasticity
	$/mt	*$/mt*	*$/mt*	*$ million*	
1995/96	3.43	(0.33)	(21.13)	(4)	–0.77
1996/97	2.08	(13.00)	(15.28)	(0)	–0.74
1997/98	1.47	(20.83)	(21.43)	(26)	–1.67
1998/99	2.99	(20.63)	(18.77)	(6)	–0.87
1999/00	2.04	(19.74)	(18.95)	(9)	–1.05
2000/01	0.94	(20.31)	(21.97)	(35)	–3.61
2001/02	0.72	(22.63)	(24.09)	(34)	–4.96
2002/03	0.45	(26.47)	(26.97)	(16)	–5.04
2003/04	1.29	(18.41)	(18.38)	(21)	–2.49
Average	**1.71**	**(18.04)**	**(20.78)**	**(17)**	**-2.36**

Note: Brackets indicate a loss for multiple sellers.

The elasticity of demand for Canada's feed barley in the Rest of the World is set at –5.0.

The quantity of 6-row and 2-row malting barley sold under multiple sellers is restricted to 110% of what was actually sold by the CWB.

The elasticity of domestic feed-barley demand is adjusted based on corn imports and varies between –0.53 and –5.0.

Source: Author's Calculations.

ENDNOTES

[i]The enlargement of the European Union includes Poland, Hungary, the Czech Republic, Slovenia, and Estonia. Other Eastern European countries, including Bulgaria, Cyprus, Latvia, Lithuania, Malta, Romania, Slovakia, and Turkey, are under consideration for EU enlargement.

[ii]All dollar amounts are expressed in Canadian dollars, unless otherwise noted.

[iv]The results of Brooks and Schmitz (1999) support the empirical results of Schmitz et al. (1997) even though the approaches are different. Because of data limitations, we do not use both approaches; instead we use the approach in Schmitz et al. (1997). Furthermore, both models are not needed since theoretically finding price discrimination using the Schmitz et al. (1997) framework should lead to a similar finding if one uses the Brooks and Schmitz (1999) framework.

[v]In the past several years CWB feed-barley sales in the domestic market have been small (Table 7.2). Even so, in 2001/02 most of the barley in the feed-barley pool was sold by the CWB in Canada's domestic market (Table 7.3).

[vii]Schmitz et al. (1997) estimate arbitrage losses based on the 1988/89 to 1995/96 crop years as shown in the Table below. The average efficiency loss was $4.9 million. While we do not update the Schmitz et al. (1997) estimates, we expect that because of sizeable feed-grain imports from the United States and the limited volume of barley in Canada's feed-barley pool during the recent feed-deficit years, pooling arbitrage losses for the 1995/96 to 2003/04 crop years are likely smaller than for the time period examined in Schmitz et al. (1997).

Canada-U.S. Barley-Price Movements and Arbitrage-Efficiency Losses, 1988/89 to 1995/96

Year	Arbitrage Efficiency loss		Price movement difference (Lethbridge AB less U.S.)	
	Great Falls MT	Devil's Lake ND	Great Falls MT	Devil's Lake ND
	$ million		*$/mt* **	
1988/89	5.154	4.068	16.69	14.43
1989/90	2.404	5.334	11.60	17.46
1990/91	1.409	.813	(6.27)	(3.82)
1991/92	.541	.624	(0.86)	(2.71)
1992/93	.129	.286	(0.46)	(1.45)
1993/94	2.355	2.088	(10.60)	(9.60)
1994/95	6.006	6.875	17.30	19.08
1995/96	21.067	18.955	(33.05)	(31.10)
1988/89 to 1995/96 Average	**4.883**	**4.880**	**(0.71)**	**0.29**

*domestic demand elasticity =–.53.

**Price movements for each week were calculated versus first week of the September average price.

Source: Schmitz et al. (1997: 45).

The Canadian Wheat Board in an Open Market: The Impact of Removing the Single-Desk Selling Powers

Murray Fulton

Adapting to New Environments: Agriculture and Rural Economies in the 21st Century
a KIS Project (CSALE)

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Contents

Indroduction

Over this past summer and early autumn, the Government of Canada has indicated its desire to remove the single-desk selling powers of the Canadian Wheat Board (CWB). Most recently the government created a task force to recommend options for how the CWB can deal with the transition to a market where its single-desk selling powers would no longer exist. This report was released on October 30; 2006.1

The purpose of this paper is to explore the impact of removing the single-desk selling powers of the CWB. The main conclusion of the paper is that it will be very difficult, if not impossible, for the CWB to survive as an organization. Thus, contrary to what the task force indicates, the most likely impact of removing the single-desk selling powers is that the CWB will cease to exist.

Although the CWB is unlikely to continue its operations, this paper nevertheless examines whether a newly constituted CWB would be able to successfully operate a pooling system for Western Canadian grain farmers. Since the analysis indicates that a pooling system is unlikely to be successful, the conclusion that the CWB will be unable to survive as an organization is further strengthened.

The paper also examines some of the structural changes that are likely to occur as a result of the disappearance of the CWB. The major conclusion of this examination is that the loss of the CWB will transform the Canadian grain handling and transportation system into one that is very similar to that in the United States. Despite the similarity in the structure and operation of the grain handling and transportation systems in the two countries, the policy environment of the Canadian grain and oilseeds sector will nevertheless differ from that in the United States in one important way – the United States will have a Farm Bill while Canada will not. As a result of this policy difference, U.S. farmers are not exposed to market forces to nearly the same extent as are Canadian farmers.

This paper is not a cost-benefit analysis of the CWB or of alternative marketing arrangements. The paper will not make the case for why one marketing system is better than another, or provide a dollar figure for the gain or loss that can be expected from the policy change that has been proposed. Nor is the paper a response to the task force report, although the recommendations of the task force will be re-

ferred to from time to time. Instead, the purpose of the paper is to paint a picture of what the CWB and the grains sector can be expected to look like when the CWB's single-desk powers are removed. Such an examination has not been undertaken and is needed as decisions are made regarding the future of the CWB.

It is important to note that Western Canadian farmers are in a unique position when it comes to this proposed policy change. Under the terms of the *Canadian Wheat Board Act*, farmers in the CWB area are provided with the power to approve or reject any proposed changes to the fundamental operations of the CWB.[2] This power is one that is held by almost no other group in society – in virtually all other policy arenas, the government has the power to make changes unilaterally. As a consequence of this provision, farmers have the ability to make a real choice about the nature of the grain marketing system under which they will operate. The Government of Canada has announced that a plebiscite will be held early in 2007 on the marketing of barley under the CWB; no formal decision has yet been made on wheat.[3]

Given the opportunity to choose the nature of their marketing system, farmers are presented with two very distinct choices for the future of the Western Canadian grains sector. One choice will be to retain the CWB, although likely not in its current form – the CWB has changed significantly over the last 10 years and has already announced its intention to make further changes.[4] The other choice is effectively to eliminate the CWB. This latter change would fundamentally transform the Canadian grains sector, eliminating the features of the current system that make it distinctive. And the changes will be irreversible – once the system has been altered, it will be virtually impossible to go back and restore the various elements that now make up the system. Thus, farmers have a real decision. In making this decision, farmers will have to ask themselves, "What is my vision of the grains sector in Canada?"

The next section of the paper provides a brief examination of what would happen organizationally if the single-desk selling powers of the CWB were removed. With this as background, the paper then moves on to an examination of the impact on the Canadian grains sector of this policy change. The paper ends with concluding remarks.

Will the CWB Continue to Operate?

It is important to start the discussion of the impact of the removal of the CWB's single-desk selling powers by examining what would happen to the CWB as an organization if this policy change were made. As will be seen in later sections of the paper, the fate of the CWB as an organization has important implications for what would subsequently occur in the industry.

The conclusion of this section is that a new CWB is unlikely to be successful in the current environment regardless of the pricing and marketing models that it would use (an examination of different models is presented in the following sec-

tion). Since a new CWB is unlikely to be successful, it follows that farmers would be unwilling to create and invest in this new organization. As a consequence, the Government of Canada's goal of having a strong, viable CWB cannot be achieved.[5] Moreover, the outcome envisaged by the task force of farmers purchasing shares in a new CWB is unlikely to occur; unless they see value in purchasing shares, there is no incentive for farmers to purchase them. Thus, the most likely consequence of removing the CWB's single-desk selling powers is that the CWB will disappear and no new farmer-owned organization (or at best a relatively small organization focused largely on the domestic market) will emerge to fill the void.

Determining whether a new CWB would be successful requires the consideration of a number of different arguments. The process that needs to be followed can be likened to determining whether any of three or four different routes through a maze will actually lead to the goal at the other end, with the goal in this case being a viable CWB. Each of the main paths has its own maze of paths, all of which need to be considered. What will be seen in the analysis below is that all of the routes end in a dead end – there is no path that leads to a viable CWB.

What are these paths that have to be considered? The first path that needs to be examined is the organizational structure that a new CWB would have. The analysis of this path indicates that farmers must have ownership and control of a new CWB if it is going to be successful; this ownership and control, however, will only occur if farmers believe the CWB can be commercially viable. Commercial viability, however, depends on the manner in which a new CWB carries out its activities. Here there are a number of options.

One possible path would be for the CWB to operate as a producer marketing agency, buying grain from farmers and selling to millers in Canada and internationally. However, to be viable, a new CWB would have to own and operate its own grain handling facilities in the country and at port position; simply put, a new CWB that operated only as a producer marketing agency would not survive economically.

Another possible path is that the CWB could own its own elevator facilities. It is unlikely, however, that a new CWB would be able to purchase the required assets. A new CWB would not have the capital required to make such a purchase, and even with capital, a new CWB would have trouble acquiring facilities. While it would have been possible 10 to 15 years ago for a new CWB to merge with the existing grain co-ops or to build new facilities of its own, such options are not available today. Purchasing grain handling facilities from other industry players is also unlikely, given that they would not like to see new competition enter the market.

A third possible path starts with the presumption that a new CWB could acquire facilities (although it is known that the probability of this occurring is very small). Even with facilities, the likelihood of a new CWB competing in the international market with the multinationals is very low. Thus, based on this reasoning, it is unlikely that a new CWB would be successful.

Organizational Restructuring – The Removal of the Single-Desk Selling Powers

To begin the analysis, it is necessary to consider the manner in which changes to the CWB can be expected to occur. There are two ways that the Government of Canada could remove the CWB's single-desk selling powers. The first would be to open the *Canadian Wheat Board Act* and remove the provisions for single-desk selling;[6] the provisions that provide the CWB with government loan guarantees would also be removed. The second way would be to rescind the *Canadian Wheat Board Act*. The approach recommended by the task force is, in effect, a combination of these two options; the task force's proposal is to rescind the *Canadian Wheat Board Act* and to replace it with another piece of legislation.

Both of these options can be expected to have the same result. Consider first the option of rescinding the *Act*. With a rescinding of the *Act*, farmers would no longer be required to deliver their grain to the CWB, the CWB would lose its single-desk selling powers, and government financing would no longer be available. In addition, the CWB would no longer exist as an organization since it would have no legal status. The CWB would only re-emerge as an organization if someone or some group took the initiative to create a grain marketing organization. Under the task force recommendations, the Government of Canada would take this initiative.

The CWB would also require reorganizing if the *Canadian Wheat Board Act* were opened and the key provisions removed. Once stripped of its major powers, the CWB would no longer need to be structured as a government organization; the result would be that the CWB would be restructured. This restructuring could occur as a result of pressure from the Government of Canada, or as a result of a decision by the CWB's board of directors.

Given that restructuring will occur, what alternative structures are likely under reorganization? There are two possibilities. The first is that one or more investors could get together and, using the Canadian Wheat Board name, form a corporation under the *Canada Business Corporations Act*. This possibility is very unlikely, since investors wishing to form a corporation for the purposes of earning a return on their investment would likely want to choose a name that does not have a connection to the CWB.

The second possibility is for a group of farmers to get together and, using the Canadian Wheat Board name, form a co-operative under the *Canada Co-operatives Act* or a farmer-owned corporation under the *Canada Business Corporations Act*. Since the characteristics of a co-operative can be mimicked under the *Canada Business Corporations Act*, these two options are very similar and will be treated as one.[7] Indeed, since what would be created would, for all intents and purposes, be a co-operative, the discussion below will draw heavily on the experience of co-operatives from Canada and the United States and elsewhere in the world.

It is important to stress that if a new CWB is to be created, success is most likely if it is done voluntarily and as a deliberate act by a group of farmers. Experience with co-operatives around the world indicates that those formed by government on

behalf of a group are almost never successful.[8] The reason has to do with benefits, ownership, and control – unless a group of people can see the benefits of forming a business and believe they have ownership and control of this business, they will not expend the time and money to form the organization. Yet this commitment of time and resources is required in order for the farmer owners to identify sufficiently with the organization to be committed to it over time.[9] Given this background, any attempt by government to form a new CWB on behalf of farmers is not likely to succeed.

While the task force calls for farmers to voluntarily decide if they wish to purchase shares in a new CWB, it recommends that the government should establish this new organization. However, unless there is truly a desire among farmers for such an organization, it is unlikely to be successful.

The likelihood of a group of farmers making the effort to form and/or invest in a new CWB depends on a host of economic and non-economic factors. The non-economic factors include things such as whether there is an existing organizational structure that is able to support development, the nature of leadership within the group, and the degree to which a sufficient number of farmers share the same view of how the industry operates and what the impact would be of a new CWB.

On the economic front, the key factor will be whether the group of farmers believes that a new CWB, organized as a farmer-owned business, would provide sufficient benefits to make the effort and investment worthwhile. Thus, any potential organizing group would look forward to what they expected to see happen in the industry if a new CWB were to be created. If they expected that a new CWB could be successful, they would be more likely to make the effort to create a new organization. If they did not expect a new CWB to be successful, then a new organization would not be formed. Success is defined here as the CWB being both commercially viable (e.g,. revenues are consistently greater than expenses) *and* organizationally viable (e.g,. a significant number of farmers support the organization). Clearly these two elements are interconnected – an organization will not be commercially viable if it is not organizationally viable and vice versa.

There are a number of business models that a farmer-owned business could adopt – the two most obvious are a marketing agent for farmers and a full-fledged grain company. Other business models where the new organization acts as an agent for sellers of Canadian wheat or as an agent for buyers of Canadian wheat are more likely to be models carried out by a group of investors.[10]

The New CWB as Marketing Agency

The task force recommends that the new "farmer-owned" CWB begin as a marketing agency for farmers. Operation as a marketing agency for farmers is almost certainly not sustainable. The best-case scenario for a farmer-owned marketing agency would be if a new CWB were able to attract some of the marketing expertise currently in the CWB and use this expertise to line up long-term contracts with domestic and international buyers. Such a scenario is unlikely, however, for at least

two reasons. First, a new CWB would not automatically have access to the people and expertise in the current CWB. Once it was clear that the current CWB was going to be dissolved, CWB employees would immediately start looking for other jobs (if they had not already done so). Other players in the grain industry would very quickly hire the most talented of the CWB staff as these players prepare for a system where they now require domestic and international marketing and logistics expertise. A new CWB would have to compete directly for the former CWB personnel; by virtue of their size and presence, the other industry players would be in a position to make sure that key personnel were enticed to join their companies.

Second, without a grain handling system, a marketing agency would only be able to source grain at the pleasure of the existing grain companies. Since in most cases the grain companies would rather supply the grain directly to the customers that the CWB was attempting to serve, rather than supplying the CWB, a new CWB would find it difficult, if not impossible, to source grain, and hence would be unable to set up long term contracts with major buyers. The situation that the CWB would be in is similar to what would happen if Case New Holland, for instance, were to rely on John Deere's dealerships to sell its line of farm equipment.[11]

The task force argues that because of excess country elevator capacity on the Prairies, the grain companies can be expected to compete aggressively for grain; one way of competing for tonnage would be to allow the CWB to move grain through their facilities. However, in its annual report on the state of the Prairie grain handling industry, Dominion Bond Rating Service (DBRS) indicates that the period of large-scale elevator abandonment is over and that there is little excess capacity in the industry. In an article in the *Western Producer* from June 2006, Brian Hayward, chief executive officer of Agricore United, echoes this view: "We don't believe there has been overcapacity in the grain handling industry for the past two or three years." This view not withstanding, DBRS also indicated that the one factor that would prompt further consolidation would be deregulation of the grain marketing system – the implication is that grain companies would be particularly concerned about extra capacity if the CWB were removed and would take steps to make sure that it did not exist.[12] The conclusion is that there neither is nor will be any excess capacity and therefore the existing grain companies will have little if any incentive to allow a new CWB to move grain through its elevators.[13]

Knowing that contracts will not be forthcoming with major buyers, and lacking any special advantage in terms of personnel, farmers would have no incentive to form a farmer-owned marketing agency. It is instructive to note that farmer-owned marketing agencies without grain handling facilities do not exist in the U.S. grain marketing system, evidence that a farmer-owned marketing agency is not a sustainable option.[14]

The New CWB as Grain Company

If the new CWB had its own grain handling system – including country and port facilities – the situation would be different, since the new CWB would then be able

to compete directly with the other grain companies for farmers' grain. It is important to note that a new CWB would have to own port facilities if it wanted to be involved in the export trade, since most of the export grain moves through one of the three main ports (Thunder Bay, Prince Rupert and Vancouver). Without terminal facilities, a new CWB would be in much the same position in international trade as if it owned no country elevators.

It would be very difficult for a new CWB to acquire grain handling facilities in the Western Canadian grain industry at the current time. The most obvious problem is a lack of capital. Unlike the Australian Wheat Board, which was allowed to build up a significant investment fund over a substantial period of time, the organizers of a new CWB would have no capital – other than what they could themselves invest – at their disposal. Without capital, acquiring grain handling facilities is simply not possible. Although the task force envisages the CWB selling shares to farmers, this share offering would only add an additional $110 million in assets, an amount insufficient to purchase a grain handling company (as an example, Saskatchewan Wheat Pool's bid for Agricore United is valued at $423.8 million).[15]

Even with a large capital fund, acquiring grain handling facilities would be difficult. One obvious way for a new farmer-owned entity to acquire facilities would be to merge with existing farmer-owned entities that already own grain handling facilities. With the conversion of the three prairie Pools to standard business corporations over the last ten years, the option to merge with co-operatively-owned grain handling firms is no longer available. A number of farmer-owned inland terminals do exist; however, many are not independent since they are partially owned by existing grain handling firms. Thus, even if one or two of the independent producer terminals were willing to merge (which itself is highly questionable), the result would not be sufficient market presence to operate across all of Western Canada.

Another option for acquiring grain handling facilities would be to purchase them from existing industry players. While some of the grain companies might be willing to off-load some of their more poorly situated elevators to a new competitor, in general the existing players will not want to see a new competitor come into the market and thus will not be willing to sell their elevators. This is particularly the case at port position, where ownership of terminal capacity provides grain companies with significant market influence. Thus, a situation where one or more of the existing companies sell off a significant portion of their grain handling system is very unlikely to occur.

What about the possibility that a new CWB would be able to purchase the entire elevator system of one of the existing companies? While this is a possibility, the likelihood of this occurring is not high. One reason is that all the grain companies are looking to the opening up of the market that would occur with the dissolving of the CWB as an opportunity to strengthen their operations and to improve their bottom lines; as a result, they are unlikely to want to sell. A second reason is that existing grain companies would be willing to spend a significant amount of money to keep a new CWB out of the market – they could do this by making a counter-bid to any grain company with which the new CWB would negotiate (in fact, any

company approached by a new CWB would have an incentive to ask for counter bids from the other existing players). While one of the large multinationals that currently does not have a presence in the Canadian market (e.g., ConAgra) would have the financial wherewithal to outbid some of the current incumbents, a new CWB, with limited financial backing, would not have this ability. Indeed, a probable outcome is that multinational grain companies would end up owning a significant portion of the Canadian grain handling system.[16]

A third option for acquiring elevator and terminal facilities would be to build new ones. While this would have been a viable option at the country level a decade ago when much of the elevator capacity needed rebuilding, this option is not viable today given the overcapacity that would result from such a move. The problem with bringing on new capacity today would be that doing so would likely trigger very intense price competition by the existing firms in the industry as they try to retain market share and drive out the new player. The farmers that would be developing the new CWB would have to ask whether they would be willing to invest their money in what can be expected to be a very risky venture, particularly during a period when farm incomes are low. Building new port facilities is an extremely costly exercise and could only be entered into if the new CWB had very secure financial backing. As a point of comparison, the cost of Saskatchewan Wheat Pool's Project Horizon was $270 million at the end of the last decade – the cost of building new facilities today could easily be double this value, particularly given the rapid rise in construction costs that has occurred during the last two or three years.

The New CWB and Export Sales

Even if a new CWB were able to acquire country and terminal facilities, it is highly unlikely that it would be able to play much of a role in international trade; its activities would be largely concentrated on the Canadian and perhaps the U.S. market. At the current time, the CWB has significant leverage in the international market because it handles all the grain exported from Western Canada. Most millers want a mix of wheat types to produce the flour they are selling. Since Canada is one of the few regions where high quality hard red milling wheat is produced, the CWB is able to gain access to buyers that are looking for this type of product – if the millers want hard red spring wheat, for instance, they need to talk to the CWB.

This situation would change if the single-desk selling powers of the CWB were removed. In that situation, there would be multiple sellers of Canadian wheat and millers would not have to deal with the CWB if other sellers were able to offer a better service. Among these sellers would be the large multinational grain companies such as Cargill, Louis Dreyfus, Archer Daniels Midland (ADM), ConAgra, and Bunge.[17] Some of these companies have a presence on the Canadian Prairies, while others could be expected to acquire this presence when the single-desk selling powers of the CWB are removed. Because of their multinational nature, these companies are able to source grain from all over the world; indeed this is one of the

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benefits they provide to buyers – buyers know that if the crop in one region of the world is poor, then the multinationals will be able to source it from another location.

A new CWB would not be able to provide this service to buyers, since it would realistically be limited to sourcing grain from only Canada (the cost associated with operating overseas and the expertise that is required would place this activity outside the realm of a new CWB). While Canadian grain is in demand from buyers around the world, a new CWB would not be the only supplier of this product. As a result, it can be expected that most of the export sales from Canada would go through the multinationals that can supply Canadian grain as well as grain from other regions of the world. This is the experience in the United States, for instance, where the large agricultural co-operatives such as CHS (formerly Cenex Harvest States) do not have much export activity despite the fact that they have a significant presence in the country.

In conclusion, a new CWB would have difficulty operating in the international market. Indeed, any grain company that relied largely on sales from Canada would have difficulty operating in the international market. As a consequence, smaller companies without an international network of supply sources and sales offices can be expected to have trouble competing with the multinationals. The result is that these companies are likely candidates for takeover by the multinationals should the CWB's single-desk selling powers be removed.

The New CWB – A Recap

In summary, a new CWB is unlikely to be successful in the current grain handling and transportation environment. Simply put, the barriers to entry for a new grain handling company, which is what a new CWB would be, are simply too great at the current time. Any company – and this includes the CWB – wishing to enter the Canadian grain industry would have great difficulty in doing so.

To be viable, a new CWB would have to own and operate its own grain handling facilities in the country and at port position – it could not operate only as a producer marketing agency and survive economically. It is also unlikely that a new CWB would be able to acquire elevator facilities. First, a new CWB would not have the capital required to make such a purchase; even with capital, a new CWB would have trouble acquiring facilities. And even with facilities, the likelihood of a new CWB competing in the international market with the multinationals is very low. Thus, it is unlikely that a new CWB would be successful.

Since a new CWB is unlikely to be successful, it follows that farmers would be unwilling to create and invest in this new organization. Specifically, the outcome envisaged by the task force – farmers purchasing shares in a new CWB – is unlikely to occur; unless farmers see value in purchasing shares, there is no incentive for them to make this purchase. Thus, the most likely consequence of removing the CWB's single-desk selling powers is that the CWB will disappear and no new farmer-owned organization will emerge to fill the void.

Even though it is unlikely that a new CWB would be created, it is nevertheless important to examine the pricing and marketing models that this organization might use were it to be successful (indeed, the choice of pricing and marketing models will in part determine success). As the next section shows, a new CWB, if it were to acquire grain handling facilities and become operational, would almost certainly buy grain from farmers on a spot market basis. Without single-desk selling powers, it would be almost impossible for a new CWB to operate a price pooling system. The removal of the CWB's single-desk power would also spawn a major transformation of other aspects of the grain handling system. A subsequent section examines the structural impacts of the elimination of the CWB.

The Myth of Marketing Choice

It was argued in the previous section that it is unlikely that a new CWB would voluntarily be created if the current CWB were disbanded. Putting that argument aside for the moment and assuming that a new CWB would be created, how might this new entity behave? Would it, for instance, offer farmers a pooled price?

The question of whether a reconstituted CWB would offer price pooling is important because of the manner in which the CWB debate has evolved. Over the last 15 to 20 years, critics of the CWB have argued that farmers should have a choice in how they market their grain. This choice was often presented in terms of a dual market. A dual market is defined as an open market where some entity (e.g., a new CWB) continues to offer pooling while the private trade offers cash trading (this definition is consistent with the task force's view that the term "dual market" should be replaced with the term "marketing choice" in the context of an open market). The question of whether price pooling is viable is also relevant because the task force gives the offering of price pools as an example of an innovative financing and pricing product that a new CWB could offer that was not offered by competing grain companies.

The purpose of this section is to show why a dual market will not be viable. The proponents of dual marketing argue that if a new CWB could not compete in such a market then it is inefficient and that failure is the result of poor management. This conclusion is incorrect. A dual marketing structure is not viable because of the incentives that are created as a consequence of the nature of the dual market. Interestingly, since a dual market is not viable, farmers will ultimately have no choice between marketing through a pool and marketing through the open market. Only the open market option will exist.

The pooling options that have been put forward include the following: (a) completely voluntary pools which farmers are free to enter or exit whenever they wish and (b) contractual pools where farmers are required to sign a contract to remain in the pool for a required period of time.

The reason why a completely voluntary pool cannot operate alongside a cash market is a direct function of pooling. Pooling is a system whereby high and low

prices – prices received at different times of the crop year and in different markets – are averaged in a weighted fashion according to sales to give the pooled price. The consequence of the averaging process is that when market prices are rising, the pool price will generally lag behind. Under a voluntary arrangement, the lower price for the pool will result in farmers delivering to the cash market. In contrast, when prices are falling, the pool price will generally be above the cash price. This will provide an incentive for producers to deliver to the pool. The consequence of this behaviour is that the voluntary pool experiences either relatively small volumes being pooled or substantial losses in the pool if guaranteed initial prices are present.

Contractual pools theoretically do not suffer from the problem of producers moving in and out of the pool. However, contractual pools have their own problems. When producers sign fixed delivery contracts, they take on significant production risk. To reduce the risk of not being able to deliver on their contracts, farmers can be expected to contract only a portion of their crop, thereby limiting the amount of grain available to the pool. Contract pools also experience problems with delivery enforcement. In most instances, delivery contracts are not ironclad and cannot be made so. The experience of the Ontario Wheat Producers' Marketing Board (OWPMB) provides a case in point. In 2003, the cash price was above the pool contract price and farmers were reneging on contracts they had with millers, saying that their wheat spoiled. The millers did not have the time or money to investigate the farmers' claims.[18] The same situation has existed for crops such as mustard – farmers have often reneged on contracts when the market price rose above the contracted price. Contract enforcement is costly and does not put the grain companies in a good light. The results are a high cost of enforcement and substantial contract default under conditions of rapidly rising prices.[19]

Pools may also be subject to the strategic behaviour of the other grain companies in the industry, who may set prices in such a fashion that the pool suffers large losses. While such a strategy may temporarily lower the profits of the grain companies, it may return long-term benefits if the pool is unsuccessful.

Some experience with contract pools exists in the United States where co-operatives have operated a number of pools over the past 30 to 40 years. In California, for instance, dual markets have been in place for such commodities as citrus, raisins, peaches, almonds, cotton, and rice. These dual markets are associated with co-operatives that purchase product from their members at a pooled price. The co-operatives involved in pooling include Sunkist (citrus), Sun-Maid Growers (raisins), Tri-Valley Growers (peaches), Blue Diamond (almonds), Calcot Ltd. (cotton), and Farmers' Rice (rice).[20]

While pools have been successful in some crops, they have not been successful in wheat. (See Appendix A for a detailed examination of the factors affecting success of marketing pools. As the appendix shows, the grain sector does not posses the characteristics that would make pooling successful.) In the United States, Landmark, Inc. and the Ohio Farm Bureau, FAR-MAR-CO (this was a division of Farmland Industries, Inc.), and Harvest States Cooperatives have all run pools in the past; none of these were ultimately successful.[21] FAR-MAR-CO's pool, which

began in 1976, was phased out in 1985. Harvest States Cooperatives experimented with a pool in the 1991/92 and 1992/93 crop years. Although the performance of this pool was good in the first year, the basis moved the wrong way in the second year, and Harvest States discontinued the program.

In Canada, the OWPMB has operated a number of pools since its single-desk selling powers were removed in 2000. Although pools are still in operation, only five percent of the total milling wheat was sold through these pools in 2003/04.[22] In this past year, the OWPMB had to source grain from Europe to meet a sale to India because it could not access it through the pool. Most farmers obviously did not view the pool accounts as being an innovative pricing product.

It should also be noted that pools have not been used by any of the existing grain companies – including the Pools when they operated as co-operatives – in canola, flax, or pulse crops.

As Appendix A describes in more depth, the operation of a successful and viable pool depends on the interaction of at least three factors: (1) the pool being able to attract a significant market share, (2) the market share being stable, and (3) the pool not operating with a deficit. In a dual market, a wheat or barley pool in Western Canada would be unable to provide the special advantages that are required to attract a significant and stable market share. This inability to offer special advantages gives farmers little incentive to deliver to the pool except when it is strategically advantageous to do so. This translates into a low and variable market share. Combined with a need to avoid deficits (which further weakens a co-operative's ability to operate a pool), the conclusion is that a dual market for wheat and barley will not be viable in Western Canada.

Given that a price pool is unlikely to be viable, a new CWB, if it were to be formed, would purchase grain from farmers using the spot market. In other words, removing the single-desk selling powers of the CWB is almost certain to result in farmers selling the bulk of their grain through the spot market system. The spot market system would be supplemented with contract purchases when grain of a particular quality and without a large market (a good example would be the specific varieties of grain sold to Warburtons) is required.[23] As a consequence, the removal of the CWB's single-desk selling powers would result in a situation where farmers would not have a choice as to whether they deliver to a price pool or the open market. Only the open market option would exist.

The Structural Impacts of Eliminating the CWB

As was outlined in the introduction, one of the conclusions of this paper is that the removal of the CWB's single-desk selling powers will fundamentally transform the Canadian grain handling and transportation system. This section examines some of the major structural changes that could be expected to occur. These changes include a shift in marketing power towards the grain companies and the railways, a

loss of political power for farmers, and modifications to transportation policy. One of the biggest impacts of these changes will be a reduction in the value obtained for Canadian grain.

It is important to note that the task force explicitly acknowledges that the removal of the CWB's single-desk selling powers will have many of the structural impacts described in this section, although it does not elaborate on them. Among the task force's recommendations are ones relating to the measures that need to be taken by the Canadian Grain Commission to ensure access to producer cars and amendments that need to be made to the *Canada Grain Act* to address problems of non-competitive behaviour in the grain handling industry. The task force also acknowledges the need to address issues of rail competition, although it does not link any changes in this area to the removal of the CWB's single-desk selling powers.

Although the task force recommendations are designed to deal with what are real problems, additional regulation is unlikely to effectively address these problems. As is well known from the regulation literature in economics, regulatory agencies are typically "captured" and influenced by the companies in the industry, with the consequence that the regulations often do not have the "teeth" they were intended to have.[24] Development of organizations such as the CWB that directly encourage competition often are a more effective way of addressing market power issues.

Reduced Competition among the Grain Companies

Primary grain handling on the Prairies is reasonably concentrated – in 2006, the top four grain handling companies (Agricore United, Saskatchewan Wheat Pool, Pioneer Grain, and Cargill) hold nearly 50 percent of the primary storage capacity in Western Canada. (This number is conservative, since a number of the producer-owned terminals are partially owned by members of the top four; as well, not all four companies have elevators at each delivery point – the result is that the spatial concentration is often much higher than the aggregate figures would suggest.)[25]

This level of concentration, along with a lack of excess capacity (see discussion earlier in the paper), suggests that the grain handling firms have the potential to exert some degree of market power, i.e., to raise prices above the cost of providing the service. To encourage greater competition among the grain companies, the CWB has, since 2001, operated a tendering process for approximately 20 to 25 percent of the grain destined for export.[26] Under the tendering process, grain companies have to provide bids to the CWB for grain cars; the CWB then selects the best bid. By having the grain companies compete with each other over supply held by one seller (namely the CWB) rather than by a large number of sellers (namely farmers), a shift in market power from the grain companies can be obtained.

Disbanding the CWB would remove the ability of the CWB to bring additional competition to the primary grain handling sector in Western Canada through a tendering process. Assuming that a restructured CWB would own grain handling facilities (recall from the earlier discussion that without facilities a new CWB would be unlikely to survive), its presence at certain delivery points would increase com-

petition at these locations. Indeed, one of the key roles of farmer-owned businesses is to bring increased competition to the market place. However, the degree of competition that could be provided can be expected to be significantly less than if the CWB were to retain its single-desk selling powers.

The primary elevator system is not the only place where competition is important. Equally, if not more important, is the competition at port for terminal services. Port facilities are highly concentrated – the largest four grain handling companies (Agricore United, Saskatchewan Wheat Pool, Pioneer Grain, and Cargill) hold 85 percent of the terminal capacity at Thunder Bay, close to 100 percent of the terminal capacity in Vancouver, and 100 percent of the terminal capacity in Prince Rupert. This ownership structure is important because almost all grain destined for export from Western Canada has to go through one of these ports (a small amount of grain goes through the Port of Churchill), and at key times of the year the port capacity is not sufficient to handle all the grain that companies wish to export – this is particularly the case with Vancouver.

There are two consequences of the port terminal's limited capacity. First, the smaller grain companies have to rely on the largest four firms for port access. Without this access, these smaller companies would not be able to bid for grain at the primary elevator level. Thus, ownership at the terminal level effectively determines competition in the country. The second consequence is that the owners of the asset that is in short supply will be able to charge a premium for access to this asset. As a result, terminal charges can be expected to be set above the cost of providing the service.

The CWB has played an important role in addressing the market power held by the terminal owners. Since the CWB controls the wheat and barley that is exported through the ports, it has the power to negotiate better terms with the terminal owners. As well, through its car allocation policies, the CWB is able to ensure that all the grain companies have access to terminal facilities. This has enabled some of the smaller grain companies to continue operations, which in turn has increased competition at the primary elevator level. The removal of the CWB's single-desk selling powers would mean the loss of this countervailing force in the market; the most likely result would be higher terminal elevator charges.

The CWB has also played an important role in keeping the Port of Churchill open. Since none of the current large grain companies in Canada have a terminal at Churchill, they are reluctant to ship grain through that port since they then do not get the terminal charges.[27] The CWB has been able to move grain through Churchill by reducing rail car access to grain companies that do not ship grain to that port. This ability to influence grain export patterns would be lost if the CWB did not have its single-desk powers. While it is possible that one of the large grain companies might purchase the terminal at Churchill (Louis Dreyfus is a partner in the operation and ownership of the terminal), thus making export through that port attractive, such a purchase would be at fire-sale prices – without the CWB in place, a terminal in Churchill has little value and the owner of that terminal has little bargaining power.

Less Favourable Terms from the Railways

The argument presented above for grain handling services also applies to rail services. The railway industry is properly described as a duopoly – that is, there are only two main firms that compete in the provision of transportation services. With the exception of a few delivery points, however, the two railways are located in different geographical regions. This geographical separation means the railways often possess local monopoly power. This market power arises because a large percentage of customers are in some sense captive. If market forces were relied upon to establish freight rates, both railways would know they could raise their freight rates without losing too many customers to their competitor. There would also be no incentive for any railway to lower freight rates, since lower rates would be unlikely to attract many new customers, particularly if their competitor were to lower its rates at the same time.

The railways operate a transportation system that is often pushed to capacity. At such times, the railways have an incentive to move goods that have a high value rather than those that have a low value, since they will be able to charge higher rates for the movement of higher valued goods. Since grain is not a highly valued product from the railway's perspective, it is often pushed aside when rail capacity gets tight.

The CWB plays an important role in addressing both of these issues. Since the CWB has control over all export grain from Western Canada, it can often negotiate better freight rates than could a number of grain companies acting independently. Similarly, the CWB is in a position to negotiate better service terms from the railways.

The removal of the CWB would change the power balance between the grain handling companies and the railways. The railways can be expected to continue their current strategies of incentive rates for multi car loadings, investment in infrastructure, and various ancillary charges that shape the behaviour of the other players in the grain handling and transportation system. As well, freight rates can be expected to rise and the level of service can be expected to fall. This impact would not be universal, since a company like Cargill, with its wide range of products and transportation needs, might be able to negotiate better terms than would the other companies. Even so, these better terms would not likely be passed on to farmers, since this would only happen if all of the grain companies had access to these better terms.

Pressure on Producer Cars and Short Line Railways

Over the last five to ten years there has been a substantial increase in the number of producer cars and in the use of short line railways.[28] The removal of the CWB would threaten much of this activity. The reasoning is very similar to that presented in the previous two sections. For producer cars, the presence of the CWB has meant that these operations can obtain rail cars; once the grain is on these cars, the grain companies have an incentive to handle the grain at terminal position. In a similar

way, the CWB has allowed the short line railways to flourish, since they have been able to ensure that these companies obtain rail cars and that the two major railways handle the cars that are loaded on the short line.

The removal of the CWB would change this situation. Since the farmers that load producer cars do not have terminal facilities, they would find themselves at the mercy of the grain companies with terminal capacity. Simply put, these grain companies would rather handle the grain themselves through their systems and thus have no incentive to provide loaders of producer cars with access to terminal facilities. Without access to terminal facilities, there is no incentive to load a producer car.

The method of rail car allocation would also change if the CWB were to lose its single-desk selling power. Instead of the CWB allocating rail cars to the grain companies according to past deliveries and success in tendering, it is likely that a bid system would emerge in which the railways would allocate cars according to the grain shippers' willingness to pay. While the largest grain companies may be able to negotiate better rates and service, the small shippers – and this includes farmers loading producer cars – can be expected to pay higher fees and to receive poorer service. This differential service would provide a further reason why producer cars would suffer. The change in railcar allocation would also affect short line railways, in part through its impact on producer cars, which make up an important part of the volume carried on short lines, and in part because the railways would ensure through their pricing that they get the rail traffic – and hence the revenue – on their lines.

Elimination of an Advocacy Voice

Over the last five to seven years, the CWB has increasingly played an advocacy role, a development that can be directly linked to the new governance structure under which the CWB now operates. With ten of the fifteen CWB directors elected by farmers, the CWB has become much more vocal and involved in policy issues that are of concern to grain farmers. Among the items with which the CWB has been involved are the rail revenue cap, railway service issues, the merger between CN and B.C. Rail, U.S and international trade challenges, and the merger between Agricore and UGG.

The CWB's ability to play a role in these policy issues is not surprising. To be effective at policy intervention, organizations require the technical capacity to engage in analysis and to fully understand the issues (e.g., the ability to hire trade lawyers), enough resources to be able to engage in policy debates over an extended period of time, and the ability to network with other groups to bring them on side. All three of these factors were at work in the discussions around the revenue cap, for example.[29] The CWB was successful in obtaining a revenue cap on rail shipments because it had the ability to research the question, to engage the policy makers on the issue over a period of time, and to bring other farm organizations on side to support a policy position.

The elimination of the CWB as it now exists would mean an end to advocacy activities. While a large farmer-owned grain company with substantial market share and size can play an important policy role (witness the success of the Saskatchewan Pool in policy during the early 1980s), for reasons presented above it is unlikely that a new CWB would ever be able to reach the size required to be effectively involved in policy and advocacy. Moreover, a number of the situations where the CWB has been effective are ones where its single-desk selling power played an important role. For instance, the fact that the CWB was the sole exporter of Canadian wheat and barley gave its position on railway service added weight.

Removal of the Freight Cap

One of the distinctive features of the grain handling and transportation system in Canada is the presence of a freight revenue cap on railway grain shipments. Under the cap, the total freight rate bill for grain shipments cannot exceed a specified amount. An important consequence of the freight revenue cap is that freight rates in Canada are generally lower than those over comparable distances in similar geographic regions in the United States. For instance, the freight rate from Winnipeg to Thunder Bay is roughly $15 per tonne lower than the freight rate from Grand Forks to Duluth, even though the distances are very similar.

One of the effects of this freight rate differential between Canada and the United States is that, without adjustments of one type of another, millers in Canada would be at a disadvantage to their U.S. counterparts. To see this, suppose the price at Duluth/Thunder Bay is $200 per tonne. Assuming a $25 per tonne freight rate to Winnipeg, millers in Canada are looking at a price of $175 per tonne. If they do not pay this rate, the grain will flow to the more lucrative export market. Millers in Grand Forks, however, are looking at a price of $160 per tonne (recall that the freight rate is higher in the United States than in Canada). This lower price puts them at a competitive advantage relative to their Canadian counterparts.

To rectify this situation and level the playing field, the CWB has been setting different prices to the Canadian and U.S. millers. Although this price discrimination results in somewhat lower revenues to the pool accounts, it does ensure that Canadian millers are able to be competitive. The CWB has been able to practice this price discrimination because of its single-desk selling powers.

If the single-desk selling powers of the CWB were removed, the grain market would arbitrage the price differential described above in a number of ways. One method of arbitrage would be for grain to flow from the United States into parts of Western Canada and then be exported through the Canadian system in order to access the lower freight rates.[30] This movement would tend to bid up the price of grain in the United States and lower it in Canada. Prices would eventually settle at a point where there is no incentive to move grain into Canada. Depending on the magnitude of the price changes, the Canadian millers might find themselves competitive with their U.S. counterparts; it is also possible they might find themselves at a disadvantage.

If this latter situation prevails, considerable political pressure can be expected to remove the freight revenue cap in an effort to restore a level playing field for domestic millers. Similar political pressure might emerge if grain shipments from the United States through Canada were to become large.[31] While the outcome of this lobbying cannot be foretold with certainty, there is a real possibility that the freight cap would be removed.

A second method of arbitrage (this outcome and the previous one are not mutually exclusive) would be for the grain companies to increase the basis between terminal position and local elevator points in Canada so that the basis included the transportation cost differential. This strategy would have the effect of eliminating the cost penalty faced by Canadian millers; it would also effectively eliminate the revenue cap (in effect, the grain companies would capture the benefits of the cap). Since farmers would no longer receive the benefit of the revenue cap, they would have little incentive to lobby for its continuation. As well, the railways could be expected to argue vigourously that the cap should be removed, since doing so would allow them to capture additional revenue, albeit at the expense of the grain companies.

The removal of the revenue cap is all the more likely given that there would probably be significant pressure on the Canadian government generally to harmonize policies with the United States in the area of grain handling and transportation. Indeed, since the elimination of the CWB's single-desk selling powers would create very similar marketing systems in both countries, the major players in the grain and transportation industry can be expected to lobby for essentially the same system on both sides of the border. Removal of the freight cap would be an important element of this harmonization.[32]

Discussion of Impacts

The structural changes described above are likely to have an impact on the value obtained for Canadian grain and on the quality of Canadian grain sold to millers.

Value of Canadian Grain

A number of studies have determined that the CWB is able to capture additional revenue in what are generally referred to as high quality markets because of its single-desk selling powers.[33] Millers in a number of markets (for instance, Japan) are willing to pay a premium for Canadian grain because of its quality and consistency. The single-desk selling powers allow the CWB to capture this willingness to pay – since no one else has a supply of Canadian wheat, the CWB is able to demand and receive a higher price than would otherwise be the case. This added revenue – which is often referred to as monopoly rent – flows back to farmers through the pool accounts.

If the single-desk selling powers of the CWB were removed, Canadian grain would now be sold by a few large exporters, most likely the multinationals.[34] The

presence of multiple sellers would mean that the monopoly rents would no longer be captured, since these firms can be expected to bid against each other to sell into particular markets, thereby lowering the price and the revenue that is obtained. However, since the sellers would still be relatively few in number, some rents can be expected to be captured; these oligopolistic rents, however, can be expected to be less than the monopoly rents captured by the CWB.

To see this more clearly, consider what a tender out of Japan, the EU, or Iran would look like without the CWB's single-desk selling powers. The multinationals would consider all the supply sources they have, calculate where the best deal could be made for their company, and then price and source supplies accordingly. In contrast, the Australian Wheat Board would make a bid based on the best interest of Australian farmers. The result is that Canadian wheat would be traded off with wheat from a variety of countries, while Australian wheat would not. The result is that fewer rents would be obtained for grain from Canada.

Moreover, in addition to generating less revenue from the sale of Canadian grain internationally – which would have a direct effect on the value available for farmers – the removal of the CWB's single-desk selling powers would have an additional impact on the price returned to farmers. Without the CWB, the extra rents generated in the export market would only be partially returned to farmers. The factors that would determine the portion of the oligopoly rents distributed to farmers include the degree of competition present at the country elevator level (the greater the competition, the more of the rents that would be returned) and the overall supply of the high quality grain that is in demand in the high quality markets.

In most years, the supply of high quality grain produced on the Prairies far exceeds the demand by the millers in the so-called high quality countries. In this situation, and without the CWB as it is currently structured, the grain companies would not need to pay farmers a premium for this grain – they would be able to access all the high quality grain at the going market price. Thus, in most years farmers would not see the extra rents returned to them. However, in years when high quality grain is in short supply, a portion of the oligopoly rents would be returned to farmers as the grain companies try to obtain a supply.[35] A good example of this situation is in malting barley. Most years malt barley is in oversupply relative to the demand by the maltsters. However, the CWB is able to obtain a premium for malt barley because it is able to constrain supplies via the single desk. In the absence of the CWB, malting barley in most years would sell for essentially the same price as feed barley (there would be some small premium to reflect the transaction costs associated with marketing). Only in years when supply is constrained due to poor weather conditions would a premium emerge.

To recap, the elimination of the CWB's single-desk selling powers can be expected to lower the rents generated in the market and to lower the proportion of these rents returned to farmers. The result is that farmers can be expected to see reduced returns from the sale of Canadian wheat.

Deterioration in the Quality of Canadian Grain

The argument presented in the previous section assumes that the quality of Canadian grain would be maintained if the single-desk selling powers of the CWB were removed. However, one of the probable consequences of changing the CWB's powers is that the quality of Canadian grain would fall.

There are a number of reasons why this outcome might occur. In the short run, quality would likely fall as a result of the competition between, and the independence of, the various grain traders that are now selling Canadian wheat. Grain quality is a function of many factors and is determined by many players in the supply chain. Varietal type is, of course, important, as is the manner in which grain is handled and stored as it moves through the marketing system from the farmer to the miller. For instance, a high quality grain shipment can easily become contaminated at a particular stage if sufficient care and attention are not provided.

Currently, the CWB has a particular incentive to monitor and to pay attention to quality of the product as it moves through the system. Since the CWB receives all the revenue and incurs all the costs from the sale of the grain, it has an incentive to ensure that the system is working in a manner that the net revenue from the system is maximized. The incentive facing multiple grain firms involved in handling and marketing the grain is different, however – each firm is only interested in the net revenue that it is able to obtain. The consequence of this different perspective is that the incentive to maintain quality at all steps along the process diminishes.[36] Concern over quality emerged as an issue in Ontario recently when grains of different classes were mixed to capture a premium; this outcome is one of the areas where the removal of the single-desk selling powers of the OWPMB had a direct impact.[37]

Research and Development

The removal of the CWB's single-desk selling powers would also have effects in a number of other areas. One is research and development (R&D) activities. Because wheat and barley are open-pollinated crops that can reproduce each year, private seed companies have little incentive to develop private varieties. As a result, public and producer funding of R&D for new varieties is critical. As a major player with a view of the entire system, the CWB currently is in a position to strongly influence the magnitude and the direction of the research that is undertaken. The removal of the single-desk selling powers would leave the industry without a body that would have the overview the CWB currently provides.

More generally, the removal of the CWB would create a vacuum of leadership in the Canadian grains industry, at least in the short run. While a body such as the U.S. Wheat Associates could be developed in Canada to coordinate R&D and market development activities, such a body does not exist today. Moreover, given the CWB's focused commercial interest, it plays a more effective role in market development and R&D than could an industry association that has to meet the goals of

many groups. As a consequence, one of the outcomes of the CWB's removal could well be less R&D, or R&D directed to only the major issues – issues that clearly have widespread support throughout the industry.

Concluding Remarks

Since the 1920s and the introduction of the grain pooling co-operatives in Western Canada, the Canadian grain handling and transportation system has evolved in a very different direction from that in the United States. The CWB has been a key element of this evolution. The changes that are proposed for the CWB would transform the Canadian grains industry, with the impact of this change felt in virtually every part of the system. The changes that would accompany the loss of the CWB's single-desk selling power would make the Canadian system more and more like that in the United States.

The price pooling system that has been in place for over 60 years would disappear and would be replaced by an open market system. Although the people and groups that are calling for the reform of the CWB are arguing for marketing choice, the proposed changes to the CWB would not generate this outcome – instead, only one marketing structure would survive.

The proposed changes to the CWB are likely the precursors to additional policy changes, all designed to harmonize the Canadian grain handling and transportation system with that in the United States. The freight revenue cap, for instance, is a unique Canadian policy response to the issue of the market power possessed by the railways. Because the existence of this policy in Canada creates a disadvantage to the railways and the millers that is not experienced in the United States, considerable pressure will be exerted to have this policy changed so that it is more in line with U.S. practices. The outcome of this harmonization would be higher freight rates for farmers in Canada.

In short, the changes that are proposed for the CWB call for a very different vision for the grains and oilseed sector than has been in place for over half a century. It is important that all participants in the system have and take the opportunity to express their views on which vision is the most appropriate. As this paper has demonstrated, the choice of vision is not one that farmers can make each day independently of what other farmers do. If the decision is to retain the CWB, then all farmers have to operate under this system; similarly, if the decision is to remove the CWB, then all farmers have to operate under the resulting open market. Ideally, the choice is one that Western farmers should make democratically as a group. If the choice is to remove the single-desk selling powers of the CWB, it needs to be understood that this choice is likely irreversible. The likelihood of replacing an open market system with a single-desk selling system is very small, in part because of the cost of doing so and in part because the political will that would be required for such a change would be immense.

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Appendix A[38]

The operation of a successful or viable pool depends on the interaction of at least three factors: (1) the pool being able to attract a significant market share, (2) the market share being stable, and (3) the pool not operating with a deficit.

Market Share and Market Variability

The abilities of a pool to attract both a significant and a stable market share are closely related. Research shows that a co-operative's ability to attract a significant and stable market share can be linked to seven explanatory factors. Co-operatives are more likely to be successful when the following conditions are observed:[39]

(1) A large investment is required for preprocessing and processing
(2) There are few growers with volumes large enough to capture processing economies of scale
(3) Crop production requires fixed investments committed over several years
(4) There is considerable flexibility in harvesting and storing the raw product
(5) Useful grades can be defined and prices can be pooled over marketing periods
(6) Costs of marketing can be spread over a longer season
(7) Growers make marketing decisions infrequently and/or when individual marketing decisions cannot earn higher returns.

If a number of these factors are not present, then farmers will find it more advantageous to either sell or process their production as individuals, rather than on a group basis through a co-operative. The lack of these factors thus gives farmers little incentive to use a co-operative (thus translating into a low market share). In addition, when farmers do use a co-operative, it is because it is strategically advantageous to do so (thus translating into a variable market share).

A number of the factors required for successful pooling are not present in the case of wheat and barley in Western Canada. Most importantly, grain farmers are able to access markets (for example, at the local elevator or at a distant grain mill) without a significant investment and without having to have large volumes of grain. As well, wheat and barley production specifically do not require fixed investments committed over several years. Although crop production in general does require such investments, farmers can use these investments to produce a wide range of crops, including wheat, barley, oats, canola, lentils, peas, and other specialty crops.

Since grain farmers are able to access markets without a significant investment and without having to have large volumes of grain, there is little incentive for farmers to commit themselves to a price pooling organization. Hammonds makes the same point in his study of co-operative market pooling: "Any cooperative or other body initiating a market pool must be certain it can provide a special service or expertise that is truly beyond the reach of individual growers, if sustained success

is to be assured. Evidence is conclusive that merely combining the crop volume of a number of growers for marketing purposes is not enough. The successful operations studied capitalized on one or more special advantage(s) they developed to differentiate their role in the marketing of the agricultural commodities with which they are identified" (p. v). The special advantages identified by Hammonds include specialized grading services offered by the co-operative, brand-name products at the consumer level, quality control programs offered by the co-operative, and substantial vertical integration. The research on California co-operatives supports this conclusion, since California co-operatives have been uniquely successful in moving into processing, vertical integration, and brand-name products at the consumer level.

The opportunity for co-operatives to provide special services is, of course, highly dependent on the market share and market share stability the co-operative is able to achieve. A large and stable market share means the co-operative will be able to exploit economies of scale, thus enabling it to attract further market share. However, the opportunities for co-operatives to develop economies of scale differ from commodity to commodity.[40] For instance, since the sale of fresh vegetables involves very little processing, individual growers are in as much of a position to supply fresh vegetables to markets as is a collection of growers. As a result, it is expected co-operatives would have trouble attracting and maintaining membership, since they can offer very little in comparison to what individuals could provide acting alone. As the evidence from California shows, co-operative activity in fresh vegetable marketing is very low. In contrast, packing and advertising almonds or raisins is an activity that is costly to carry out by individual growers, but can be done much more inexpensively by a co-operative. Almonds and raisins are two commodities in which co-operatives have a significant market share (Smith and Wallace).

A wheat or barley pool in Western Canada is unlikely to provide any special advantage compared to what can be offered through other marketing channels. For instance, in the domestic market, farmers would be able to deliver directly to a flour mill without going through the pool; hence the pool is unable to provide any special service. As well, unless the pool could obtain a significant portion of the production, it would not be able to obtain any price premium in the international market relative to what other grain sellers would be able to obtain.

The result is that a wheat or barley pool would be unable to attract a significant or stable market share. The consequence is a vicious downward spiral, where the lack of opportunities for economies of scale means a low and variable market share, which in turn results in a lack of opportunities for economies of scale. With a low and variable market share, a wheat or barley pool is not viable.

An example of the importance of the need for market share stability is provided by the 1994/95 barley market experience in Canada. Lower than expected stocks, higher domestic usage, and lower than expected world production created a situation where the cash market was driven dramatically upward. The result was that deliveries to the pool were reduced. As a result of losing deliveries to the pool, the CWB was forced to forgo sales in a rising market environment. This, in turn,

resulted in a reduction of the pool price, as sales at the higher prices were forgone (Canadian Wheat Board). As was discussed above, market share variability gives rise to a vicious downward spiral.

Deficits

A grain pool operating in a dual market will also have a problem with deficits. A price pool can avoid a deficit by not providing farmers with an initial price. This strategy, however, will have the consequence of significantly reducing the volume of grain the pool can expect to receive. If farmers have to wait until the pool period is over to receive payment, they will bypass the pool and sell to the cash market, unless, of course, the pool can generate a substantially higher price. There is no reason to suspect that a new CWB will be able to attract a higher price than its competitors, particularly when these competitors include multinationals with marketing agents in virtually every market in the world.

To increase the likelihood of obtaining a sizable and stable market share, the pool can offer an initial price; the higher this initial price, the bigger and more stable the expected market share. However, if the initial price is set too high, the pool will run the risk of incurring a deficit. For instance, if market prices drop below the initial price, farmers can be expected to deliver to the pool. Unless the pool is able to hold the stocks they accumulate during this period and sell them later when the price has risen (such a strategy is extremely risky, however, for grain prices could fall, thereby increasing the deficit), the pool will run a deficit.

A new CWB operating a price pool would not be able to take the risk of running a deficit, even for a year. The reason has to do with the financing of the deficit. The deficit would not be financed by the government; if it were, strong objections would be raised by both the private grain trade and by other grain trading countries. The private grain trade would object because they would see such funding as the subsidization of the grain pool, thus making sales through them less attractive. Other grain trading countries would object because under the World Trade Organization (WTO) such funding would be viewed as a form of a direct agricultural subsidy. If funding for deficits were provided by check-offs on grain delivered to the pool, farmers would be that much less willing to deliver to the pool because the pool price would be reduced by the amount of the check-offs.

Conclusion

In a dual market, a wheat or barley pool in Western Canada would be unable to provide the special advantages that are required to make a pricing pool viable. This inability to offer special advantages gives farmers little incentive to deliver to the pool except when it is strategically advantageous to do so. This translates into a low and variable market share. Combined with a need to avoid deficits (which further weakens a co-operative's ability to operate a pool), the conclusion is that a dual market for wheat and barley would not be viable in Western Canada.

Endnotes

1. See Agriculture and Agri-Food Canada (2006a) for the announcement of the creation of the task force. See Migie et al. for the full report.
2. Section 47.1 of the *Canadian Wheat Board Act* reads:

   47.1 The Minister shall not cause to be introduced in Parliament a bill that would exclude any kind, type, class or grade of wheat or barley, or wheat or barley produced in any area in Canada, from the provisions of Part IV, either in whole or in part, or generally, or for any period, or that would extend the application of Part III or Part IV or both Parts III and IV to any other grain, unless

   (a) the Minister has consulted with the board about the exclusion or extension; and
   (b) the producers of the grain have voted in favour of the exclusion or extension, the voting process having been determined by the Minister.
3. See Agriculture and Agri-Food Canada (2006b).
4. See CWB Board of Directors for an overview of the changes that the CWB has proposed.
5. This goal was outlined in the Minister of Agriculture's announcement of the task force. See Agriculture and Agri-Food Canada (2006a).
6. The CWB's single-desk selling powers are found in section 45 of the *Canadian Wheat Board Act*. This section reads:

   45. Except as permitted under the regulations, no person other than the Corporation shall

   (a) export from Canada wheat or wheat products owned by a person other than the Corporation
   (b) transport or cause to be transported from one province to another province, wheat or wheat products owned by a person other than the Corporation;
   (c) sell or agree to sell wheat or wheat products situated in one province for delivery in another province or outside Canada; or
   (d) buy or agree to buy wheat or wheat products situated in one province for delivery in another province or outside Canada.
7. Good and Gilchrist examine the use of a traditional co-operative, a new generation co-operative, and a business corporation as organizational vehicles for a new Canadian Wheat Board. The implicit assumption in their paper is that the CWB will be restructured as a new organization.
8. The list of countries where co-operatives were formed by government as part of a national policy to use this organizational form as a development tool is long; it includes the likes of India, Kenya, and Tanzania. The experience of China in the 1950s when Mao mandated the formation of village co-operatives (they

eventually became the village communes) would also fall into this category. In all instances the co-operatives that were formed failed. For a discussion of the East Africa case, see Hyden. Attwood and Baviskar, and Baviskar and Attwood examine the India case, while Lin examines collectivization in China. For a general overview of the conditions necessary for the formation of farmer-owned business organizations, see Fulton (2005).

9. For a discussion of the role of member commitment in co-operatives and particularly the Saskatchewan Wheat Pool, see Lang and Fulton.

10. JRG Consulting Group provides an overview of these various options. A new CWB that is formed to act as an agent for sellers of Canadian wheat or as an agent for buyers of Canadian wheat is unlikely to be owned by a group of farmers (unless these farmers are first and foremost strictly investors, in which case the organization would effectively be owned by a group of investors). The reason is that such organizations would provide very little, if any, direct benefit to farmers. As a result, there would be no incentive for farmers to create such organizations, other than as an investment vehicle.

11. This reluctance by companies to allow others to use their network/dealership even applies within a company. Case tractors, for instance, are not sold through New Holland dealerships, nor vice versa.

12. See Ewins (2006a) for an overview of the DBRS report and quotes from industry sources, including the one by Brian Hayward.

13. Even if there were excess capacity in the system, it is not a given that the grain companies would use sales through a new CWB as a way of competing. While competition can be expected to be stronger the greater is the excess capacity, the companies may try to attract grain to their elevators by using incentives such as better grades or trucking subsidies rather than by using the CWB.

14. There is historical evidence from the Canadian grain industry that a farmer-owned marketing agency cannot operate without grain handling facilities. The co-operative grain marketing companies that were formed in 1923 and 1924 (they eventually became known as Alberta Wheat Pool, Saskatchewan Wheat Pool and Manitoba Pool Elevators) were often denied handling agreements with existing elevator companies – even those that were co-operatively owned. As a result, the prairie Pools constructed and acquired their own elevators (Fairbairn, p. 58).

15. See Donville for details.

16. A possibility that needs to be mentioned is that one or more of the existing grain handling co-operatives in the United States might move northward and take on new members and new facilities. While there is some experience with international co-operatives (e.g., those with members in more than one country) in Europe, there is very little experience in North America, thus making this outcome problematic. If a U.S. co-operative were to come to

Canada, it would be expected to operate in a fashion similar to how it operates in its home country. The result, of course, would not be the creation of a new CWB. As well, even a large international co-op located in North America is unlikely to be able to compete effectively with the multinationals in the international market – the co-op would simply not have enough diversity of supply to play on equal terms with the multinationals. For more on the role of the multinationals in the international grain trade, see the discussion below.

17. The international grain trade is highly concentrated. Hayenga and Wisner, for instance, report figures that indicate that, in the 1990s, 81 percent of U.S. corn exports went through the facilities of the top four firms; these same firms accounted for 65 percent of U.S. soybean exports. For wheat, the top four firms handled 47 percent of U.S. exports. All multinationals operate extensive information and market intelligence networks. They also operate vast networks of storage, handling, and transportation facilities that allow them to co-ordinate various aspects of grain distribution and handling (Davies). Proprietary assets such as information networks and personnel with specialized knowledge of the international narket provide incumbent trading firms with economies of scale and cost advantages, which in turn implies that these firms possess market power (Fulton, Larue and Veeman). Although multinationals dominate international markets, they compete in national markets with co-operatives, national trading companies, and on occasion, state trading enterprises (Hill, Davies). The result is that, at the country elevator level, competition ranges from very high to very low (Hill).
18. See Dobson and Duering.
19. The 1994/95 barley market experience in Canada is a good example of this problem. Lower than expected stocks, higher domestic usage, and lower than expected world production created a situation where the cash market was driven dramatically upward. The result was that deliveries to the pool were reduced. As a result of losing deliveries to the pool, the CWB was forced to forgo sales in a rising market environment. This, in turn, resulted in a reduction of the pool price, as sales at the higher prices were forgone (Canadian Wheat Board).
20. See Smith and Wallace for details on these pools. Tri-Valley Growers is no longer in operation; it filed for bankruptcy in 2000. The failure of the co-op was not due to its pooling practices, but rather to its inability to properly position its tomato processing operations to reflect changes in the industry (Sexton and Hariyoga).
21. For information on the Landmark/Ohio Farm Bureau pool, see Hammonds.
22. Dobson and Duering provide a more complete analysis of the OWPMB and the price pools.
23. For a detailed case study of Warburtons, see Kennett et al.

24. Articles by Stigler and by Posner are the classics in this literature. Friedlaender examines the impact of regulation on the rail industry in the United States and argues that railways were often able to use regulation to their benefit.

25. A CR4 ratio (the percentage of the total market represented by the four largest firms together) of 0.50 is indicative of a reasonable degree of concentration. For details on storage capacity of licensed primary elevators in Western Canada, see Canadian Grain Commission.

26. In the early years of the tendering process, the CWB tried tendering 50 percent of the grain movement. This amount was too high – the producer-owned terminals often found themselves unable to compete with the large grain companies such as Saskatchewan Wheat Pool and Agricore United, which were very aggressive in their bidding. As a consequence, the CWB dropped the tendering amount to the 20 to 25 percent range to ensure that the producer-owned terminals were able to remain viable and independent.

27. A recent article in the *Western Producer* examines this issue (White). In the article, Bill Drew, the executive director of the Churchill Gateway Development Corp., said the grain companies have shown little interest in using the port. "Most grain companies have their own facilities either in the St. Lawrence Seaway or in Vancouver. They have an economic incentive not to direct their sales through Churchill."

28. As Ewins (2006b) reports, the number of producer cars shipped by prairie farmers could surpass 10,000 in 2005/06, the highest total in 13 years.

29. The revenue cap was proposed by CP Rail during the Estey Review (the Estey report was released in December 1998) as a policy instrument to replace the maximum rate cap. The CWB was instrumental on the revenue cap issue as a result of its work on railway productivity sharing during the Kroeger process (May to September 1999). The CWB study in June 1999 was important in getting the federal government to ask the Canadian Transportation Agency (CTA) to do a railway productivity sharing study (July 1999). The results of the CWB and CTA studies showed that the railways had achieved significant productivity savings since the last costing review in 1998, and had not shared enough of these gains with shippers. As a result of these studies, the federal government reduced freight rates $5.92 per tonne when the revenue cap was introduced on August 1, 2000. This amounted to savings of $178 million for Prairie farmers. The CWB also played a role in ensuring that revenue from bid cars was counted as revenue for purposes of calculating the revenue cap.

30. As a result of Canada's compliance with a 2004 World Trade Organization (WTO) ruling, it would be legal for Canadian grain companies to source and handle U.S. grain separately, exporting it through the Canadian system at the rate cap (see WTO). See Office of the United States Trade Representative for the U.S. reaction to this ruling.

31. Grain shipments through Canada need not be large for arbitrage to occur, so it cannot be determined in advance if grain shipments would indeed increase.

32. There has been some discussion in policy circles of a much greater policy harmonization with the United States, one that would go beyond the establishment of uniform policies with respect to grain handling and transportation and involve Canada adopting a U.S.-style Farm Bill, complete with large subsidies that would be made available to farmers (see Furtan and Fulton for an examination of this policy option). Such a policy change would have major implications for the entire grain industry and might influence farmers' preferences regarding the structure of the CWB if they could be assured that this change would occur. However, such assurance is almost impossible to provide, particularly since the Government of Canada has shown no interest in linking this policy change with a change in the structure of the CWB.

33. These studies include Kraft, Furtan, and Tyrchniewicz; Schmitz, Gray, Schmitz, and Storey; and Lavoie. Schmitz and Furtan provide a good overview of the premium issue.

34. See the discussion above for more details on multinationals' role in the international grain trade.

35. The situation described here is explored in a more general framework in the book *Co-opetition* by Brandenburger and Nalebuff. Multiple sellers of a product will have equal bargaining power with a single buyer when the supply held by the multiple sellers just meets the demand by the single buyer. The bargaining power of the multiple sellers falls, however, when they have an excess supply of the product.

36. Hennessy argues that the overall quality of the food produced in food production systems that involve many interacting stages and multiple decision makers can be enhanced through leadership by one or more firms. This leadership can take the form of adherence to standards, for instance. Without leadership, it may be necessary to establish liability through legislation in order to generate a high quality output. In the current system, the CWB can be viewed as being the leader.

37. See Dobson and Duering.

38. The material in this section is taken from Fulton (1996a, 1996b).

39. See Smith and Wallace for further details.

40. See Smith and Wallace.

About the Author

Murray Fulton is a professor in the Department of Agricultural Economics at the College of Agriculture and Bioresources. His research and teaching interests are focused in a number of areas, including industrial organization, agricultural industry analysis, co-operative theory, and community development.

Murray is the co-author of a number of books and reports, including *Canadian Agricultural Policy and Prairie Agriculture*, *The Changing Role of Rural Communities in an Urbanizing World*, *Co-operatives and Community Development*, *Climate for Co-operative Community Development*, *Economic Impact Analysis of the Co-operative Sector in Saskatchewan*, and *Co-operatives and Canadian Society*. He has worked on research projects for the Economic Council of Canada and has served as the consultant to the Saskatchewan government and the Federal/Provincial Task Force on the Role of Co-operatives and Government in Community Development.