An Analysis of the Western Canadian Feed Grain Market

by

Jennifer D. Doiron

A Thesis Submitted to the Faculty of Graduate Studies in Partial Fulfillment
of the Requirements for the Degree of

MASTER OF SCIENCE

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ABSTRACT

Both feed grain prices and livestock production in Western Canada have been affected by regional, national and international government programs. This study analyzed export prices realized by the Canadian Wheat Board's (CWB) in the feed barley and wheat markets, how the elimination of the Western Grain Transportation Act (WGTA) subsidy and the United States Export Enhancement Program (EEP) affected domestic feed prices pre and post 1995. The study also looked at what the subsidy impact has been on historical ration costs and how the price relationship between Canada and the Mid-Western United States has changed after subsidies were discontinued and/or suspended.

Results of this study show that the CWB had limited powers of price discrimination and they simply matched US prices to EEP and non-EEP eligible markets. EEP lowered the total returns to CWB pool accounts and prices paid for feed grain exports. The net impact on Prairie feed grain prices of the various subsidy programs that were in place in Canada and the US was found to be highly variable, but overall, they tended to lower the cost for feed grain users in Western Canada between the mid 1980's to mid 1990's. Hog ration costs in Manitoba were found to be nearly identical to ration costs in Iowa.

Following the termination of the WGTA, it was strongly believed that

domestic feed prices would fall and that Western Canada would have a comparative advantage in livestock production relative to the Mid-Western US. The period of analysis, post 1995 has been marked with significant price volatility, increased weanling hog exports (<50kg) and a shift away from traditional feed grain production. The feed cost advantage that was believed to be realized in the Canadian Prairies following the elimination of the subsidy under the WGTA was not supported by the analysis.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Introduction

1. Introduction

Both the Prairie feed grain and livestock industries have been directly and indirectly affected by regional, national and international agricultural policies. Prairie agriculture does not operate in a vacuum and is directly affected by the governmental policies from other nations, particularly from the United States and the European Union. International subsidies of wheat and barley by the US and EU have led to numerous trade disputes over price distortion and unfair competition. Historically, Canadian transportation and agricultural policies have subsidized prairie feed grains at various points along the supply chain; including producers, railways and exporters. Provincial programs have also directly subsidized feed grain buyers in an attempt to offset the Canadian government's payments to railways and periodic deficits in the Canadian Wheat Board (CWB) pool accounts.

Government intervention into the feed market has direct consequences for the Prairie livestock industry whose predominant cost of doing business is feed grains. The number of animals in Western Canada has increased substantially in recent years. As seen from Table (1), total hog figures within the Prairies increased by 3.1% per year on average between 1980 and 1998 and hog numbers in Manitoba increased dramatically by 4.7% annually, eventually surpassing the total

Table (1):

HOGS ON FARMS AT JULY 1 BY PROVINCE

YEAR	MANITOBA 000 Head	SASKATCHEWAN 000 Head	ALBERTA 000 Head	TOTAL 000 Head
1980	876.0	640.0	1,251.0	2,767.0
1981	865.0	560.0	1,185.0	2,610.0
1982	873.0	500.0	1,180.0	2,553.0
1983	914.0	540.0	1,255.0	2,709.0
1984	1,044.0	625.0	1,470.0	3,139.0
1985	1,086.0	620.0	1,475.0	3,181.0
1986	1,089.0	609.0	1,508.0	3,206.0
1987	1,148.0	695.0	1,670.0	3,513.0
1988	1,250.0	845.0	1,735.0	3,830.0
1989	1,305.0	791.0	1,809.0	3,905.0
1990	1,196.0	770.0	1,689.0	3,655.0
1991	1,310.0	843.0	1,760.0	3,913.0
1992	1,372.7	929.7	1,913.1	4,215.5
1993	1,386.1	878.6	1,848.6	4,113.3
1994	1,466.4	889.8	1,778.6	4,134.8
1995	1,666.7	868.0	2,031.1	4,565.8
1996	1,813.7	829.3	1,875.9	4,518.9
1997	1,809.5	862.0	1,822.0	4,493.5
1998	1,998.6	930.8	1,880.9	4,810.3
1999	1,916.8	917.8	1,807.9	4,642.5
2000	1,935.9	1,039.8	1,778.7	4,754.4
2001	1,990.1	1,068.3	1,822.5	4,880.9

SOURCE: *"Livestock Statistics", Catalogue 23-603, Statistics Canada.*

number of hogs in Alberta. A large part of this expansion was driven by declining barley prices and the elimination of transportation subsidies as well as the belief that these reductions would lead to lower feed grain costs in the Prairies, particularly in Manitoba where the transportation subsidies were very substantial. Domestic feed grain consumption has expanded correspondingly with the increase in animal populations. Table (2) shows the amount of wheat and barley that was being consumed within Western Canada as domestic feed, a net increase of 102% in feed wheat and 110% in feed barley consumption from 1980 to 1998.

The questions that arise from continued livestock expansion, along with all of the changes to domestic and international policies, are: how have all of these changes impacted the relative position of the feed grain user in Western Canada?; has there been a net decrease or a net increase in feed costs?; what has been the impact from these export programs?; and what would domestic prices have been in the past without these programs?

1.1 Background

The Western Canadian feed grain industry has undergone three substantial policy changes since the 1995-96 crop year. First of all, on August 1st, 1995, the Government of Canada discontinued a transportation subsidy that had reduced the railway tariffs paid by shippers of grain, oilseeds and other grain related products since 1983. Concurrently, the CWB redefined the location where wheat and barley would be valued in the pool accounts. Thunder Bay, an intermediate location

Table (2):

FARM SUPPLY AND DISPOSITION OF PRINCIPAL CROPS, WESTERN CANADA

Feed, Waste & Dockage

Crop Year	Wheat 000 Tonnes	Barley 000 Tonnes
1980-81	1,292	3,754
1981-82	1,153	4,035
1982-83	1,209	4,048
1983-84	1,586	4,225
1984-85	1,387	3,808
1985-86	1,063	3,981
1986-87	2,160	4,647
1987-88	2,862	5,103
1988-89	1,775	4,530
1989-90	1,601	4,610
1990-91	1,542	4,978
1991-92	2,328	4,977
1992-93	1,938	4,074
1993-94	3,312	5,123
1994-95	2,925	5,423
1995-96	2,736	6,553
1996-97	2,992	7,008
1997-98	2,911	8,086
1998-99	2,616	7,868

1990, 1996 & 2001 Canada Grains Council "Statistical Handbook"

relative to exports through the east coast, was replaced by terminals along the St. Lawrence as the basis for establishing an in-store price of wheat and barley. The third policy change that indirectly impacted the Western Canadian feed grain market was the United States governments discontinuance of it's Export Enhancement Program (EEP) in July of 1995 on exports of wheat and barley.

The current situation is that the application of wheat and barley export subsidies through EEP have not resumed, the St. Lawrence and Vancouver remain the export locations for establishing prices paid by the CWB and there are no direct or indirect grain transportation subsidies. Current legislation does however cap the revenues that Canadian railways are permitted to earn on the transportation of grain to export positions.

The method of paying the transportation subsidy set out in the Western Grain Transportation Act (WGTA) had been analyzed regularly since it was first legislated in 1983. Two government inquiries were commissioned to recommend who should receive the subsidy and how it would be paid. Justice Gordon Hall chaired a Committee of Inquiry on the Crow Benefit Payment in 1985 and a Producer Payment Panel also reported to the Minister of Agriculture and Agri-food Canada in 1994. Between 1983, when the subsidy was first paid to the railways, until August 1995, when it was terminated, several studies that have analyzed the implications of higher freight rates have reached similar conclusions, with respect to Prairie agriculture. They have concluded that in the future there would be:

1. Decreased production of higher yielding, lower valued crops such as wheat, barley and oats;

2. Reduced exports of all grains and oilseeds;

3. Higher consumption of feed grains arising from more beef cattle and swine on Prairie farms, and

4. Increased forage production [Klein, K. (1989), MacGregor, B., B. Jenkins and D. Barber (1994), McPhee, T. (1996)].

MacGregor et al. (1994) and McPhee (1996) analyzed the separate and combined impacts stemming from the change in the CWB basis and discontinuance of the transportation subsidy. Both studies concluded that within the Prairies, grain prices would continue to be determined on an export basis - namely, world prices less marketing costs. The weighted average FOB prices received by the CWB would be reduced by the marketing costs incurred to move wheat and barley into exportable positions.

Prior to the policy change, Carter (1993) and Schmitz, et. al. (1997) agreed that the "CWB is the dominant participant in the Canadian barley market, and it's domestic and offshore sales activities determines Canadian prices". Carter reached his conclusion after comparing net barley prices farmers received from sales to the CWB relative to the prices paid by Prairie users between 1975 and 1992.

Kraft, et al. (1996) in their performance evaluation of the Canadian Wheat Board concluded that prices for Canadian feed wheat did not exceed comparable prices for wheat sold by the European Union or for corn sold by the United States. Prairie feed wheat prices were comparable to the FOB export price less marketing

costs.

There have been no studies addressing the ex-post relationship of the domestic feed market following the change in basis and the loss of the transportation subsidy for grain and oilseed related products. One objective of the study is to analyze Western Canadian feed barley and feed wheat markets prior to August 1995 and for three subsequent years following all of the changes. One explicit objective of the study is to determine whether the basis has changed, namely the difference between the CWB export price and prices paid by Prairie buyers. This is important because feed grain prices have a direct bearing on the comparative livestock ration costs of producing beef cattle, swine and poultry in Western Canada relative to other locations in North America.

Prior to the removal of the transportation subsidy, other studies have concluded that with the removal of this subsidy, the drop in Prairie feed grain prices would lower livestock ration costs relative to other areas in North America. Western Canada would be well positioned to competitively produce livestock. In the later part of this analysis, domestic feed costs for a hog enterprise in Manitoba will be compared to a standard ration in the Mid-West U.S. to see if their has been a significant relationship change post 1995.

Moving the basis from Thunder Bay to the St. Lawrence was first discussed by the Canadian Wheat Board in 1985, but was only implemented in 1995 concurrently with the discontinuance of the Western Grain Transportation subsidy. Prior to 1995, the added rail costs of moving grain from the Thunder Bay catchment

7

area to the West Coast were paid from the CWB pool accounts along with the added payments incurred to ship grain from Thunder Bay to the St. Lawrence. The implications of the basis change were analyzed by Groenewegan (1986) and by Agriculture and Agri-food Canada (AAFC) in a report to the Producer Payment Panel in 1994. Both studies concluded that the CWB had effectively raised feed barley and wheat prices in Manitoba and lowered them in Alberta by deducting the lower of the freight rates to Vancouver or Thunder Bay. In the 1994 AAFC study, projected barley revenues lost in Manitoba and eastern Saskatchewan from changing the basis to the St. Lawrence were exactly offset by gains in western Saskatchewan and Alberta. The relatively low magnitude of the symmetric income transfer for the east to the west appeared to emphasize CWB exports more than domestic barley sales within the Prairies. Any change in net prices that farmers realized from sales of feed barley to the CWB would also be transmitted to the domestic feed barley market. Wheat revenue transfers from the eastern to the western Prairies would closely parallel the changes in the regional wheat exports as feed wheat normally represented a small share of farm sales. Changes in the CWB price of feed wheat brought about by eliminating the added shipping costs from the CWB wheat pool account was expected to reduce domestic eastern Prairie feed wheat prices and to raise prices in the west.

In response to the CWB changing the basis from Thunder Bay to the St. Lawrence Seaway, the federal government provided a subsidy to ease the adjustment to farmers receiving lower wheat and barley prices [$105 M was

provided as Freight Cost Pooling Assistance]. The goal of this program was to gradually phase in the effects of changing the basis so as to minimize the adverse income effects experienced by eastern Prairie producers. In 1995-96, producers received direct compensation to cover additional freight charges on CWB deliveries attributable to pooling reform in the 1995-96 crop year. In Manitoba, freight rebates were based on 1995-96 feed barley and feed wheat deliveries to the CWB. Payments depended upon the origin of the shipments and ranged from $6.40 to $18.72 per tonne for feed barley and wheat payments ranged from no payments up to a payment of $7.49 per tonne. This "Freight Cost Pooling" Assistance Program (FCPAP) was in addition to the $1.6 Billion "Western Grain Transition Payments Program" (WGTPP) which compensated owners of farm lands for potential losses in land values following the termination of the WGTA freight subsidy. The FCPAP was a part of the $300 Million "Western Grain Transportation Adjustment Fund" (WGTAF). In 1996-97, the FCPAP totaled $22 Million for Manitoba producers of wheat and barley and was paid as adjustment funding rather than direct compensation. An individuals entitlement was based on total sales of wheat and barley reported in their 1995 NISA application. For each farmer this 1996-97 subsidy was determined prior to their decision to produce or sell wheat and barley and the payment was assumed to be market neutral in terms of feed wheat and barley sales to export or to domestic prairie buyers.

A third event that had an indirect, but significant impact on Prairie feed grain markets happened in July of 1995 when the US suspended wheat and barley export

subsidies through EEP. The Export Enhancement Program provided export subsidies directly to US grain companies on certain sales of wheat and barley to specific EEP eligible countries. Long term importers of Canadian grain, including Algeria, Bulgaria, Cyprus, the Former Soviet Union, Iraq, Israel, Jordan, Morocco, Poland, Romania, Saudi Arabia and Tunisia were all eligible at one time or another, between June 1985 and June 1995 as subsidy eligible destinations. With the exception of barley in 1988 and 1989, nearly all US feed barley and a majority of US wheat exports qualified for EEP subsidies.

While EEP subsidies were always present in the period between June 1985 to June 1995, the magnitude of these subsidies varied widely. For example, the average EEP subsidy on barley was C$2.25 per tonne in May and June of 1989 and peaked to a high of C$77.54 per tonne in May and June of 1994. The average monthly EEP barley subsidy for the ten years was C$35.41 per tonne. Wheat export subsidies varied from a low of C$17.70 per tonne in May thru July of 1990 to a high of C$67.83 per tonne from July 1993 thru April 1994 [USDA Foreign Agricultural Service; Bank of Canada Exchange Rates]. The average monthly EEP subsidy on US wheat exports for the ten years was C$37.84 per tonne.

The primary impact of EEP was to raise internal US grain prices relatively higher than they would have been without the export subsidies, and to decrease net returns to other exporters of wheat and barley. Haley et al. (1992) analyzed the 1986-87 and 1987-88 crop years and concluded that EEP raised US domestic barley prices between US$6 and US$11 per tonne. Their study also estimated that

10

EEP decreased average prices for Canadian feed barley exports by 3%. Their estimated increase in US domestic prices rests critically on the assumption of the added US exports. Haley et al. (1992) estimated that US barley exports doubled because of EEP. Carter (1993) agreed that EEP raised the price of barley relative to corn in the US, however he questioned whether the increases were as large as Haley found when EEP shipments were relatively lower. Gray, Ulrich and Schmitz (1993) concluded that overall Canadian feed barley sales, both domestic and export, were C$75 Million dollars lower because of EEP in the 1991-92 and 1992-93 crop years. An explicit objective of this study is to determine the magnitude that EEP subsidies reduced CWB pooled wheat and feed barley receipts and to show that feed barley and feed wheat prices paid by Prairie feed grain users were correspondingly reduced indirectly by these EEP subsidies.

1.2 Purpose of the Study

The primary objective of this study is to determine the net impact of the three combined policy changes on the Canadian feed barley and feed wheat markets and its effect on the domestic feed industry, prior to 1995 and post 95. An ex-post analysis has not yet been done and most of the previous studies have analyzed the ex-ante economic implications of each policy change separately.

11

1.3 Organization of the Study

The remainder of the thesis is arranged as follows. The second chapter presents a review of some of the literature on the role of EEP in the Canadian market. Chapter three addresses the objective in determining the impact of United States EEP subsidies on the CWB's feed barley and feed wheat receipts and a study of the CWB's role in the world feed grain market and the inter-relationship of export grain prices. Following this, Chapter four focuses on the export value of wheat and barley and the connection between the CWB pooled prices and the domestic feed grain markets, particularly the impact of changing the basis and the elimination of the WGTA. Chapter four will also address the primary objective of this thesis and summarize the net impact of these three combined policy changes and the role of excess inventory on the Canadian Prairie feed grain market. A summary of a typical hog ration cost in the Canadian Prairies will be compared in Chapter five to a historical summary of a typical ration cost in the Mid-Western United States and show how Western Canada ration costs would have differed in the absence of government policies. Chapter six provides a summary of the analysis and some conclusions and limitations of the thesis.

Chapter 2

Canadian Feed Export Market

2. Canadian Feed Barley and Feed Wheat Exports

2.1 Feed Barley

Carter (1993) and Schmitz, et al. (1997) reached different conclusions with respect to whether the CWB has been able to price discriminate between feed barley markets. Carter (1993) analyzed the Canadian barley export data provided by Statistics Canada from 1976 to 1988 [Exports by Commodity]. Sales to four major export markets including the US, Japan, FSU and Saudi Arabia were studied in terms of whether the CWB export prices were the same for all importers. Carter concluded that the CWB did not have any significant market power in the world feed barley market, including their sales to the US and determined that there were no additional revenues being realized through a single desk agent. Brooks (1993) discounted Carter's findings that the Canadian Wheat Board did not price discriminate between export barley markets because the price information analyzed by Carter were public CWB quotes. Brooks argued that the public CWB quotes were not reflective of the actual contracted prices and that no determination of market power could be made without the contractual price information.

Prior to a producer plebiscite on whether the Canadian Wheat Board should remain the single desk exporter of barley, Schmitz et al. (1997) released a report

concluding that the CWB was in fact able to price discriminate when the prices used in their analysis were based on actual sales agreements between the CWB and importers. When the United States was not subsidizing barley exports between August 1980 and June of 1986, there was limited evidence of price discrimination in sales to Japan and the United States. In other words, the CWB export prices for feed barley to the US and to Japan were similar and generally the export price differential between sales to the US and the rest of the world were also not different. However, Schmitz, et al. (1997) found that once US barley exports were subsidized by EEP, the inter-country barley price differentials realized by CWB sales increased and were statistically different from zero. The EEP program differentiated between export barley markets in terms of which countries were eligible for subsidized exports as well, the magnitude of the barley subsidy varied for each eligible country. The statistical results of the Schmitz analysis suggests that the CWB more or less followed the world pricing pattern that emerged from the EEP subsidies where the CWB charged US buyers C$4.47 per tonne more than to the rest of the world and the Japanese Import Agency paid C$23.20 per tonne more than other buyers. Schmitz et al. concluded "the ability of the CWB to price discriminate was dependent on the size of the EEP subsidy...and the export subsidies of the United States and the European Union had a major impact on the CWB's export pricing of Canadian feed barley" (pg.28). Schmitz went on to model and simulate equilibrium barley trade flows and market clearing prices, with and without a single desk authority vested with the CWB. The feed barley market consisted of four regions:

Japan, the United States, the 'Rest of the World' and the domestic Canadian market. For the period 1985-86 to 1994-95, the model estimated that Canadian feed barley prices averaged C$3.52 per tonne more under the single desk scenario. For the multiple seller scenario, the Canadian feed barley prices were equal to the US prices for comparable locations and the law of one price was found to prevail.

2.2 Feed Wheat

In the CWB wheat pool accounts, feed wheat is just one of many grades and varieties of wheat of which the revenues from all sales are combined. Prices paid to farmers for each category of wheat is related to the overall revenue from all sales and a differential established for each grade. Feed wheat is the lowest valued wheat of all the grades.

The average price of all wheat sales in the pool account varies with the year to year price levels of spring and winter wheat, the composition of the grades sold and the availability of export subsidies. FOB export prices are negotiated independent of export subsidies reported for a number of varieties and countries by the International Wheat Council. Wheat export prices quoted for United States grades and varieties reflect commercial transactions, while Canadian and Australian quotes are prices that the CWB and Australian Wheat Board report as the asking price. Dark Northern Spring 14% (DNS) and Hard Winter Ordinary (HWO), wheat varieties sold in the US are respectively close substitutes for #1 or #2 Canadian Western Red Spring (CWRS) and #3 CWRS. Between 1980 and 1998, the export

price of DNS 14% has ranged from C$150 per tonne in 1990-91, to over C$300 per tonne in 1995-96. HWO lacks some of the milling and baking attributes of DNS and corresponds closely to the end use characteristics of #3 CWRS.

The amount of feed wheat sold into the wheat pool account is closely related to it's availability, which is related in turn to the weather conditions during harvest. Grade deterioration down to the feed category is a result of damage caused by frost, sprouting and discoloration. Prices in the livestock feed market are not closely related to higher quality wheat that is sold for bread or noodles. Feed wheat discounts will vary according to prices paid for milling wheat. In the Kraft, et al. (1996) analysis of Canadian Wheat Board sales of wheat, they noted that feed wheat sales did not contribute to the overall premium realized in other wheat grades. Unpredictable supplies of feed wheat and the availability of other feed grains as substitutes results in Canadian feed wheat exports that are equivalent to the FOB prices of US corn and European feed wheat. The feed wheat prices reported in the CWB annual reports were not elevated because of price discrimination however, they were likely affected by the EEP subsidy since subsidized wheat prices for some transactions were below corn prices.

2.3 Summary

Researchers have not come to a consensus on the Canadian Wheat Board's ability to price discriminate in either the feed barley or feed wheat markets. Depending on the source of the price data, or the time frame analyzed, researchers

16

have varied in their opinions on the CWB's market power. Carter came to the conclusion that there was no price discrimination in the feed barley market by using a publically available set of price data. Schmitz, et al. (1997) reached a different conclusion after an examination of CWB sales agreements. They concluded that price discrimination did in fact exist and was even more evident in the presence of EEP.

A feed wheat analysis by Kraft, et al. (1994) found that the feed class of wheat was not sold for a premium relative to US corn and European Union feed wheat because of the unreliability of supplies and the presence of substitutes.

This analysis will continue by looking at the issue of price discrimination to EEP and non EEP eligible markets and whether the CWB exercised observable market power or if they simply followed the dominant United States in pricing export feed grains.

Chapter 3

Methodology

3. Methodology

3.1 Canadian Feed Barley and Feed Wheat Exports and the World Market

The approach followed in this study was not to explicitly examine sales to individual export markets, but rather to indirectly analyze Prairie feed grain prices between 1980 and 1998 through the evidence found in the CWB pooled feed barley and wheat sales, from US barley and wheat prices and from US EEP subsidies.

The Canadian Wheat Board's feed barley and wheat receipts as reported in their annual financial statements for the pool account normally encompasses two time periods. The first time period is for barley and wheat sales up to July 31st of the crop year and the second time period is from August 1st until the pool account is closed. The closing date varies from year to year and is largely dependent upon the stocks owned by the CWB on July 31st that had not been sold for future delivery. Since pool accounts report sales in terms of revenue and quantity up to July 31st and sales completed between July 31st and the date the account is closed, it is possible to determine an average price for each time period.

Table (3), for example, shows that in the 1993-94 crop year, feed barley sales before July 31st, 1994 were deemed to occur between October 1st, 1993 and

July 31st, 1994 and from August 1st to September 30th, 1994. Sales from feed barley exports recorded in the 1993-94 pool account were assumed to start in October 1993 since the 1992-93 pool account did not close until September 30th, 1993.

Table (3):

Canadian Feed Barley Pool Accounts

1993-94 Crop Year	Sales (Tonnes)	Sales (C$)	Average Price (C$/Tonne)
Feed Barley sold between 01/10/93 and 31/07/94	2,305,867	$238,989,043	**$103.64**
Feed Barley Value Credited to the Pool Account 01/08/94 to 30/09/94	735,595	$73,507,657	$99.93
Inventory Transferred to Subsequent Pool Account on 30/09/94	276,300	$31,220,962	$113.00
Sales 01/08/94 to 30/09/94	459,295	$42,286,695	**$92.07**

Source: Canadian Wheat Board Annual Reports

The average sales value for feed barley shipped between October 1st 1993 and July 31st 1994 was C$103.64 per tonne, while sales between August 1st to September 30th, 1994 averaged C$92.07 per tonne. The feed barley credited to the pool account on September 30th was C$99.93 per tonne and is the weighted average of sales made to date ($92.02) and the book value assigned to the remaining inventory ($113.00). The sales data for the eighteen barley pool account statements between 1980-81 to 1997-98 have thirty-two average barley prices of a potential thirty six observations. The difference of four observations represented years when the pool account was closed on July 31st.

Tables (4) and (5) show the average CWB's pooled FOB feed barley and wheat prices as was determined from the above method, as well as a weighted US export price and an average EEP subsidy for the corresponding monthly interval. Table (4) shows that pooled feed barley sales reported by the CWB ranged in value from a low of C$66.79 per tonne between November 1986 and July 1987 to a high of C$217.19 per tonne between September 1995 and July 1996. Table (5) shows that the pooled spring wheat sales ranged in price from C$126.34 per tonne between May and July 1991 to C$267.07 per tonne between June 1995 and April 1996.

As seen from Table (4), the CWB in-store barley sales revenues are export receipts less the fobbing charges. In order to compare CWB reported in-store prices to US FOB quotations, it was necessary to add in the fobbing charges incurred by the CWB. Fobbing charges are paid by the CWB but do not appear as a line item in the pool account statements. Fobbing charges include the receiving, weighing and inspection of grain, cancellation of terminal elevator receipts and other administrative procedures including superintendence, wharfage and forwarding brokerage. The reference feed barley prices specified in the model used to explain CWB barley prices are US export market prices. Therefore, for comparison, CWB barley prices inclusive of the fobbing charges were used. Table (4) sets out the CWB barley prices, Canadian fobbing charges, US export market barley prices and average monthly EEP subsidies.

Monthly prices for two US barley markets, the Pacific Northwest (PNW) and

Table (4):

Average Feed Barley Prices for Export Sales from Canada and the US

CWB Sales Period	CWB (Pool) Sales C$/Tonne	Fobbing Charges [1] C$/Tonne	CWB (Pool) Sales FOB C$/Tonne	Weighted US FOB Prices [2] C$/Tonne	Average EEP C$/Tonne
08-80 to 07-81	$158.21	$5.61	$163.82	$170.79	$0.00
08-81 to 10-81	$146.94	$6.10	$153.04	$156.76	$0.00
11-81 to 07-82	$144.62	$6.10	$150.72	$140.21	$0.00
08-82 to 10-82	$125.12	$6.09	$131.21	$141.51	$0.00
11-82 to 07-83	$113.32	$6.09	$119.41	$112.38	$0.00
08-83 to 10-83	$113.78	$6.68	$120.46	$124.50	$0.00
11-83 to 07-84	$138.07	$6.68	$144.75	$156.07	$0.00
08-84 to 10-84	$148.00	$6.92	$154.92	$160.80	$0.00
11-84 to 07-85	$142.55	$6.92	$149.47	$147.07	$0.00
08-85 to 09-85	$121.60	$7.13	$128.73	$142.63	$0.00
10-85 to 07-86	$96.11	$7.13	$103.24	$124.86	$0.00
08-86 to 10-86	$70.14	$7.13	$77.27	$107.78	$33.15
11-86 to 07-87	$66.79	$7.13	$73.92	$108.35	$40.20
08-87 to 10-87	$67.50	$7.13	$74.63	$116.61	$53.61
11-87 to 07-88	$76.31	$7.19	$83.50	$115.84	$47.82
08-88 to 07-89	$128.25	$7.19	$135.44	$148.36	$7.20
08-89 to 09-89	$133.18	$7.55	$140.73	$145.74	$2.25
10-89 to 07-90	$132.00	$7.55	$139.55	$137.61	$11.05
08-90 to 09-90	$109.49	$7.71	$117.20	$143.84	$6.05
10-90 to 07-91	$94.96	$7.71	$102.67	$134.83	$33.62
08-91 to 10-91	$94.67	$7.92	$102.59	$141.64	$46.83
11-91 to 07-92	$108.30	$7.92	$116.22	$136.39	$42.48
08-92 to 08-92	$116.41	$7.97	$124.38	$144.32	$48.18
09-92 to 07-93	$116.30	$7.97	$124.27	$144.03	$34.91
08-93 to 09-93	$94.84	$8.09	$102.93	$141.58	$43.71
10-93 to 07-94	$103.64	$8.09	$111.73	$138.26	$61.55
08-94 to 09-94	$92.07	$8.23	$100.30	$144.13	$77.54
10-94 to 07-95	$113.70	$8.23	$121.93	$145.58	$34.63
08-95 to 08-95	$103.84	$8.57	$112.41	$172.75	$18.94
09-95 to 07-96	$217.19	$8.57	$225.76	$200.70	$0.00
08-96 to 07-97	$168.11	$9.49	$177.60	$170.16	$0.00
08-97 to 07-98	$154.68	$9.60	$164.28	$150.45	$0.00

Source: CWB Annual Reports, Canadian Grain Commission, USDA Feed Grain Yearbook, USDA Foreign Agricultural Service, Bank of Canada Daily Close Exchange Rate

[1] Receiving, weighing and inspection, cancellation of terminal elevator receipts, superinendence, whafage and forwarding brokerage.

[2] Weighted according to Canadian barley shipments from the West Coast and Thunder Bay.

[3] Advanced three months to more closely correspond to the period the CWB reported sales. Most contractual arrangements are negotiated at least three months prior to the delivery of the grain

Table (5):

Average Wheat Prices for Export Sales from Canada and the US

CWB Sales Period	CWB Spring Wheat C$/Tonne	Fobbing Charges[1] C$/Tonne	CWB (Pool) Sales FOB C$/Tonne	Weighted US Prices[2] C$/Tonne	Average EEP C$/Tonne
11-80 to 04-81	$241.24	$3.82	$245.06	$236.96	$0.00
05-81 to 07-81	$227.11	$3.82	$230.93	$228.93	$0.00
08-81 to 04-82	$225.58	$4.37	$229.95	$217.41	$0.00
05-82 to 07-82	$209.64	$4.37	$214.01	$219.39	$0.00
08-82 to 04-83	$205.90	$4.74	$210.64	$198.56	$0.00
05-83 to 07-83	$197.06	$4.74	$201.80	$208.21	$0.00
08-83 to 04-84	$212.71	$4.98	$217.69	$213.46	$0.00
05-84 to 07-84	$212.19	$4.98	$217.17	$226.45	$0.00
08-84 to 04-85	$219.05	$5.08	$224.13	$221.23	$0.00
05-85 to 06-85	$203.65	$5.08	$208.73	$222.62	$0.00
07-85 to 04-86	$188.22	$5.23	$193.45	$199.11	$33.62
05-86 to 08-86	$139.25	$5.23	$144.48	$163.74	$44.16
09-86 to 04-87	$137.73	$5.23	$142.96	$149.98	$58.24
05-87 to 07-87	$134.03	$5.23	$139.26	$148.42	$43.57
08-87 to 04-88	$148.28	$5.23	$153.51	$165.02	$45.52
05-88 to 06-88	$149.82	$5.23	$155.05	$189.89	$31.55
07-88 to 04-89	$214.98	$5.60	$220.58	$219.56	$21.99
05-89 to 06-89	$213.75	$5.60	$219.35	$219.37	$22.45
07-89 to 04-90	$201.20	$5.97	$207.17	$194.69	$19.75
05-90 to 07-90	$166.95	$5.97	$172.92	$169.45	$17.70
08-90 to 04-91	$129.02	$6.41	$135.43	$147.85	$44.46
05-91 to 07-91	$126.34	$6.41	$132.75	$150.65	$48.78
08-91 to 03-92	$147.87	$6.58	$154.45	$184.83	$57.98
04-92 to 05-92	$172.75	$6.58	$179.33	$208.54	$29.04
06-92 to 04-93	$159.10	$6.71	$165.81	$175.49	$40.18
05-93 to 06-93	$167.04	$6.71	$173.75	$168.91	$25.98
07-93 to 04-94	$159.66	$6.81	$166.47	$189.17	$67.83
05-94 to 06-94	$152.81	$6.81	$159.62	$199.31	$64.74
07-94 to 04-95	$200.88	$7.07	$207.95	$221.79	$40.34
05-95 to 05-95	$226.45	$7.07	$233.52	$227.21	$30.84
06-95 to 04-96	$267.07	$7.36	$274.43	$293.35	$5.83
05-96 to 04-97	$240.54	$7.69	$248.23	$262.19	$0.00
05-97 to 06-97	$196.49	$7.69	$204.18	$239.28	$0.00
07-97 to 04-98	$211.62	$7.74	$219.36	$229.58	$0.00

Source: CWB Annual Reports, Canadian Grain Commission, USDA Feed Grain Yearbook, USD Foreign Agricultural Service, Bank of Canada Daily Close Exchange Rate

[1] Receiving, weighing and inspection, cancellation of terminal elevator receipts, superinendence, whafage and forwarding brokerage.

[2] Weighted according to CWB share of #1/#2 CWRS and #3 CWRS.

[3] Advanced three months to more closely correspond to the period the CWB reported sales. Most contractual arrangements are negotiated at least three months prior to the delivery of the grain

Minneapolis, were weighted according to the amount of feed barley exported by the CWB thru the West Coast and Thunder Bay (Statistical Handbook, Canada Grains Council). In other words, if 75 percent of Canadian barley exports were through West Coast terminals, then the US market price quoted for the PNW was weighted at 0.75 and Minneapolis had a 0.25 weight. For each CWB pooling period, the average US barley price was determined from the months that most likely represented the time period in which the CWB negotiated the sales. Terms of sale for CWB contracts are negotiated prior to when the barley is actually loaded and payment is received. A lag of three months was assumed between negotiating the terms of sale and delivery. Therefore, a revenue pooling period between August 1st and September 30th assumes that sales were negotiated in May and June of the same year. Similarly, for a pooling period where sales were first recorded in October and closed the following July, the corresponding period where the terms of sale were negotiated was assumed to be the preceding period July to April.

Monthly EEP subsidies shown in Table (4) are the average of the barley transactions for the month. The volume of barley associated with the subsidy was not taken into consideration in determining the average subsidy. A simple average of the monthly EEP subsidies was assumed to best represent the willingness of the US to subsidize barley exports. In tendering barley to countries eligible for EEP, the CWB would take into consideration the most recent information on the EEP subsidies prior to setting their asking price.

Wheat prices and subsidies were analyzed in a similar manner as feed

23

barley, shown in Table (5). The CWB's pooled sales of all wheat classes (grade varieties) were disclosed in the CWB annual reports for the wheat pool account and the average price for wheat followed the same methodology that was applied to the feed barley analysis. Fobbing charges were added to CWB reported wheat prices to compare to US FOB quotations.

Monthly prices for two US wheat markets, the PNW (DNS - 14%) and the Gulf (HW - ORD) were weighted according to the amount of wheat exported by the CWB in terms of the share of #3 CWRS and lower grades that was assigned to the HWO prices, while the remainder was weighted at the DNS - 14%. The PNW (DNS - 14%) was also discounted according to the protein premium that was captured in the price. The discount corresponded to the average level of protein in the #1 CWRS. One US price series was created so that the relationship between the Canadian Wheat Board's pool returns could be compared to a standard US price. The data was lagged in the same manner as was done in the feed barley market.

The monthly EEP subsidies shown in Table (5) are again simple averages of EEP in the corresponding months and do not depend on the actual volume of wheat that was exported at that level of subsidy. Likewise, this variable was also lagged by three months to match with the months that the CWB would have actually negotiated the sales.

3.2 CWB and Price Discrimination

If the CWB did not price discriminate in the feed market, we would find that
the Board's pooled price is simply a weighted average of the prices reported in the
US markets for commercial transactions and the share of CWB sales to EEP eligible
markets adjusted by the export subsidies. Equation (1) represents this relationship:

$$
\begin{aligned}
P_{iCWB_t} &= (1-S)P_{iUS(W)_{t-3}} + S(P_{iUS(W)_{t-3}} - EEP_{i,t-3}) \\
&= P_{iUS(W)_{t-3}} - S\,(EEP_{i,t-3})
\end{aligned}
\tag{1}
$$

where:

P_{iCWB} =   Average grain price reported by CWB plus fobbing charges, C$/tonne;

$P_{iUS(W)}$ =   Weighted price of U.S. grain, C$/tonne;

EEP_i =   Average EEP subsidies; C$/tonne;

S =   Canada's share of exports to EEP eligible markets.

If the CWB was not able to price discriminate and sold all of it's barley or wheat into
markets not eligible for EEP, S equals zero and the CWB pooled price would be
equal to the US non-subsidized commercial market price for feed grains. The same
relationship would hold if EEP equaled zero. On the other hand, if Canadian barley
or wheat exports were sold solely to markets that were eligible for EEP, the average
CWB price would equal the US commercial market price less the EEP subsidy.
When equation (1) is estimated by ordinary least squares (OLS) using the data in

Tables (4) and (5), the following two equations are specified:

$$P_{bCWB_t} = \beta_0 + \beta_1 P_{bUS(W)_{t-3}} - \beta_2 EEP_{b,t-3} \qquad (2)$$

$$P_{wCWB_t} = \beta_0 + \beta_1 P_{wUS(W)_{t-3}} - \beta_2 EEP_{w,t-3} \qquad (3)$$

where:

P_{bCWB} = Average feed barley price reported by CWB plus fobbing charges, C$/tonne;

$P_{bUS(W)}$ = Minneapolis/PNW weighted FOB price of U.S. feed barley, C$/tonne;

EEP_b = Average US EEP barley subsidy; C$/tonne

P_{wCWB} = Average spring wheat price reported by CWB plus fobbing charges, C$/tonne;

$P_{wUS(W)}$ = PNW-DNS(14%) and Gulf HW-ORD, weighted, FOB price of U.S. wheat, C$/tonne;

EEP_w = Average US EEP wheat subsidy; C$/tonne;

The null hypotheses for the regression parameters in equations (2) and (3) are:

$$H_0: \beta_0 = 0; \quad \beta_1 = 1; \quad \beta_2 = S$$

In other words, if the CWB pooled feed prices merely reflect weighted average export prices in Minneapolis and the PNW or PNW and the Gulf, then β_1 should equal 1 and the intercept β_0 should equal zero. The term on the EEP variable should equal the share of Canadian barley or wheat exports to EEP eligible countries. If this hypothesis cannot be rejected, then the aggregate barley and wheat markets in Tables (3) and (4) cannot be used to deny the argument that the CWB merely matched the commercial and subsidized feed prices quoted by sellers of US barley and wheat.

3.2.1 Canadian Feed Barley and US Price Relationship

Over the ten year time period 1986-87 to 1994-95, total Canadian bulk barley exports were 38.8 million tonnes of which feed barley comprised 30.9 million tonnes [Tables XVI - CWB Annual Report 1994-95 and CWB Annual Reports 1985-86 to 1994-95]. Canadian feed barley exports to EEP eligible markets totaled 18.3 million tonnes, or 59% of all feed barley exports. Therefore, the null hypothesis for equation (2) is that β_2 equals 0.59. Estimating equation (2) using OLS provides equation (4) and the analysis of the regression parameters of this equation provides further insight to the questions of price discrimination and EEP on Canadian feed barley prices.

$$P_{bCWB_t} = \underset{(20.14)^{n.s.}}{-19.30} + \underset{(0.13)^{***}}{1.10} \; P_{bUS(W)_{t-3}} - \underset{(0.11)^{***}}{0.56} \; EEP_{t-3} \qquad (4)$$

$$R^2 = 0.83; \quad DW = 2.24; \quad n = 32; \quad \delta = 13.74$$

note:

^{ns} not significant; * significant at 90%; ** significant at 95%; *** significant at 99%;
( ) standard error of the coefficient.

The interpretation of the 1.10 relationship between the average prices in the US export feed barley markets and the price reported in the CWB barley pool accounts suggests that over the period 1980 - 1998, the CWB prices exceeded US prices. However, the null hypothesis that the regression parameter 1.10 equaled 1 could not be rejected given 0.13 as the standard error. The data supports the hypothesis that US and Canadian barley prices are equivalent   Furthermore, the intercept of $-19.30 per tonne suggests the CWB sold feed barley at a discount to the US price,

however given the standard error of 20.14, the null hypothesis that the intercept equals zero also cannot be rejected. The prices reported by the CWB in the barley pool accounts are not different from a comparable weighted average of US feed barley markets once EEP is adjusted for. The CWB may have been able to price discriminate between feed barley markets, however the net result in terms of consistently raising the pooled barley price above the US feed barley price was not large enough to be measured by equation (4) in relationship to the price variability unexplained by the model. While equation (4) explained 83% of the price variation, the remaining standard error of $13.74 per tonne makes it impossible to confidently conclude that a premium was a part of the revenue in the feed barley pool account. Certainly a single desk premium of C$3.52 per tonne that was estimated by Schmitz et al. (1997) could not be confirmed or denied by equation (4) as it is too small in relationship to the unexplained price variability inherent in equation (4).

The regression coefficient for EEP of 0.56 is nearly identical to the Canadian share of feed barley exports to EEP markets, 59 percent. Therefore, equation (4) infers that the CWB matched the price for the subsidized markets and that the EEP subsidy reduced the average pool price by C$0.56 per tonne for every dollar of subsidy, primarily because 59% of the CWB barley was exported to EEP eligible markets. EEP impact on Canadian feed barley prices was directly linked to the level of subsidy available to export markets and how much barley the CWB sold to countries eligible for EEP. For the 1986-87 and 1987-88 crop years, Haley et al. (1992) estimated a 3% reduction in Canadian export prices, or approximately $3.50

28

per tonne because of EEP. For the two crop years 1986-87 and 1987-88, the average monthly EEP subsidies for each crop year were $43.56 and $39.98 per tonne respectively. On the basis of equation (4), the average EEP subsidy would have lowered CWB feed barley pooled prices by C$24.39/tonne in 1986-87 [=0.56 * $43.56] and C$22.39/tonne in 1987-88 [=0.56 * $39.98].

The feed barley revenue losses of $75 million attributed to EEP that were estimated by Gray, Ulrich and Schmitz (1993) for the two crop years of 1991-92 and 1992-93 also appear to be too low. Average monthly EEP barley subsidies during the 1991-92 and 1992-93 crop years was $38.60 and $36.70 per tonne respectively. The estimated barley price reductions from equation (4) because of EEP is $21.62 and $20.55 per tonne for 1991-92 and 1992-93. Given the CWB feed barley exports of 2.5 and 2.4 million tonnes for each crop year, the revenue losses to the pool account exceed $103 million total. This calculation does not take into consideration a comparable drop in prices that producers would have received on sales to domestic Canadian feed grain users.

While parameters estimated in equation (4) do not conclusively disprove that the CWB has practiced price discrimination in the feed barley market, they do suggest that the practice of price discrimination is not sufficiently revenue enhancing to raise average pooled prices between the period 1980-81 and 1997-98 so that it can be detected statistically. This raises the issue of the differences in market prices between a number of countries cited by Schmitz et al. (1997) in their tests of price discrimination. The differences in the prices realized by the CWB for feed

barley sales to different countries were statistically significant when EEP subsidies were available from 1985-86 to 1994-95. The difference in prices of $28.33/tonne between Japan and markets in the Rest of the World (excluding the US), was not surprising when over 90% of the CWB feed barley exports to countries in the Rest of the World (ROW) were eligible for EEP subsidies averaging $35.41 per tonne. The EEP parameter in equation (4) merely suggests the CWB was a price follower in terms of sales to EEP eligible markets and any price discrimination was practiced by the US. The price differential that is surprising, in the Schmitz et al. (1997) market comparisons, is the Japan-US differential of $23.86 per tonne. Average prices of Canadian feed barley exports to the US buyers that are $23.86 per tonne lower than sales to Japan raises the question of whether the prices were standardized to the same basis. The sales value recorded for US barley imports possibly reflect the location where the barley was delivered or originated. Over the 1985-86 to 1994-95 period, US barley sold through the PNW was worth C$26.08 per tonne more than sales in the Minneapolis/Duluth market. Barley sold to Japan would, in all likelihood, be comparable to the PNW quotations and while sales to the US buyers may reflect prices delivered to an interior location. The price differential between US and Japanese sales, cited by Schmitz et al. (1997), may not necessarily reflect price discrimination by the CWB, but rather a different basis.

3.2.2 Canadian Wheat and US Price Relationship

Over the ten year time period between 1985-86 and 1994-95, total Canadian wheat exports were 170 million tonnes and domestic sales equaled 15 million tonnes [Canadian Grain Exports, Canadian Grain Commission]. Canadian exports of wheat to EEP eligible markets totaled 78 million tonnes, or 42 percent of all CWB wheat sales. Estimating equation (3) provides us with the following result:

$$P_{wCWB_t} = \underset{(19.47)**}{41.61} + \underset{(0.08)***}{0.78}\ P_{wUS(W)_{t-3}} - \underset{(0.13)***}{0.52}\ EEP_{t-3} \tag{5}$$

$$R^2 = 0.90;\quad DW = 1.72;\quad n = 34$$

note:
> ^{ns} not significant; * significant at 90%; ** significant at 95%; *** significant at 99%;
> ( ) standard error of the coefficient.

It appears from equation (5) that the CWB sold wheat at a fraction of US prices (78%) plus a constant $41.61. The null hypothesis that the regression parameter 0.78 equals 1 is rejected given the standard error of 0.08. The intercept of $41.61 however suggests that the CWB actually sold feed wheat for a premium to the US price between 1980 and 1998. Given the standard error of 19.47, the null hypothesis that the intercept equals zero is also rejected. In fact, it is likely that the two effects offset each other. For example, in 1984-85, P_{wUS} was $221.23 per tonne and EEP was zero, the expected P_{wCWB} was $214.15 per tonne ($41.61+0.78*P_{wUS}-0.52*0). In fact, the actual average spring wheat price reported by the CWB was $219.05 per tonne, a difference of only $2.18 per tonne from the US price.

The regression coefficient for EEP at 0.52 exceeds the 42 percent share of

Canadian wheat sales into EEP eligible markets. It would appear that the lost revenues exceed that of sales solely into EEP eligible markets. This could be a result of the European Unions subsidies on their wheat exports which would further discount the CWB's sales opportunities. The result can still be drawn that for every dollar of EEP subsidy, CWB prices were correspondingly reduced by C$0.52 per tonne.

3.3 Summary

The Canadian Wheat Board's role on the selling price of feed barley and wheat was identified relative to a comparable US price series and the influence EEP played on their pool returns.

The returns in the feed barley accounts found that the CWB's price was not statistically different from a commercial US sales price and that the estimated EEP coefficient of 0.56 was nearly identical to the Canadian share of feed barley exports into EEP eligible markets, 59 percent. Every dollar of US EEP subsidy reduced returns in the CWB feed barley pool accounts by 56 cents. The Canadian Wheat Board appeared to match US commercial sales prices to non-EEP eligible and EEP eligible countries. While the estimated equation did not conclusively disprove the Board's ability to price discriminate, any effects of such were found to be not significant enough to be detected in this analysis.

The wheat relationship was less conclusive. It appeared as though the CWB sold wheat at a fraction of US prices, plus a premium of more than forty dollars per

tonne. These two effects likely offset each other. The estimated EEP coefficient exceeded the share of CWB sales to EEP markets, but there were other exogenous factors, including other countries subsidizing influences that would have further discounted CWB sales, but were not accounted for in this study.

Chapter 4

Interdependence of Canadian Domestic and Export Feed Markets

4. The CWB and the Prairie Feed Market

4.1 Export and Import Basis

The total demand for Western Canadian feed barley and feed wheat arises from local buyers using feed for domestic livestock production, the seed required for next years crop and from export demand. Figures (1) and (2) illustrate the demand in terms of either DD_2 and DD_0. The demand function DD_2 becomes perfectly price elastic at P_2 as export buyers will take all of the barley or wheat that the Canadian Wheat Board can offer at the given export price of P_2.

Prior to 1995, domestic prices for barley and wheat were linked closely to the export prices that were offered by the CWB less marketing costs incurred to move the feed grains to an exportable position. In Figures (1) and (2), an export based price is depicted by P_2, where Q_2^d is the amount of barley and wheat utilized in Western Canada and Q_2^s is the volume of production. The difference between Q_2^s and Q_2^d is the volume of exports. Discontinuing the transportation subsidy and moving the basis from Thunder Bay to the St. Lawrence reduced the net price farmers received for sales to the CWB. In Figure (1), the added transportation costs to move feed barley into an exportable position reduces the price offered for export sales from P_2 to P_0. As illustrated in Figure (1), barley prices only fell to P_1 after the

34

Figure (1):

Western Canadian Feed Barley Market

Price in the country

P₃ — S S₃ Import Basis

P₂ — D₂ Export Basis (1980-95)

P₁
P₀ — D₀ Export Basis (1996-98)

D
S

0   Q_2^d Q_1^d Q_2^s Barley (tonnes)

Volume of Exports

Figure (2):

Western Canadian Feed Wheat Market
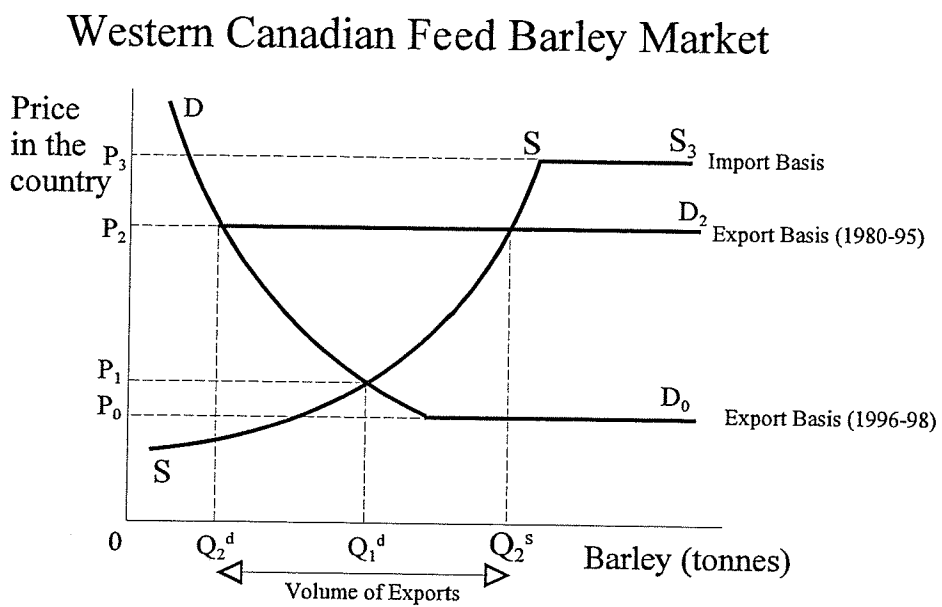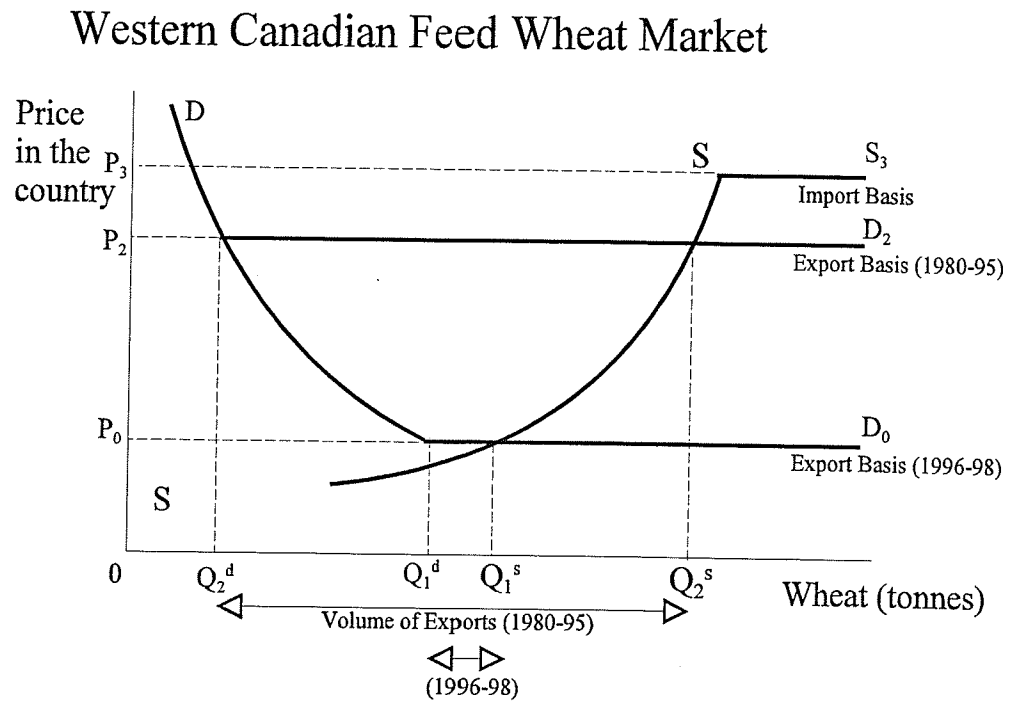
change in the export basis. In this scenario, all of the barley produced at the lower

price is consumed in Western Canada and there are no Canadian Wheat Board

exports of feed barley. At the lower price of P_0, the CWB would no longer be able

to offer prices that were competitive with the local buyers, and thus the market

clearing feed barley prices would no longer determined by CWB export prices. The

price drop from P_2 to P_1 has not been modeled by previous studies as feed barley

exports were just assumed to continue following the loss in the transportation

subsidy and the change in the basis. In other words, it was assumed that the farm

price of feed barley for export sales would exceed P_1. If this were the case, some

level of feed barley would continue to be exported and domestic prices in the feed

barley market would continue to be closely linked to export prices.

On the other hand, while the export price offered by the CWB for sales of

feed wheat also dropped, it was thought that the export price would still be

competitive and continue to influence domestic feed wheat prices. In Figure (2), this

is exhibited by export prices falling from P_2 to P_0, but at a price that was still high

enough to generate domestic exports, although at a reduced volume. Under this

scenario at price P_0, more feed wheat would be consumed in Western Canada, less

would be produced and less exported. At this lower price in Figure (2), the CWB

would still offering a price that is competitive with the price being offered by

domestic buyers and thus the domestic market clearing price would still be

determined by the export price.

Whether the equilibrium price for feed in Western Canada exceeds, or is

37

equal to the export based price depends upon the price elasticity of supply and domestic demand for feed barley and feed wheat. As a single crop, feed barley competes with wheat, oilseed and pulse crops for similar land, labor and capital inputs. Coyle (1993), Paddock (1984), Mielke et al. (1990), have modeled the cropland allocation between the various crops in Western Canada. These models were specified and estimated over a period between 1960 and 1985. The results are consistent in showing that the barley price, or revenue elasticity of barley, exceeds one. Wheat, because it has the largest share of cropland (between 50 and 65% of all crop area is dedicated to wheat production), is less elastic to a price or revenue change but the absolute output response is higher. The implications are that if the relative price/revenue of barley decreases in terms of wheat and the oilseed crops, the area seeded to barley will decline more than the relative price decrease.

As an example, when marketing/transportation costs increase by C$20.00 per tonne across all crops, barley revenues decrease relative to wheat and canola. Revenue per acre declines more for barley than for wheat or canola because total transportation costs per acre increase in accordance with the higher yields produced by a barley crop. The significance of a price elastic barley supply is that barley production will fall by more than the 7.6% or 9.4% drop in revenue relative to either wheat or canola.

Table (6):

Illustration of a Change in Relative Crop Returns for an Increase in Transportation Rates [1]

Crops	Marketing Costs With WGTA $20/tonne	Marketing Costs Without WGTA $40/tonne	% Change
Barley Wheat	0.85	0.79	-7.6
Barley Canola	0.74	0.67	-9.4
Wheat Canola	0.89	0.86	-3.6

[1] Assumes the following yields and export prices for wheat (1 tonne/acre; $250/tonne), barley (1.5 tonnes/acre; $150/tonne), and canola (0.6 tonnes/acre; $450/tonne).

The relative change in crop returns that result from higher freight rates will be smaller when export prices are all relatively higher, as they were in 1995-96, and of a much larger magnitude for years with lower export prices, such as in 1997-98. At some point, the price elasticity of barley or wheat becomes infinite when feed grains can be shipped into Western Canada at a competitive price. This is shown in Figures (1) and (2) where barley and feed wheat would be priced on an import basis at P_3. This would only occur when feed grain supplies are reduced as a result of abnormally low yields because of drought or frost.

The domestic demand for barley and wheat is more price inelastic from crop year to crop year. Livestock populations in terms of hogs and beef cattle tend to change less rapidly in response to feed costs, while consumption by poultry and

dairy is tied to exogenously determined production quotas. The most price sensitive demand is for finishing beef cattle, while more feeder hogs could be retained in the Prairies with lower ration costs. However, both circumstances assume the capital facilities are in place to accommodate more cattle on feed or finisher hogs. Generally, the demand function shifts slowly to the right as the population of hogs and cattle increase from year to year.

4.2 CWB Acquisitions of Wheat and Barley

4.2.1 Initial Payments & Other

The Canadian Wheat Board pools the revenue from feed barley and feed wheat sales throughout the crop year. The amount that is paid to farmers for delivering barley or wheat to the CWB varies according to the initial payments, adjusted, interim and final payments. The timing of the adjusted and interim payments, which supplement the initial payment that is set at the beginning of the crop year, varies from year to year. In many years, when prices are not rising, there are no adjustments to the initial payment. The final payment to producers generally occurs five to six months after the pool account has been closed but does not occur every year. Since this final payment is received up to six months after the crop year ends and is subject to uncertainty, the previous years final payment was assumed to best represent the expected final payment in the current crop year when analyzing CWB feed grain prices in relationship to the prices offered by domestic users. Furthermore, the previous years final payment was discounted by the prime

40

interest rate before it was added to the initial, adjusted and interim payments in determining a producers expected price for feed grain sales to the CWB. Equation (6) lays out the pricing parameters used to establish the producers expected price for feed barley and feed wheat delivered to the CWB.

$$ EP_{b\,or\,w\,CWB_t} = P_{i_t} + P_{a_t} + P_{n_t} + (1-i)P_{f_{t-1}} \tag{6} $$

where:

$EP_{b\,or\,w\,CWB}$ = Expected final realized price of barley or wheat, from the CWB (C\$/tonne);

P_i = Initial pool payment;
P_a = Adjustment payment (if applicable);
P_n = Interim payment (if applicable);
P_f = Final payment (if applicable);
i = Prime interest rate for commercial loans.

During and following the 1992-93 crop year, the CWB updated farmers on their projected prices in the current crop year, however, the expected prices determined by equation (6) were used in the study to provide consistent price expectations for all 18 years in the study.

4.2.2. Grain Handling and Transportation Charges

The CWB in-store initial and final payments reflect the pooled receipts from feed barley and wheat sales, less storage, handling and transaction costs incurred by the CWB. Net feed prices realized by farmers must account for additional marketing services provided by primary elevators and railways. Tables (7) and (8) show elevator and railway tariffs for barley and wheat for a central point in

41

Table (7):

Primary Elevator Tariffs

Crop Year	BARLEY Primary Elevation C$/tonne	FEED WHEAT Primary Elevation C$/tonne
1980-81	$7.30	$5.32
1981-82	$7.92	$5.88
1982-83	$8.40	$6.23
1983-84	$8.56	$6.36
1984-85	$8.73	$6.33
1985-86	$9.00	$7.02
1986-87	$9.21	$7.02
1987-88	$9.21	$7.02
1988-89	$10.23	$8.35
1989-90	$10.80	$8.76
1990-91	$11.88	$9.20
1991-92	$12.37	$9.56
1992-93	$12.23	$9.54
1993-94	$12.40	$9.53
1994-95	$12.60	$9.46
1995-96	$13.12	$9.46
1996-97	$14.21	$9.70
1997-98	$14.41	$10.16

Source: Canadian Grain Commission, Annual Yearbooks

Table (8):

Rail Tariffs and Transportation Subsidies

| Crop Year | Brandon - Thunder Bay/Vancouver[1] | |
	Transportation Cost C$/tonne	Transportation Subsidy C$/tonne
1980-81	$4.00	$14.87
1981-82	$4.00	$14.87
1982-83	$4.00	$14.87
1983-84	$4.40	$14.47
1984-85	$5.92	$13.55
1985-86	$4.61	$16.95
1986-87	$4.59	$19.21
1987-88	$4.87	$18.55
1988-89	$4.75	$18.53
1989-90	$6.93	$16.38
1990-91	$7.85	$15.43
1991-92	$8.11	$15.46
1992-93	$8.78	$14.76
1993-94	$10.06	$13.44
1994-95	$10.46	$11.10
1995-96	$42.05	$0.00
1996-97	$45.05	$0.00
1997-98	$45.96	$0.00

/1 Between 1980-95 rail freight was charged between Brandon and Thunder Bay, post 1995 rail tariffs between Brandon and Vancouver.

Source: Canadian Grain Commission, Annual Yearbooks

Manitoba. These fees were deducted from the CWB's initial prices to determine a country price for feed sales to the Board.

Table (7) shows primary elevator tariffs in Manitoba that have ranged from $7.30 per tonne of barley in 1980-81 to $14.41 in 1997-98 and the primary elevation for wheat from Brandon range from $5.32 to $10.16 per tonne. Between 1980 and 1995, the rail freight from Brandon to Thunder Bay was charged for CWB feed exports and post 1995 the relevant transportation costs were the rail tariffs between Brandon and Vancouver. Table (8) shows that the shipper paid portion of the rail freight rate increased from $4.00 to $45.96 per tonne between Brandon and Vancouver and transportation subsidies were at their peak in 1986-87 at $19.21 per tonne and were discontinued in the 1995-96 crop year.

Starting in the 1995-96 feed barley pool account, the revenues reflect in-store sales basis Vancouver, while in all of the previous feed barley pool accounts barley prices were based on an in-store Thunder Bay or Vancouver. Prior to 1984, the Canadian government provided indirect rail subsidization but in the period from 1984 to 1995, rail transportation was directly subsidized by the Canadian government. Between 1984 and 1995, a portion of the total transportation cost was borne by the producer with the Federal government paying a lions share of the cost.

4.2.3 Delivery Quotas

Historically, the Canadian Wheat Board scheduled deliveries of barley and wheat throughout the crop year through the declaration of delivery quotas. Barley

and wheat deliveries and quotas were based on the CWB's export sales program and the availability of both rail transportation and storage facilities. The quota system was based upon the area of cropland a farmer assigned to either wheat and barley. When grain was required to meet export sales requirements, the CWB could increase the per acre quota amount and farmers could choose to deliver their grain within a specified time period. In response to the rationalization of the country elevator system, the wider varieties of grains flowing through these facilities, as well as the changing nature of the export market, the delivery policy was reviewed and overhauled for the 1993-94 crop year. Delivery is currently based on volume contracts with producers and the grain is called into the country elevator system by the CWB. This revised system puts the onus onto the producers to hold the grain for the exclusive use of the CWB, but there is no obligation on the Board to actually take delivery. A producer would generally have several opportunities during the year to offer grain to the CWB where the quantity offered is related to the amount of available grain. Contracting provides the CWB with more precise information about the tonnage and grades of grain to be delivered. Under this system of delivery, the CWB is better able to develop marketing strategies and improve inventory flows to meet sales requirements. The producer can periodically revise their delivery volume for certain crops. At a given point in time, producers are often unable to deliver as much grain as they may wish to and may be forced to store the crop on farm for a future call on deliveries. As time elapses during the crop year, it may become evident that surplus grain will have to be carried over until the next

crop year. This can occur if CWB export sales do not materialize and if the transportation and/or elevator network is congested. These limitations on deliveries restrict a producer's access to the export market and forces them to hold more grain or to sell it domestically at the given price. In the domestic feed market, delivery quotas do not exist and consequently do not limit sales. Restricted access to the export market means that sales to domestic buyers would be at prices below the CWB's export based prices if credit is not available, or if it is relatively expensive to finance carrying more stocks of feed barley and feed wheat.

The assessment of producers willingness to hold certain levels of barley and wheat on farm was a qualitative analysis of the general marketing conditions in the given crop year. Typically, involuntary holdings of inventory results for one or more of the following reasons: relatively high levels of production, congested elevators, work stoppages, inefficient transportation of the grain or lower export sales. Table (9) shows feed barley holdings in 1981-82 and 1982-83 to be involuntary because of the large crops harvested in these two years and the inability of the grain handling system to move these stocks to an export position. However, as shown in Table (10), the 1982-83 wheat inventories were not deemed to be involuntary because there were relatively low holdings on farm. In 1992-93 and 1993-94 transportation bottlenecks were a dominating factor in the forced holding of stocks on farm. Also in 1993-94, an increase in barley and wheat production and corresponding drop in world demand also influenced producers holdings. Most recently in the 1996-97 crop year, transportation bottlenecks were again a real

46

Table (9):

Prairie Farm Inventory of Feed Barley and Sales to the CWB

Crop Year	Year End Inventory on Farm MB/SK/AB	Inventory Holdings	Feed Barley Purchased by the CWB	
1980-81	960,000	Voluntary	4,723,319	
1981-82	1,790,000	Involuntary	5,542,873	
1982-83	3,035,000	Involuntary	4,574,888	
1983-84	920,000	Voluntary	4,007,756	
1984-85	690,000	Voluntary	3,068,472	
1985-86	810,000	Voluntary	4,947,005	
1986-87	1,310,000	Voluntary	5,428,259	
1987-88	2,450,000	Voluntary	2,224,961	
1988-89	985,000	Voluntary	4,035,425	
1989-90	920,000	Voluntary	3,067,088	
1990-91	1,320,000	Voluntary	4,127,250	
1991-92	1,380,000	Voluntary	1,994,574	
1992-93	1,600,000	Involuntary	3,328,087	
1993-94	1,890,000	Involuntary	4,162,477	/1
1994-95	970,000	Voluntary	1,059,655	
1995-96	815,000	Voluntary	1,267,781	
1996-97	1,800,000	Involuntary	2,440,097	
1997-98	1,550,000	Voluntary	262,000	

B Annual Reports

/1 Continental Barley Market allowed 1.8 million tonnes to be sold to the United States without CWB involvement. These exports were added to CWB feed barley purchases in 1993-94 of 2,362,477 tonnes.

Table (10):

Prairie Farm Inventory of Wheat and Sales to the CWB

Crop Year	Year End Inventory on Farm MB/SK/AB	Inventory Holdings	Wheat Purchased by the CWB
1980-81	1,525,000	Voluntary	17,766,221
1981-82	3,510,000	Involuntary	16,936,279
1982-83	1,950,000	Voluntary	22,231,894
1983-84	1,680,000	Voluntary	20,186,978
1984-85	1,050,000	Voluntary	16,192,572
1985-86	740,000	Voluntary	18,931,918
1986-87	4,970,000	Voluntary	18,555,981
1987-88	3,150,000	Voluntary	15,476,040
1988-89	795,000	Voluntary	14,218,367
1989-90	690,000	Voluntary	16,682,883
1990-91	2,220,000	Voluntary	22,196,617
1991-92	3,425,000	Voluntary	19,324,862
1992-93	4,475,000	Involuntary	22,820,299
1993-94	3,795,000	Involuntary	17,522,229
1994-95	655,000	Voluntary	14,640,658
1995-96	1,005,000	Voluntary	14,352,453
1996-97	2,040,000	Involuntary	19,756,578
1997-98	860,000	Voluntary	15,201,105

Source: *Cansim Database; CWB Annual Reports*

problem. Compounding the transportation problem, Prairie barley production reached record levels in 1996-97 in response to relatively high prices in 1995-96 and excellent growing conditions in Western Canada that year. Involuntary holdings result in comparatively higher levels of inventory on farm and lower purchases by the CWB. This forced holding of stock is generally believed to depress domestic prices for feed barley and feed wheat.

A producer's voluntary holdings of inventory will result for one or more reasons, generally though it has to do with their expected requirements prior to harvesting the current crop, uncertainty surrounding current production and/or the current prices being offered for the grain. That is to say if a producer is unsure of whether they will produce enough barley in the upcoming crop year to meet their on farm requirements, then they will voluntarily choose to hold more of their current year's crop. Although on farm inventory was at it's highest level at the end of the 1987-88 crop year, the choice to hold this level of inventory was voluntary. This decision by producers was in response to relatively low export prices in 1987-88 and the extreme drought conditions throughout the spring and summer of 1988 that did not bode well in terms of the upcoming harvest.

A previous study by Carter, Hickson and Kraft (1984) identified export constraints that resulted in higher barley inventory levels which lowered domestic barley prices between the period 1974-75 and 1979-80. Investment in transportation infrastructure, locomotive and hopper cars have since then expanded the grain shipping capacity. Whereas Table (9) shows that inventory of barley has

not been depleted to minimal threshold levels every year since 1980, stocks have not systematically accumulated. Inventory is specified as a factor that could depress Prairie feed prices if stocks exceeded levels that farmers would voluntarily hold.

4.3 Domestic Feed Market

Between 1976 and 1996, feed barley and feed wheat sales to buyers deducting a premium under the Western Grain Stabilization Act (WGSA) were recorded by the Canadian Grain Commission (CGC). These transactions between farmers and grain companies, feed mills, feed lots and other buyers registered with the WGSA covered all barley and wheat sales, except for the farm to farm sales. Weekly weighted average feed prices received by Prairie farmers were published for Manitoba, Saskatchewan and Alberta (Canadian Grain Commission, 1992). This is the price of feed that has been used in this analysis used to represent domestic sales prices, by province until July 1996. Subsequent price information was obtained from the Manitoba Department of Agriculture (Manitoba Markets, 1994-98), Saskatchewan Agriculture (Sikora, Personal Correspondence) and from Alberta Agriculture (Alberta Average Farm Input Prices, 1994-98). The data, post 1996, was standardized to the CGC data by matching the common provincial barley or wheat quotations with the CGC price data between 1994 and mid 1996. By doing so, it was observed that the published bid price quotations for barley from Manitoba and Alberta were $7.00 and $7.69 per tonne lower respectively, then the actual

provincial average prices collected by the CGC. Wheat differentials were also $9.88 and $10.00 per tonne lower. The differences between weekly bid prices collected by the provincial governments and that transaction prices compiled by the CGC were statistically significant at a 95 percent confidence level. Therefore, when the CGC discontinued collecting feed barley and feed wheat transactions and only the provincial weekly bid prices were published, feed barley prices were adjusted upward by $7.00 per tonne in Manitoba and $7.67 per tonne in Alberta, with the assumption that the difference continued to exist between bid prices and actual transactions. Likewise wheat prices were adjusted upward by $9.88 and $10.00 per tonne respectively for Manitoba and Alberta. There were no significant differences between the Saskatchewan price series and thus no adjustments were required to make them compatible.

4.3.1 Feed Barley Market

In the period 1980-1995, the domestic price of feed barley was assumed to be closely tied to the export market price. Following the termination of the transportation subsidy and the change in basis by the Canadian Wheat Board, economic theory cannot provide a definitive conclusion on whether the domestic price is above or equal to the new export basis [Figure 1]. This is a quantitative question and will be analyzed with the following model set out in equation (7):

$$P_{bfeed_t} = \beta_0 + \beta_1 EP_{bCWB_t} - \beta_2 S_t + \beta_3 D_t \qquad (7)$$

where:

P_{bfeed}	=	Average annual price paid for barley by domestic buyers, provincial, (C\$/tonne);
EP_{bCWB}	=	Interest adjusted expected price of barley, for sales to the CWB, provincial, (C\$/tonne);
S	=	Involuntary holdings of barley on farms at July 31, provincial, ('000 tonnes);
D	=	Dummy variable to represent structural change in the market after 1995.

The null hypothesis is that $\beta_3 = 0$ and the domestic feed barley market continues to have the same relationship to the export market and barley inventory after 1995 as it had before. If a structural change has occurred, namely, the domestic price is higher, this should be supported with evidence of declining barley exports. Equation (7) was estimated for each province and the results are shown in equations (8), (9), and (10):

Manitoba:

$$P_{bfeed(MB)} = \underset{(5.90)**}{26.52} + \underset{(0.06)***}{0.73} EP_{bCWB(MB)} - \underset{(0.012)**}{0.043} S_{(MB)} + \underset{(4.04)***}{26.28} D \qquad (8)$$

$$R^2 = 0.93; \quad DW = 2.22; \quad n = 18$$

Saskatchewan:

$$P_{bfeed(SK)} = \underset{(7.15)**}{28.37} + \underset{(0.07)***}{0.68} EP_{bCWB(SK)} - \underset{(0.006)**}{0.018} S_{(SK)} + \underset{(4.77)**}{23.26} D \qquad (9)$$

$$R^2 = 0.89; \quad DW = 1.66; \quad n = 18$$

Alberta:

$$P_{bfeed(AB)} = \underset{(7.03)^{***}}{28.66} + \underset{(0.07)^{***}}{0.73} EP_{bCWB(AB)} - \underset{(0.003)^{**}}{0.011} S_{(AB)} + \underset{(4.77)^{***}}{26.57} D \qquad (10)$$

$$R^2 = 0.92; \quad DW = 1.74; \quad n = 18$$

note:

^{ns} not significant; * significant at 90%; ** significant at 95%; *** significant at 99%;
( ) standard error of the coefficient.

The ordinary least squares parameter, β_0, β_1, β_2 and β_3 determined for equation (7), for each of the provincial feed barley markets are remarkably similar. Equation (8) for Manitoba will be selected for illustration. The average expected CWB export price for the fifteen years was $93.18 per tonne, as was determined earlier in the analysis. For the period 1980 to 1995 the average provincial price determined from equation (8), when barley inventory was not excessive, was $94.54 per tonne [26.52 + .73*(93.18)]. The observed average domestic feed barley price was $91.20 per tonne. Therefore, it is apparent than the export based barley price was instrumental in establishing the domestic price. After 1995, the domestic price increased by $26.28 above the historical export based price. The structural change captured by the dummy variable indicates that the price determined in the Manitoba feed barley market is above the export based price. Referring back to Figure (1), Manitoba would be represented by demand curve DD_0 and domestic prices are at P_1, while export prices are at P_0. As was observed in Table (9), CWB purchases of feed barley were reduced to minimal acquisitions in 1997-98, and the export price was below the domestic price for feed barley.

Involuntary holdings of barley inventory are shown to depress domestic feed prices. The inventory effect was strongest in Manitoba where for every 100,000 tonnes of unwanted barley inventory, domestic prices were decreased by $4.30 per tonne.

4.3.2 Feed Wheat Market

Like barley, for the period 1980-1995, domestic prices for feed wheat are assumed to be tied closely to the export market prices. Unlike barley, this domestic price is still assumed to be linked closely with the export price following the change in the basis and the termination of the transportation subsidy. Export prices were assumed to still be high enough to generate significant exports, although at reduced volumes. The relationship will be analyzed with the following model set out in equation (11):

$$P_{wfeed_t} = \beta_0 + \beta_1 EP_{wCWB_t} - \beta_2 S_t + \beta_3 D_t \qquad (11)$$

where:

P_{wfeed} = Average annual price paid for feed wheat by domestic buyers, prov., (C$/tonne);

EP_{wCWB} = Interest adjusted expected price of feed wheat, for sales to the CWB, provincial, (C$/tonne);

S = Involuntary holdings of wheat on farms at July 31, provincial, ('000 tonnes);

D = Dummy variable to represent structural change in the market after 1995.

Like in equation (7), the null hypothesis is that $\beta_3 = 0$ and the domestic feed wheat

market continues to have the same relationship to the CWB's export market prices after 1995 as it had before. Equation (11) was estimated using ordinary least squares for each province and the results are shown in equations (12), (13) and (14):

Manitoba:

$$P_{wfeed(MB)} = \underset{(12.80)^{**}}{25.64} + \underset{(0.10)^{***}}{0.85}\, EP_{wCWB(MB)} - \underset{(0.02)^{**}}{0.052}\, S_{(MB)} + \underset{(8.12)^{***}}{30.36}\, D \tag{12}$$

$$R^2 = 0.87; \quad DW = 2.00; \quad n = 18$$

Saskatchewan:

$$P_{wfeed(SK)} = \underset{(13.10)n.s.}{15.82} + \underset{(0.11)^{***}}{0.88}\, EP_{wCWB(SK)} - \underset{(0.003)^{**}}{0.009}\, S_{(SK)} + \underset{(8.16)^{*}}{15.71}\, D \tag{13}$$

$$R^2 = 0.87; \quad DW = 2.16; \quad n = 18$$

Alberta:

$$P_{wfeed(AB)} = \underset{(13.06)n.s.}{18.86} + \underset{(0.11)^{***}}{0.86}\, EP_{wCWB(AB)} - \underset{(0.008)^{*}}{0.012}\, S_{(AB)} + \underset{(8.45)n.s.}{9.52}\, D \tag{14}$$

$$R^2 = 0.85; \quad DW = 1.87; \quad n = 18$$

note:
ns not significant; * significant at 90%; ** significant at 95%; *** significant at 99%;
( ) standard error of the coefficient.

The estimated equations are very similar between Saskatchewan and Alberta, whereas Manitoba seems to stand alone. Saskatchewan, Alberta and Manitoba all show a very significant relationship between the domestic market

prices and the export based prices, and all three show that inventory does depress domestic feed wheat prices. However, Saskatchewan and Alberta estimators show that the dummy variable is insignificant and thus there is has been no meaningful structural change in the relationship between the export and domestic price of feed wheat since 1995. The domestic price continues to be export driven and thus, Saskatchewan and Alberta are working off demand curve DD_0 in Figure (2) and exports are present, but smaller than before. Both export and domestic prices are at P_0.

Manitoba , however, appears to have experienced a structural change that is captured by the dummy variable in equation (12). This equation shows that the price determined in the Manitoba feed wheat market is $30.36 a tonne above the historical export based price. The situation for feed wheat in Manitoba is more like the feed barley market illustrated in Figure (1), where Manitoba is working off demand curve DD_0 and domestic prices are at P_1, while export prices are at P_0. Manitoba feed wheat market is determined on an import basis of corn from Minnesota and feed wheat from Saskatchewan. In some cases, Manitoba feed mills will purchase higher quality Manitoba wheat to use for feed (#2CWRS and #3CWRS).

Involuntary holdings of wheat inventory, as a result of weak export sales programs or transportation problems, are shown to depress domestic feed wheat prices. Similar to the feed barley market, the inventory effect was the strongest in Manitoba where for every 100,000 tonnes of surplus inventory, domestic prices

were decreased on average by $5.20 per tonne.

4.3.3 Historical Impacts on Prairie Feed Barley and Feed Wheat Markets

Manitoba, Saskatchewan and Alberta domestic feed buyers are all indirectly affected by the Canadian and US governments policy decisions with regards to feed barley and feed wheat exports. They are also directly affected by other programs that are targeted to domestic buyers and also by the producers involuntary holdings of inventory.

The first policy program that affected domestic feed prices was Canada's WGTA transportation subsidy. The WGTA subsidy was perceived to perpetually raise the price of domestic feed grains to users in Western Canada. The WGTA subsidy evolved from the original Crow's Nest Pass agreement of 1897 and came into effect in the fall of 1984. It goal was to ensure that the railways were being sufficiently compensated for moving grain to an export position and to encourage investment in infrastructure by the railways. Grain shippers were to benefit from lower freight rates, but the program was designed to have these shippers assume a larger share of the transportation cost over time. This subsidy served to increase the cost to domestic feed grain users as the marketing costs of exporting grain were sufficiently reduced from the transportation subsidy. The livestock industry in the Prairies had to buy grain at inflated prices because of the WGTA export subsidy as they competed for the same grain that would otherwise be destined to the subsidized export market. The magnitude of the transportation subsidy impact

varied across the Prairies. The value of the subsidy shown in Table (11), ranged from $19.21/tonne in 1986-87 to $11.10/tonne in 1994-95, basis Brandon, Manitoba and the price paid by domestic buyers were correspondingly inflated.

The second policy program that affected domestic feed prices was the United States' EEP subsidy. US EEP effectively lowered the price for domestic feed in Canada, in that the CWB's sales price were lowered for specific markets because they had to match subsidized US export prices. As was previously stated, the Canadian Wheat Board export price was instrumental in determining the domestic price of feed. Therefore, any policies that affected the Board's price for feed barley and feed wheat indirectly impacted the domestic market. Every one dollar of EEP in the US lowered feed barley prices in Canada by $0.56/tonne on average and wheat prices by $0.52/tonne. Table (12) shows the magnitude of the EEP subsidy on domestic Canadian feed prices.

A third event that inflated domestic prices for feed happened whenever the CWB had a deficit in their pool accounts. CWB deficits are guaranteed by the Federal government and, when they occur, lead to inflated export prices, which in turn results in higher prices paid by domestic users of feed grains. For this reason, when the CWB had significant deficits in the 1985-86 and 1986-87 feed barley pool accounts, this had the impact of raising the price to domestic buyers by $34.64 and $17.05 per tonne respectively as shown in Table (13).

Table (11):

Western Grain Transportation Act Subsidies

Crop Year		WGTA Subsidy Brandon - Thunder Bay C$/tonne	WGTA Subsidy Saskatoon - Vancouver C$/tonne	WGTA Subsidy Red Deer - Vancouver C$/tonne
1980-81	*	$14.87	$18.03	$19.04
1981-82	*	$14.87	$18.03	$19.04
1982-83	*	$14.87	$18.03	$19.04
1983-84		$14.47	$17.53	$18.20
1984-85		$13.55	$17.33	$17.04
1985-86		$16.95	$21.69	$21.31
1986-87		$19.21	$24.57	$24.15
1987-88		$18.55	$23.73	$23.32
1988-89		$18.53	$27.89	$22.23
1989-90		$16.38	$20.94	$20.60
1990-91		$15.43	$19.72	$19.41
1991-92		$15.46	$19.77	$19.44
1992-93		$14.76	$18.88	$18.55
1993-94		$13.44	$17.18	$16.90
1994-95		$11.10	$14.19	$13.96
1995-96		$0.00	$0.00	$0.00
1996-97		$0.00	$0.00	$0.00
1997-98		$0.00	$0.00	$0.00

* Prior to 1983-84 costs were absorbed by the railways

Table (12):

Effect of United States EEP on Domestic Feed Prices

Crop Year	Effect of EEP on Domestic Feed Barley C$/tonne	Effect of EEP on Domestic Feed Wheat C$/tonne
1980-81	$0.00	$0.00
1981-82	$0.00	$0.00
1982-83	$0.00	$0.00
1983-84	$0.00	$0.00
1984-85	$0.00	$0.00
1985-86	$0.00	($18.81)
1986-87	($24.39)	($24.90)
1987-88	($22.39)	($20.61)
1988-89	($3.60)	($8.45)
1989-90	($6.15)	($7.59)
1990-91	($21.22)	($22.97)
1991-92	($21.62)	($25.11)
1992-93	($20.55)	($18.52)
1993-94	($37.17)	($31.25)
1994-95	($14.43)	($13.88)
1995-96	$0.00	$0.00
1996-97	$0.00	$0.00
1997-98	$0.00	$0.00

Table (13):

Canadian Wheat Board Pool Account Deficits
C$/tonne

Crop Year	CWB Deficit Feed Barley Pool Account	CWB Deficit Feed Wheat Pool Account
1985-86	$34.64	$1.22
1986-87	$17.05	N/A
1990-91	$0.23	$30.34

Source: CWB Annual Reports

Involuntary inventory accumulation is a condition that is generally out of the producers control and occurs when the producer cannot sell as much wheat and barley as they would have otherwise liked to have sold. Excess inventory had the most significant impact on domestic prices within Manitoba as from equations (8), (9) and (10). The involuntary holdings of stocks had the following impact on domestic feed barley prices by province, shown in Table (14):

Table (14):

Involuntary Inventory and the Impact on Domestic Feed Barley Prices

Crop Year	On Farm Inventory MB (tonnes)	P_bfeed(MB) (C$/tonne) /1	On Farm Inventory SK (tonnes)	P_bfeed(SK) (C$/tonne) /2	On Farm Inventory AB (tonnes)	P_bfeed(AB) (C$/tonne) /3
1981-82	200,000	-8.60	520,000	-9.36	1,070,000	-11.77
1982-83	375,000	-16.12	1,100,000	-19.80	1,560,000	-17.16
1992-93	250,000	-10.75	500,000	-9.00	850,000	-9.35
1993-94	190,000	-8.17	650,000	-11.70	1,050,000	-11.55
1996-97	300,000	-12.90	600,000	-10.80	900,000	-9.90

Source: Cansim Database

1/ Equation 8, Chapter 4
2/ Equation 9, Chapter 4
3/ Equation 10, Chapter 4

In 1996-97, domestic prices in Manitoba were $12.90/tonne lower than they would have been if there had not been excess involuntary holdings. In five of the 18 years under observation, inventory accumulation has depressed domestic market prices for barley. In selective years, inventory holdings in the three Prairie provinces have depressed domestic feed barley prices between $8.17 and $19.80 per tonne.

Based on equations (12), (13) and (14), the involuntary holding of wheat inventory on farm had the following impacts on the domestic prices of feed wheat as shown in Table (15).

Table (15):

Involuntary Inventory and the Impact on Domestic Feed Wheat Prices

Crop Year	On Farm Inventory MB (tonnes)	$P_{wfeed(MB)}$ (C$/tonne) /1	On Farm Inventory SK (tonnes)	$P_{wfeed(SK)}$ (C$/tonne) /2	On Farm Inventory AB (tonnes)	$P_{wfeed(AB)}$ (C$/tonne) /3
1981-82	270,000	-14.04	2,230,000	-19.85	1,010,000	-12.62
1992-93	525,000	-27.30	3,100,000	-27.59	850,000	-10.63
1993-94	300,000	-15.60	2,300,000	-20.47	1,195,000	-14.94
1996-97	140,000	-7.28	1,300,000	-11.57	600,000	-7.50

Source: Cansim Database

1/ Equation 12, Chapter 4
2/ Equation 13, Chapter 4
3/ Equation 14, Chapter 4

Wheat inventory has accumulated in four of the eighteen years of analysis and depressed farm prices of feed wheat between $7.28 and $27.59 per tonne across the Prairie provinces.

Provincial governments tried, at various points, to try and offset some of these distorting price effects by offering varying regional programs to domestic feed grain buyers. The Alberta provincial government countered the effects of the WGTA transportation subsidy by offering a per tonne rebate to domestic feed buyers, referred to as the Crow Benefit Offset Program. This program was introduced in the fall of 1985 to counter distortions in the Alberta feed grain market resulting from the payment of the Crow benefit directly to the railways. In 1986, which was the programs first full year of existence, Alberta feed barley expenses were reduced by $78 million. The Crow Offset led to tremendous growth in the Alberta livestock

sector and to significant investment into modern livestock processing facilities. The government of Saskatchewan followed suit and introduced their own offset program effective October 1st, 1989. Manitoba's Livestock Development Program (LDP) was launched simultaneously. Manitoba's LDP feed assistance applied only to cattle and sheep producers, but not for hogs. Manitoba's program was designed to help local cattle and lamb feeders compete with subsidized producers in Saskatchewan and Alberta. Manitoba was the only province to exclude hogs from the provincial feed rebate program, in part because the US governments countervail duties on pork exports. Manitoba's Loan Deficiency Program ended July 31st, 1991, while Alberta and Saskatchewan both discontinued their programs March 1994, anticipating a change in the WGTA in response to GATT negotiations on reducing export subsidies.

4.3.4 Net Cost Impact on Feed Grain Users

The overall net effect of all of these market interventions by government on the Prairie feed market varied widely from year to year. Figures (3) and (4) are illustrative of the domestic feed wheat and barley markets in Manitoba and show the importance of the previously discussed government programs and inventory buildups. Similar results are found in Saskatchewan and Alberta, but the effect in Manitoba will be discussed for representative purposes. Prior to 1985-86, both domestic feed barley and feed wheat prices were elevated primarily due to WGTA subsidies, although burdensome barley inventories in 1981-82 and 1982-83 put

64

Figure (3):

Price Effects on Manitoba Feed Barley
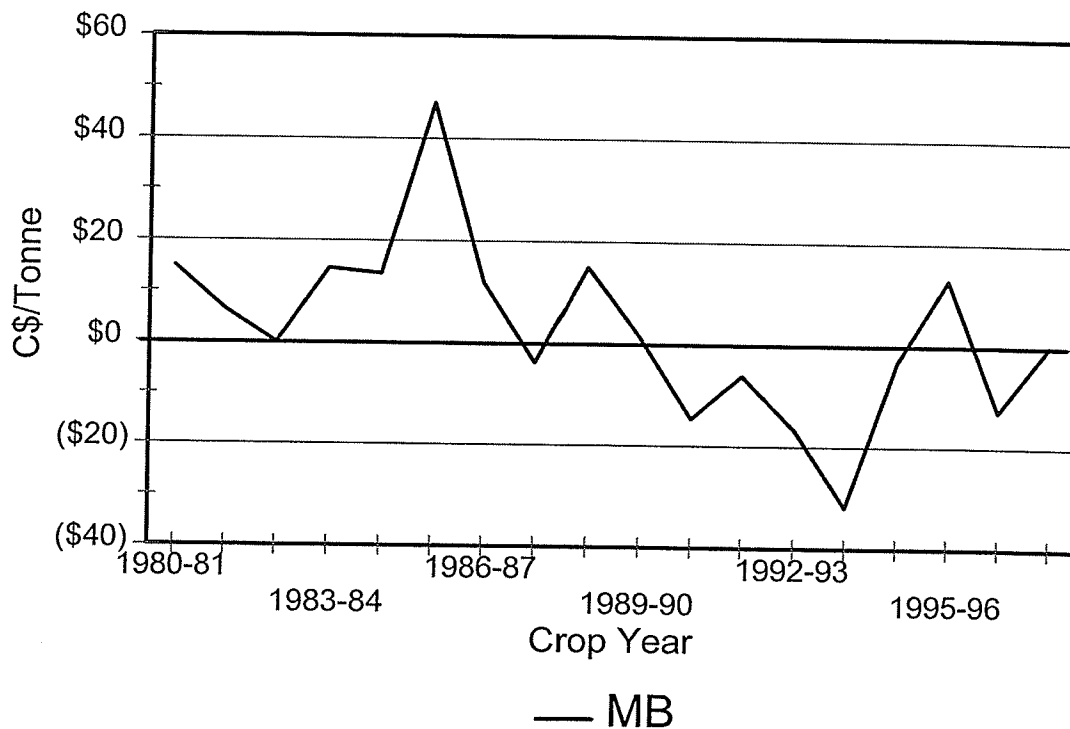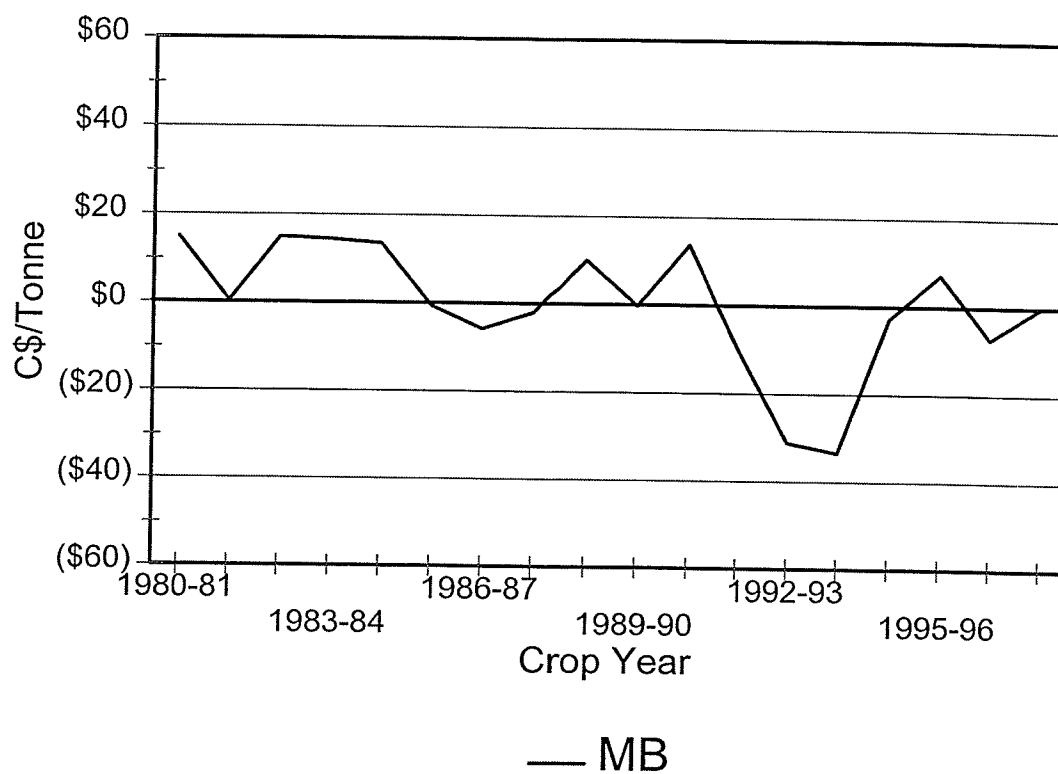## Subsidy and Inventory

Figure (4):

Price Effects on Manitoba Feed Wheat
Subsidy and Inventory

— MB

downward pressure on the subsidy inflated price. In years where the CWB ran a deficit in the pool accounts, domestic barley prices were inflated, such as in 1985-86 when domestic barley prices in Manitoba were inflated by $46.95 a tonne as a result from the CWB's $34.64/tonne deficit in the barley pool account and the Canadian Governments $16.95/tonne transportation subsidy. The introduction of EEP in June of 1986 depressed domestic prices by $4.64/tonne, which partially offset some of the price increasing subsidy effects. Provincial transportation offset programs also helped to neutralize some of these inflated prices. After 1986-87, the export depressing effect of EEP on CWB barley exports tended to exceed the transportation subsidy and feed barley prices in Manitoba fell below the subsidy neutral levels. Feed barley was at its lowest relative value which prompted the Federal government to endorse a North American continental barley market in the summer of 1993. It was subsequently overturned by the courts and the CWB retained exclusive export authority. While Prairie feed grain sellers lost money overall, it was a lucrative period for feed grain users. For example, in 1993-94 when EEP subsidies were of a greater magnitude (-$37.17/tonne) and on-farm inventory was burdensome and decreased domestic price by $8.17 and the WGTA transportation subsidy increased prices by $13.44, the combined effect was to effectively lower domestic prices in Manitoba by $32.00 per tonne. Alternatively, in 1989-90 in the Manitoba feed barley market, EEP lowered the domestic price by $6.15 per tonne, the WGTA raised the domestic price by $16.38, the LDP lowered barley prices by $9.00 (to cattle and sheep producers only) and the net effect of all

67

of these programs was to effectively raise the domestic price by only $1.23 per tonne [Appendix Table 1]. Inventories were an additional impact on domestic prices further to government policies and programs, such as the WGTA subsidy, EEP export subsidies, the guarantee of the CWB's deficits, and the Crow offset and Livestock Development Programs.

Similar domestic price impacts can be found in the Prairie feed wheat markets in Figure (4). Feed wheat prices generally fell below the subsidy neutral level after 1985-86, with the exception of 1990-91, when the CWB incurred a $30.44/tonne deficit in the wheat pool account.

The net effects of the subsidy lowered feed grain prices are shown by commodity, by province in Appendix Tables (1) thru (6). The subsidy programs were more favorable for Saskatchewan and Alberta feed grain users because of their additional Crow offset programs. EEP had a very big negative impact on domestic feed wheat and feed barley prices across all three provinces in the early 1990's. While the subsidies generally distorted grain prices and reduced the incomes of grain farmers and taxpayers, they were a financial benefit to the Prairie livestock industry overall in this time period.

4.4 Summary

Domestic users compete for Canadian feed grain in the world market. Domestic prices have a link with world prices. This part of the study looked at how strong that link is, and if it has changed with a changing world subsidy environment.

68

Export sales subsidies from Canada and other exporting countries all have an impact on Canadian domestic feed prices. When Canada removed the transportation subsidy, it was thought that there would be a corresponding drop in domestic feed prices and reduced exports.

As sellers form their expectations on what they believe is the total price offered by the CWB in the pool account, they must chose wether to deliver into the export system, or to sell domestically for feed. They are however sometimes limited on delivering grain into the export system and are forced to hold stocks of grain involuntarily. This typically results in depressed domestic prices.

Export price was shown to be influential on domestic barley prices prior to 1995. Post 1995, a dummy variable captured a shift in the market where domestic prices were significantly elevated relative to what the CWB was offering. CWB acquisitions of feed barley have fallen to minimal levels. In all three Western provinces, excessive inventory was found to depress domestic prices in the feed barley market.

Like barley, domestic feed wheat prices were expected to increase relative to the export market following the end of the transportation subsidy. Feed wheat exports were expected to decline, but unlike feed barley, a continued close link between export prices and domestic prices was expected to continue. This was found to be true in Alberta and Saskatchewan, but Manitoba exhibited a structural change in the relationship where domestic prices were significantly elevated relative to export prices. Manitoba feed wheat is priced on an import basis from corn in the

Midwest US and import feed wheat from Saskatchewan. Excessive inventory holding again depressed local prices, most notably in Manitoba where the inventory effect was the strongest.

The overall net effect of these market interventions by government on the domestic feed market varied widely from year to year. Prior to 1985/86, domestic feed prices were elevated primarily due to WGTA, but when the US began subsidizing exports thru EEP in 1985 and 1986, the combined impact of all of the various subsidy programs in Canada and the US were found to be net favorable to domestic feed grain users and the livestock industry across the Western provinces.

Chapter 5

Ration Costs

5.1 Hog Rations in Iowa and Manitoba

The cost of grain for feed is one of the most significant expenses of producing livestock. Therefore, the previously discussed individual policy impacts will have a tremendous influence overall on the development of livestock industries within Western Canada. With the termination of the WGTA, it had been forecast that there would be a higher consumption of feed grains arising from increased beef cattle and hogs on Prairie farms. However, since the WGTA subsidy was only one of several programs affecting domestic feed prices, this study has attempted to separate each individual programs impact on domestic feed prices and this chapter will follow with what this has actually meant for feed users on a ration cost basis and show what the domestic ration cost would have been historically if there had been no US or Canadian subsidies in place.

5.1.1 Standard Ration Components

For comparison purposes, standard rations were developed to evaluate the cost of finishing a hog in the Prairies versus finishing a hog in the Midwest United States. A typical grower ration in Manitoba consists of 49.0 percent barley, 31.3 percent wheat, 15.0 percent soybean meal and 4.7 percent other supplements.

Farm prices of these commodities were used to determine an average ration cost for a given crop year to be compared with a typical ration cost out of Iowa. Ration costs in the Midwestern States were based on a 76.2 percent corn, 20.0 percent soybean meal and 3.8 percent supplement ration. Supplements are high in protein and, in order to meet the nutritional requirements of the animal, Manitoba producers typically use more supplement because of their reduced used of soybean meal. The cost of the supplementary feed ingredients, including Premix, canola oil, and L-Lysine HCL, was valued at $909.00 per tonne of feed supplement as per information contained in Manitoba Agriculture's "Guidelines for Estimating Swine Production Costs" and Iowa's "Livestock Enterprise Budgets". Based on the above described composition, Table (16) shows the per tonne cost, in Canadian funds, of both rations between 1980-81 and 1997-98. If the price of barley and wheat are out of line with the price of corn, producers can switch from one type of feed to another if the transportation costs are not prohibitive. The critical factor is to ensure that the nutritional requirements of the animal are being met. Wheat and barley are grown and used for rations on the Canadian prairies, whereas corn is primarily grown and used in the Midwest.

5.1.2 Ration Cost Comparison

For the first five years in the 1980's, the average actual cost for a standard Manitoba hog ration was C$187/tonne, shown in Table (16). Without EEP subsidies, CWB deficits and WGTA subsidies, the average price of a hog ration in

Table (16):

Standard Hog Ration Costs

Crop Year	Actual Ration Cost - Manitoba C$/tonne	Subsidy Impact on Domestic Rations C$/tonne	Manitoba Ration Cost Adjusted for No Subsidies C$/tonne	Actual Ration Cost - Iowa C$/tonne
1980-81	$209.80	$11.94	$197.86	N/A
1981-82	$184.23	$11.94	$172.29	$168.13
1982-83	$166.01	$12.53	$153.48	$170.00
1983-84	$188.42	$11.62	$176.80	$205.71
1984-85	$184.14	$10.88	$173.26	$174.86
1985-86	$163.27	$22.81	$140.46	$166.30
1986-87	$145.14	$4.04	$141.10	$134.97
1987-88	$149.53	($2.53)	$152.06	$153.44
1988-89	$200.62	$10.47	$190.15	$180.07
1989-90	$168.87	$7.76	$161.11	$156.90
1990-91	$148.05	$4.41	$143.64	$148.53
1991-92	$143.10	($6.04)	$149.14	$156.05
1992-93	$146.22	($4.01)	$150.23	$155.63
1993-94	$150.21	($17.20)	$167.41	$184.64
1994-95	$165.31	($2.50)	$167.81	$162.77
1995-96	$222.72	$0.00	$222.72	$232.40
1996-97	$204.35	$0.00	$204.35	$216.83
1997-98	$183.64	$0.00	$183.64	$188.17

Manitoba for the same period would have been C$175/tonne, $12/tonne lower than the actual 'subsidized' price, shown in Figure (5). The actual Manitoba ration cost exceed an average Iowa cost of $180 per tonne by $7.00, however, the 'non-subsidized' Manitoba ration cost would have been $5.00 per tonne lower than the cost in Iowa.

The average actual ration cost between 1985 and 1995 in Manitoba was $158 per tonne, two dollars less than the average Iowa cost. The 'non-subsidized' Manitoba ration cost would have been $156 on average over the same time period, $2.00 tonne lower than actual and $4.00 less than the average Iowa cost. Ration costs were significantly depressed as a result of some very large EEP subsidies in the early 1990's. Given the overall price variation between 1985 and 1995 shown in Figure (5), the regional feeding costs could be considered equal between Manitoba and Iowa.

Post 1995 ration costs have been shown to be very volatile and it is hard to draw significant conclusions as to whether there has been a fundamental shift in the competitiveness of a Manitoba ration. For the three years under observation, the average Manitoba ration cost was C$204.00, but overall range of ration cost spanned $40.00 from high to low. The average ration cost in Iowa for the same period was C$212, which is $8.00 more than the average cost in Manitoba. Iowa also experience the same price variation in the ration cost formulation and varied by C$45.00 per tonne.

In Manitoba, there has been less of a decline in the area seeded to barley

Figure (5):

Hog Finisher Ration Costs
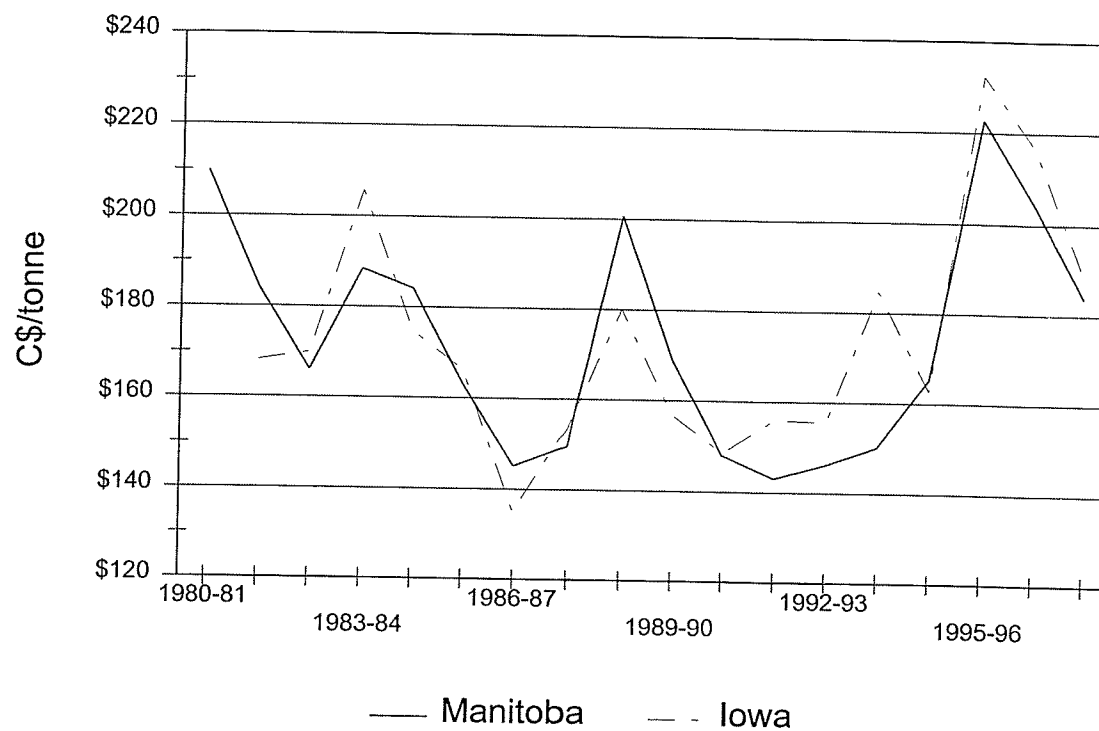
post 1995 to 2001, but the area seeded to wheat in Manitoba has decreased significantly following the termination of the transportation subsidy in 1995. Shown in Table (17), barley acres averaged 569,000 hectares between 1985 and 1995 and 504,700 ha between 1995 and 2001, 11% less. Spring wheat acres went from an average of 1.886 m ha to 1.447 m ha in same time periods a drop of 23.3%.

Although Manitoba feed costs from 1995 to 1998 appear on average to be $8 per tonne lower than feed costs in Iowa, the number of weanling pigs that are leaving Canada for the US to be finished and slaughtered has risen by 387% between 1995 and 2001. This exodus is primarily from Manitoba where exports have risen by 321% since 1995. Manitoba weanling exports account for 54% of all Canadian exports.

The number of weanlings being exported from Canada, shown in Table (18) has risen from 226,300 head in 1992 to 3,168,500 in 2001, an increase of 1300% in 10 years. The number of hogs on farm, shown in Table (1) has not increased by anywhere near the same magnitude. The total number of hogs on farm in MB, SK and AB increased 15.8% from 1992 to 2001 and only 6.9% since 1995 and the end of the transportation subsidy.

5.2 Summary

A standard ration comparison showed that average Manitoba ration costs were $7 per tonne higher than Iowa rations costs in the early 80's and virtually the same over a 10 year period from the mid 80's to mid 90's. Post 1995, the picture

76

Table (17):

Area of Crops, Manitoba

Crop Year	All Wheat (000 ha)	Spring Wheat (000 ha)	Barley (000 ha)
1980-81	1,336.0	1,275.0	809.0
1981-82	1,577.9	1,470.0	951.0
1982-83	1,619.1	1,532.0	809.0
1983-84	1,861.2	1,766.0	708.0
1984-85	1,801.2	1,686.0	728.0
1985-86	1,962.5	1,797.0	749.0
1986-87	2,003.3	1,817.0	627.0
1987-88	1,963.2	1,807.0	688.0
1988-89	1,934.4	1,821.1	574.7
1989-90	2,134.7	1,983.0	647.5
1990-91	2,205.5	2,063.9	607.0
1991-92	2,173.1	2,065.8	505.9
1992-93	2,084.1	2,023.4	424.9
1993-94	1,983.0	1,932.4	445.2
1994-95	1,657.2	1,554.0	424.9
1995-96	1,614.5	1,549.8	465.4
1996-97	1,699.6	1,628.8	627.3
1997-98	1,570.2	1,497.3	546.3
1998-99	1,307.1	1,191.8	501.8
1999-00	1,272.7	1,224.1	404.7
2000-01	1,572.1	1,475.0	481.6
2001-02	1,647.1	1,562.1	505.9

Source: Canada Grains Council, Statistical Handbook

Table (18):

Weanling Hog Exports to the US ('000 head)

Year	All Canada Weanlings <50 kg	Manitoba Weanlings <50 kg
1992	226.3	185.8
1993	280.8	210.4
1994	401.5	259.4
1995	650.7	408.7
1996	768.0	496.7
1997	987.3	595.7
1998	1,466.1	847.5
1999	2,083.4	1,350.3
2000	2,340.4	1,439.4
2001	3,168.5	1,720.3

Source: Statistics Canada, Manitoba Agriculture

becomes less clear. A three year observation shows that Manitoba ration costs are $8 per tonne lower than a comparable ration in Iowa, however this was also a period that was marked by significant price volatility, shifts in production and large increases in weanling exports. These supporting variables point to Manitoba as NOT having the comparative feed advantage that was initially believed to occur post 1995.

Chapter 6

Summary

6.1 Summary

Grain and livestock production in Western Canada has been affected by regional, national and international agricultural policies. This study has looked at the individual impacts of US and Canadian subsidies, the link between Canadian export and domestic prices and the corresponding impact on the hog industry on a ration cost basis. In particular, the study looked at the price relationship pre and post 1995 to determine if there had been a fundamental shift in the domestic feed grain industry following the termination of the transportation subsidy and the US Export Enhancement Program. Ration cost formulation was looked at on an actual basis and what a standard Manitoba hog ration would have been without subsidies.

There were three objectives set out in this study. The first was to establish the Canadian Wheat Boards ability to price discriminate or to determine whether they were simply price takers in the world market. The second was to consider how · all of the changes to domestic and international policies impacted the relative position of the feed grain user in Western Canada and whether there had been a net decrease or net increase in feed costs. The third was to determine what has been the total impact from all of these export subsidies and what the domestic ration cost would have been in the past without these subsidies.

For any of these objectives to have been met, it was necessary to gather a significant amount of comparable price data. First, a publically available collection of the CWB's feed barley and feed wheat receipts was collected from their annual financial statements. From this, it was possible to determine an average price for a given sales period for both feed barley and wheat export sales. This price data was to correspond with a comparable US price series. Monthly prices for two US barley markets, the PNW and Minneapolis were weighted and lagged to coincide with CWB feed barley export sales. Two monthly prices series for wheat, the PNW and Gulf, were also weighted and lagged to establish one price series that was comparable to Canadian wheat sales. There was no single source for domestic feed barley and wheat prices. The Canadian Grain Commission (CGC) published weekly sales data by commodity, by province until July 1996. After 1996, it was necessary to standardize provincially reported data to the CGC price series. The collection of this information allowed for the meeting of the above stated objectives.

6.2 Conclusions

The CWB was not able to noticeably price differentiate between feed barley markets. The Board simply matched US sales prices to EEP and non EEP eligible markets. The wheat market is less clear, but there is no conclusive evidence to suggest that the CWB consistently extracted premiums in their feed wheat sales. United States EEP effectively lowered the price for domestic feed in Canada, in that the CWB's prices were lowered because they had to match US export prices to EEP

eligible markets. As was previously stated, the export price was instrumental in determining the domestic price. Therefore, any policies that affected the CWB price for feed will indirectly affect the domestic market. The WGTA subsidy effectively and continually raised the price of feed in the Prairies. Provincial governments attempted to counter these distortions by offering a Crow Benefit Offset Program in Alberta and Saskatchewan and a Livestock Development Program in Manitoba. The net effects of these market interventions varied widely from year to year, but after 1985-1986, the price depressing effect of EEP tended to exceed the transportation subsidy and domestic prices fell below subsidy neutral levels. While the subsidies distorted grain prices and reduced incomes of grain farmers and taxpayers, they were financially beneficial to the Western Canadian livestock industry.

Following the termination of the transportation subsidy, the anticipated drop in domestic feed prices has not been apparent relative to comparative ration costs in the Mid-Western United States. It was this forecasted drop in ration costs that fueled much of the expansion in the livestock industry in Western Canada. The period post 1995 has been marked by significant price volatility, increasing numbers of weanling hog exports and shifts away from traditional feed grain production.

6.3 Limitations and Further Research

The biggest limitation to this study is its reliance on publically available export price information provided in the Canadian Wheat Boards annual financial statements. Actual CWB sales data to specific countries would have allowed for a conclusive statement on their ability to price discriminate between EEP and non EEP markets. This study was only able to state that if there were price premiums captured by the CWB, they were not significant enough to be observed, once there was an adjustment made for EEP discounts.

The study also relies on a simple average EEP for all markets as a general willingness of the US to subsidize exports in that given time period. Actual CWB price data could have been matched to specific countries, during specific time periods to assess the Board's market power.

There are other exogenous market influences that would have also played into CWB's prices, such as European Union subsidization of feed exports and the impact that removing US EEP had on US domestic prices. These were not modeled in the analysis.

The United States Loan Deficiency Payments (LDP) program can be seen to encourage overproduction of some of these feed crops, such as corn and soybeans. Overproduction will result in lower US domestic prices. This effect was not captured.

Finally, there has been the introduction of the Canada Transportation Agencies revenue cap on rail transportation of export feed grains that could be

viewed as an indirect subsidy to grain production. This was introduced in August 2000, after the period of analysis in this study.

The overall analysis would also benefit from being extended to the end of the 2001-2002 crop year, adding an additional three years of analysis to capture more of the post- subsidy impact.

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Appendix Table (1):

Manitoba Feed Barley Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Brandon - Thunder Bay C$/tonne	Net Effects on P_{bCWB} C$/tonne	Livestock Development Program (Cattle & Sheep) C$/tonne	Net Effects on P_{bfeed} C$/tonne
1980-81	$0.00	$0.00	$14.87	$14.87		$14.87
1981-82	$0.00	$0.00	$14.87	$14.87	$0.00	$14.87
1982-83	$0.00	$1.21	$14.87	$16.08	$0.00	$16.08
1983-84	$0.00	$0.00	$14.47	$14.47	$0.00	$14.47
1984-85	$0.00	$0.00	$13.55	$13.55	$0.00	$13.55
1985-86	$0.00	$34.64	$16.95	$51.59	$0.00	$51.59
1986-87	($24.39)	$17.05	$19.21	$11.87	$0.00	$11.87
1987-88	($22.39)	$0.00	$18.55	($3.84)	$0.00	($3.84)
1988-89	($3.60)	$0.00	$18.53	$14.93	$0.00	$14.93
1989-90	($6.15)	$0.00	$16.38	$10.23	($9.00)	$1.23
1990-91	($21.22)	$0.23	$15.43	($5.56)	($9.00)	($14.56)
1991-92	($21.62)	$0.00	$15.46	($6.16)	$0.00	($6.16)
1992-93	($20.55)	$0.00	$14.76	($5.79)	$0.00	($5.79)
1993-94	($37.17)	$0.00	$13.44	($23.73)	$0.00	($23.73)
1994-95	($14.43)	$0.00	$11.10	($3.33)	$0.00	($3.33)
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Appendix Table (2):

Saskatchewan Feed Barley Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Saskatoon - Vancouver C$/tonne	Net Effects on P_{bCWB} C$/tonne	Saskatchewan Crow Offset C$/tonne	Net Effects on P_{bfeed} C$/tonne
1980-81	$0.00	$0.00	$18.03	$18.03	$0.00	$18.03
1981-82	$0.00	$0.00	$18.03	$18.03	$0.00	$18.03
1982-83	$0.00	$1.21	$18.03	$19.24	$0.00	$19.24
1983-84	$0.00	$0.00	$17.53	$17.53	$0.00	$17.53
1984-85	$0.00	$0.00	$17.33	$17.33	$0.00	$17.33
1985-86	$0.00	$34.64	$21.69	$56.33	$0.00	$56.33
1986-87	($24.39)	$17.05	$24.57	$17.23	$0.00	$17.23
1987-88	($22.39)	$0.00	$23.73	$1.34	$0.00	$1.34
1988-89	($3.60)	$0.00	$27.89	$24.29	$0.00	$24.29
1989-90	($6.15)	$0.00	$20.94	$14.79	($13.00)	$1.79
1990-91	($21.22)	$0.23	$19.72	($1.27)	($13.00)	($14.27)
1991-92	($21.62)	$0.00	$19.77	($1.85)	($13.00)	($14.85)
1992-93	($20.55)	$0.00	$18.88	($1.67)	($13.00)	($14.67)
1993-94	($37.17)	$0.00	$17.18	($19.99)	($13.00)	($32.99)
1994-95	($14.43)	$0.00	$14.19	($0.24)	$0.00	($0.24)
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Appendix Table (3):

Alberta Feed Barley Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Red Deer - Vancouver C$/tonne	Net Effects on P_{bCWB} C$/tonne	Alberta Crow Offset C$/tonne	Net Effects on P_{bfeed} C$/tonne
1980-81	$0.00	$0.00	$19.04	$19.04	$0.00	$19.04
1981-82	$0.00	$0.00	$19.04	$19.04	$0.00	$19.04
1982-83	$0.00	$1.21	$19.04	$20.25	$0.00	$20.25
1983-84	$0.00	$0.00	$18.20	$18.20	$0.00	$18.20
1984-85	$0.00	$0.00	$17.04	$17.04	$0.00	$17.04
1985-86	$0.00	$34.64	$21.31	$55.95	($21.00)	$34.95
1986-87	($24.39)	$17.05	$24.15	$16.81	($21.00)	($4.19)
1987-88	($22.39)	$0.00	$23.32	$0.93	($13.00)	($12.07)
1988-89	($3.60)	$0.00	$22.23	$18.63	($13.00)	$5.63
1989-90	($6.15)	$0.00	$20.60	$14.45	($11.00)	$3.45
1990-91	($21.22)	$0.23	$19.41	($1.58)	($11.00)	($12.58)
1991-92	($21.62)	$0.00	$19.44	($2.18)	($11.00)	($13.18)
1992-93	($20.55)	$0.00	$18.55	($2.00)	($10.00)	($12.00)
1993-94	($37.17)	$0.00	$16.90	($20.27)	($10.00)	($30.27)
1994-95	($14.43)	$0.00	$13.96	($0.47)	$0.00	($0.47)
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

90

Appendix Table (4):

Manitoba Feed Wheat Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Brandon - Thunder Bay C$/tonne	Net Effects on P_{wCWB} C$/tonne	Livestock Development Program (Cattle & Sheep) C$/tonne	Net Effects on P_{wfeed} C$/tonne
1980-81	$0.00	$0.00	$14.87	$14.87	$0.00	$14.87
1981-82	$0.00	$0.00	$14.87	$14.87	$0.00	$14.87
1982-83	$0.00	$0.00	$14.87	$14.87	$0.00	$14.87
1983-84	$0.00	$0.00	$14.47	$14.47	$0.00	$14.47
1984-85	$0.00	$0.00	$13.55	$13.55	$0.00	$13.55
1985-86	($18.81)	$1.22	$16.95	($0.64)	$0.00	($0.64)
1986-87	($24.90)	$0.00	$19.21	($5.69)	$0.00	($5.69)
1987-88	($20.61)	$0.00	$18.55	($2.06)	$0.00	($2.06)
1988-89	($8.45)	$0.00	$18.53	$10.08	$0.00	$10.08
1989-90	($7.59)	$0.00	$16.38	$8.79	($9.00)	($0.21)
1990-91	($22.97)	$30.34	$15.43	$22.80	($9.00)	$13.80
1991-92	($25.11)	$0.00	$15.46	($9.65)	$0.00	($9.65)
1992-93	($18.52)	$0.00	$14.76	($3.76)	$0.00	($3.76)
1993-94	($31.25)	$0.00	$13.44	($17.81)	$0.00	($17.81)
1994-95	($13.88)	$0.00	$11.10	($2.78)	$0.00	($2.78)
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Appendix Table (5):

Saskatchewan Feed Wheat Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Saskatoon - Vancouver C$/tonne	Net Effects on P_{WCWB} C$/tonne	Saskatchewan Crow Offset C$/tonne	Net Effects on P_{wfeed} C$/tonne
1980-81	$0.00	$0.00	$18.03	$18.03	$0.00	$18.03
1981-82	$0.00	$0.00	$18.03	$18.03	$0.00	$18.03
1982-83	$0.00	$0.00	$18.03	$18.03	$0.00	$18.03
1983-84	$0.00	$0.00	$17.53	$17.53	$0.00	$17.53
1984-85	$0.00	$0.00	$17.33	$17.33	$0.00	$17.33
1985-86	($18.81)	$1.22	$21.69	$4.10	$0.00	$4.10
1986-87	($24.90)	$0.00	$24.57	($0.33)	$0.00	($0.33)
1987-88	($20.61)	$0.00	$23.73	$3.12	$0.00	$3.12
1988-89	($8.45)	$0.00	$27.89	$19.44	$0.00	$19.44
1989-90	($7.59)	$0.00	$20.94	$13.35	($13.00)	$0.35
1990-91	($22.97)	$30.34	$19.72	$27.09	($13.00)	$14.09
1991-92	($25.11)	$0.00	$19.77	($5.34)	($13.00)	($18.34)
1992-93	($18.52)	$0.00	$18.88	$0.36	($13.00)	($12.64)
1993-94	($31.25)	$0.00	$17.18	($14.07)	($13.00)	($27.07)
1994-95	($13.88)	$0.00	$14.19	$0.31	$0.00	$0.31
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Appendix Table (6):

Alberta Feed Wheat Market

Crop Year	Effect of EEP C$/tonne	CWB Deficit C$/tonne	WGTA Subsidy Red Deer - Vancouver C$/tonne	Net Effects on P_{wCWB} C$/tonne	Alberta Crow Offset C$/tonne	Net Effects on P_{wfeed} C$/tonne
1980-81	$0.00	$0.00	$19.04	$19.04	$0.00	$19.04
1981-82	$0.00	$0.00	$19.04	$19.04	$0.00	$19.04
1982-83	$0.00	$0.00	$19.04	$19.04	$0.00	$19.04
1983-84	$0.00	$0.00	$18.20	$18.20	$0.00	$18.20
1984-85	$0.00	$0.00	$17.04	$17.04	$0.00	$17.04
1985-86	($18.81)	$1.22	$21.31	$3.72	($21.00)	($17.28)
1986-87	($24.90)	$0.00	$24.15	($0.75)	($21.00)	($21.75)
1987-88	($20.61)	$0.00	$23.32	$2.71	($13.00)	($10.29)
1988-89	($8.45)	$0.00	$22.23	$13.78	($13.00)	$0.78
1989-90	($7.59)	$0.00	$20.60	$13.01	($11.00)	$2.01
1990-91	($22.97)	$30.34	$19.41	$26.78	($11.00)	$15.78
1991-92	($25.11)	$0.00	$19.44	($5.67)	($11.00)	($16.67)
1992-93	($18.52)	$0.00	$18.55	$0.03	($10.00)	($9.97)
1993-94	($31.25)	$0.00	$16.90	($14.35)	($10.00)	($24.35)
1994-95	($13.88)	$0.00	$13.96	$0.08	$0.00	$0.08
1995-96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1996-97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
1997-98	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00