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A REGIONAL ANALYSIS OF THE IMPACT OF MEDIUM QUALITY WHEAT PRODUCTION ON FARM RETURNS

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Introduction

Until recently, farmers in Western Canada have grown only one type of wheat. This superior type of wheat was hard red spring (HRS) wheat which is well adapted to the Canadian prairies. In the last few years, producers have begun to question the conventional wisdom and have started to grow a higher yielding medium quality wheat known as prairie spring (PS) wheat. The question at present is "Which type of wheat should be grown?" More important to the farmer is "Which wheat will give the highest return?"

The basic objective of this paper is to determine the impact on farm returns of growing PS wheats versus HRS wheats based on regional soil and climatic differences. The analysis focuses on the farm level rather than the national or international wheat market structure although these areas are discussed in passing. Various studies (Ulrich and Furtan, 1984; Carter, et al., 1986; Canada Grains Council, 1986; Enns, 1985) have examined the issue based mainly on price projections. Historical data, although limited, are now available and are used to examine the returns farmers in Western Canada could have achieved by growing PS wheat.

Background

The first variety of wheat to be registered as Canada Prairie Spring wheat was HY320 (HY=high yield) in 1985. This was called a 3M wheat which meant medium protein, medium hardness, and medium gluten strength. From 1983 to 1985, it was grown under contract with the Canadian Wheat Board after which it could be grown without restriction. Carter, et al., (1986) argued that this measure was taken merely to limit production of other unlicensed semi-dwarf varieties. Other varieties which have since been licensed are Oslo, Biggar (HY368), and HY355 (white PS).

Despite their higher yields, these varieties do possess some undesirable agronomic characteristics. HY320 in particular exhibits a longer growing season, poor disease resistance, and poor sprouting resistance. It also appears that PS wheat may be affected more adversely by drought conditions. Because of these deficiencies, HY320 will be deregistered as of August 1, 1990. Plant breeders have improved some characteristics with the newer PS varieties however some problems still remain. Table 1 compares the current PS wheat varieties with the dominant HRS variety, Katepwa. The agronomic characteristics are important considerations for farmers who are making planting decisions.

Methodology

Each area of the prairies has different climatic and soil qualities which increase or decrease the yield and grade differential between PS wheat and HRS wheat. Various studies (Ulrich and Furtan, 1984; Canada Grains Council, 1986) have shown that the black soil zones seem to be more suitable for the production of PS wheat. In the drier brown soil zones where high quality HRS wheat grades can be achieved consistently and where yield advantages of PS wheat are limited by soil moisture deficiencies, the incentive to grow PS wheat may be limited. In the more northern grey soil zones, a shorter growing season limits the production of PS wheat.

This study uses prairie regions as identified by the provincial agriculture departments in their seed variety recommendations to producers. These zones reflect the prairie soil zones fairly accurately and are illustrated in Figure 1.

The provincial variety recommendations were also used to determine the yield advantages for PS wheat. HY320 was used as a representative variety since HY320 yields are comparable to potential yields for all PS wheat varieties. The greatest amount of yield data is also available for HY320 wheat. These yields results were compared to CWB yield results which were found, in some cases, to be significantly higher. Thus, the provincial data and CWB data were combined using a simple average to generate a single yield value. Some harmonization of the data concerning soil zones was required. Yield data can be seen in Appendix 1.

Price data were obtained from the CWB and are 6-year averages of total payments to producers basis in store Thunder Bay or Vancouver. These prices for 1CWRS, 2CWRS, 3CWRS, and Canada Feed wheat were then weighted against the 10-year average grade pattern for that crop zone. Grade data for HRS wheat were derived from Ulrich and Furtan (1984). Due to insufficient grade data for PS wheat, Ulrich and Furtan's system of deriving grade patterns for PS wheat was used. This system is illustrated below in Figure 2. Price and grade data are shown in Appendix 2.

The weighted prices were then multiplied by the yields for each zone to determine the average returns that a producers could expect by growing HRS

Table 1 -- Wheat variety Descriptions

Variety	Days to Maturity	Height	Lodging	Resistance to Stem Rust	Resistance to Leaf Rust	Resistance to Loose Smut	Resistance to Bunt
Katepwa	97	Medium	Good	Good	Fair	Good	Good
HY320	103	Semidw	Exc	Good	Good	Poor	Poor
Oslo	98	Semidw	Exc	Good	Good	Poor	Fair
Biggar	103	Semidw	Exc	Good	Good	Poor	Poor
HY355 (white)	102	Medium	Fair	Good	Fair	Fair	Poor

Source: Manitoba Agriculture. Field Crop Variety Recommendations for Manitoba. 1989, 1990.

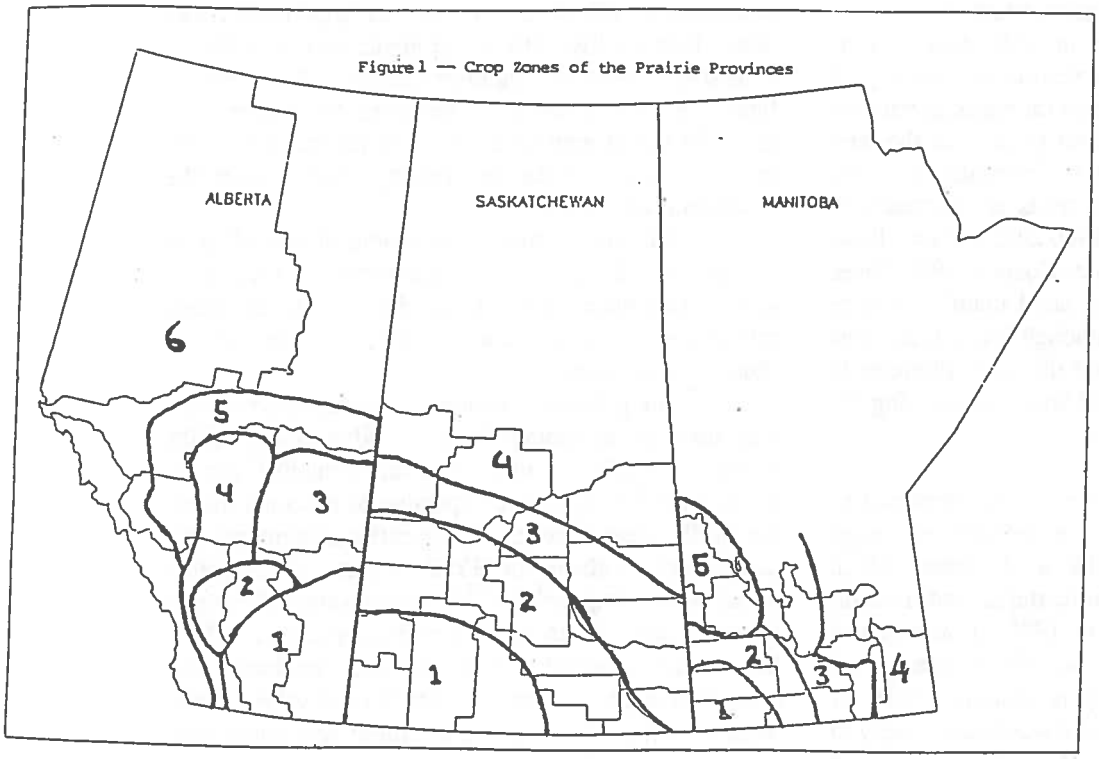
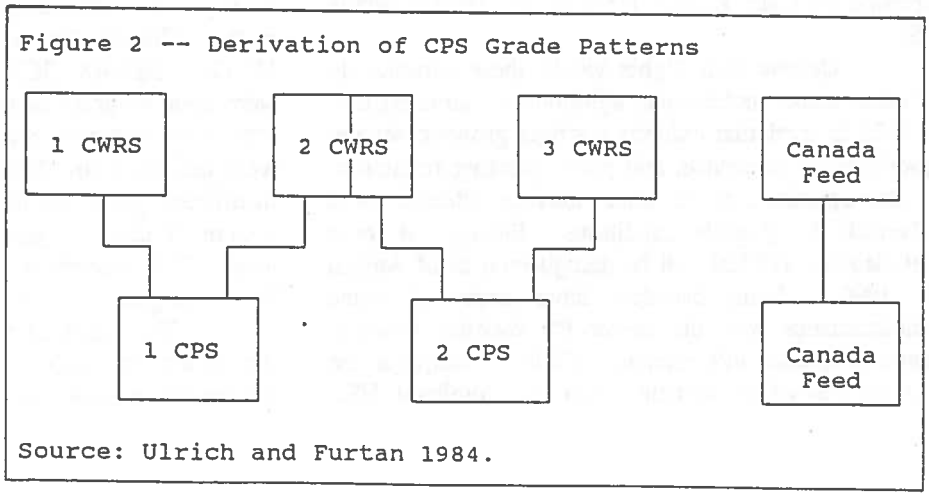


Figure 1 — Crop Zones of the Prairie Provinces

Sources: Provincial Agriculture Variety Recommendations



and PS wheat in that area.

Results

The price-yield calculations resulted in the farm returns shown in Table 2. These results indicate that every area of the prairies could benefit from growing PS wheat however, additional costs, which are discussed in the next section of the paper, must be taken into account. When these costs are viewed, the benefits are limited and in some cases the costs may exceed the gain from growing PS wheat.

As expected, the benefits were unequally distributed throughout the crop zones. Gains were lowest in the southwestern region of Saskatchewan and southeast Alberta. This is due to the fact that high grades of HRS wheat can be grown consistently in this region which increases the price premium for HRS wheat over PS wheat. Also, yield differentials between HRS and PS wheat are not as great in the arid crop zones as they are in other regions. It would be most advantageous to produce PS wheat in central and eastern Alberta as well as most of Manitoba. This is because of a higher yield differential and a lower price differential based on average grade patterns.

Cost Factors

The cost of growing and marketing PS wheat is higher than HRS wheat. With a higher yield, and thus larger volumes, Ulrich and Furtan (1984) have estimated extra storage costs to be $2.74/tonne, added farm transportation costs to be $3.65/tonne, and extra machinery costs at $0.55/tonne. If one were to use a rough yield estimate of 1 tonne per acre, these costs would total $6.94 per acre.

Seed costs are estimated by Canada Grains Council (1986) to be equal to HRS wheat. This estimate is despite the fact that a higher seeding rate is required for PS wheat due to a larger seed size. Lower seed prices for the lower value PS wheat should offset this higher seeding rate. PS wheats, due to poor disease resistance, require seed treatment which is estimated at approximately $1.50 per acre based on a 1.5 bushel per acre seeding rate.

Crop insurance premiums are slightly higher ($0.30 - $0.40/acre) for PS wheat, however, coverage is approximately $5/acre greater as well.

Freight charges per tonne are the same for both types of wheat. Freight charges *per acre* are higher for PS wheat due to increased yield. This extra cost is exactly proportional to the yield advantage obtained by growing PS wheat. For example, a 25 percent yield increase per acre would cause freight charges per acre to rise by 25 percent. Thus, in 1988/89, average elevator and freight charges deducted from a farmer's grain cheque were $1957/tonne (Canada Grains Council 1989). For a 32 bu/acre of HRS wheat, elevator and freight charges are approximately $17.00/acre. If the PS wheat yield is 25 percent higher (40 bu/acre), the handling charges are$21.30/acre,and increase of $4.30/acre. These cost will vary depending on a producer's location and grain company with which he/she is dealing.

The cost mentioned above total $13.08/acre. It must be remembered that the cost estimates are very rough but they do give some guidelines as to the additional costs a farmer might expect to incur when growing PS wheat. These estimates alter the results of the analysis by eliminating the incentive to grow PS wheat in several zones. These regions must be studied in a more detailed manner to determine the actual benefits or costs of growing wheat. The analysis is beyond the scope of this paper.

Other Considerations

If the price signals exist to encourage producers to switch to growing PS wheat, do farmers use them in their planting decisions? It is questionable as to the extent to which farmers use CWB initial prices as a signal to increase or decrease acreage of various crops.

> From 1980 to 1988, there were only three years in which wheat acreage went in the same direction as initials weren't announced until July, and couldn't have affected seeding. (Morriss, 1990, p.4).

CWB initial prices may not be an accurate measure of wheat prices but farmers may also fail to respond to more accurate indicators of price. Total prices received in a previous year seem to have little effect on seeding intentions of PS wheat in the following year as seen in Figure 3. The price spread between 1 Can PS and 2 CWRS should cause PS wheat acreage as a percent of total wheat acreage to move in the opposite direction. That is, a lower price differential should cause prairie spring wheat acreage to increase. Instead, the lagged price spread and PS wheat acreage have moved in the same direction.

Other factors, such as agronomic characteristics, also had some effect on this movement. If, over time, farmers perceived HY320 (the dominant PS variety) as an inferior type of wheat, acreage would drop. Thus, it can be seen that factors other than price have an effect on the acreage of a crop that is seeded. Farmers likely use price signals but their importance may be outweighed by other considerations.

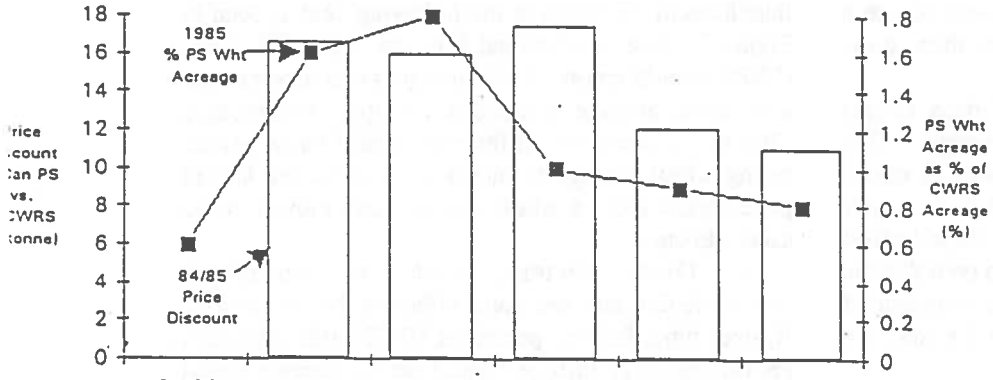
Cash flow is another important factor that farmers consider when making crop decisions. This is especially true now that the CWB cash advance program has been effectively dismantled. As a result, the occurrence of CWB quotas has become an important factor in planting decisions. Marketing potential and flexibility is best described by the number of quota bushels per acre which have been issued as of December 31st of each crop year. This is demonstrated in Figure 4 which compares the number of quota bushels issued for PS wheat and HRS wheat as of December 31. In 1984/85 and 1985/86, the CWB called for total production of PS wheat which was grown

Table 2. Regional Farm Returns for HRS Wheat and PS Wheat

Crop Zones	HRS Wheat Yield (bu/ac)	Weighted HRS Price ($/t)	Avg HRS Return ($/ac)	PS Wheat Yield (bu/ac)	Weighted Ps Price ($/t)	Avg PS Return ($/ac)	PS Return less HRS Return ($/acre)	PS as % of HRS (%)
MANITOBA								
1 & 2	27.7	151.34	114.09	33.3	138.97	125.95	11.85	110.4
3	31.4	152.81	130.59	39.1	139.49	148.44	17.85	113.7
4	29.9	147.87	120.33	33.9	137.77	127.11	6.78	105.6
5	31.0	145.87	123.07	37.2	137.02	138.72	15.65	112.7
SASKATCHEWAN								
1	18.6	158.97	80.47	22.4	140.72	85.79	5.31	106.6
2	23.2	154.30	97.43	28.3	139.30	107.29	9.86	110.1
3	25.7	149.77	104.76	32.4	138.05	121.73	16.98	116.2
4	27.8	148.00	111.98	34.5	137.45	129.06	17.08	115.3
ALBERTA								
1 & 2	25.6	155.67	108.46	30.9	139.85	117.61	9.15	108.4
3	29.0	145.87	115.13	36.7	136.53	136.37	21.24	118.4
4	39.8	140.42	152.10	49.8	134.35	182.09	29.99	119.7
5	33.0	138.67	124.54	40.4	132.58	145.77	21.23	117.0
6	30.5	141.70	117.62	N/S	134.22	-		

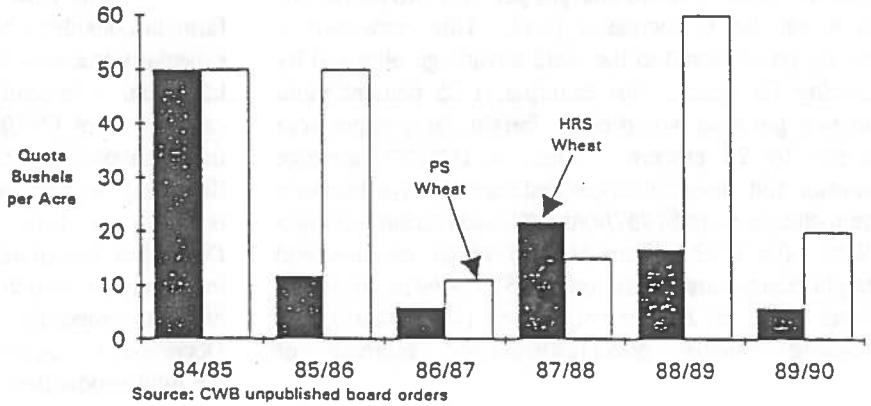
N/S - not generally suited to region

Figure 3
PS Wheat Acreage vs. Previous Year Price Spread



Source: CWB, Seeded & Quota Acreage Statistics and Annual Reports (various years)

Figure 4
Quota Bushels as of Dec 31st of Crop Year



Source: CWB unpublished board orders

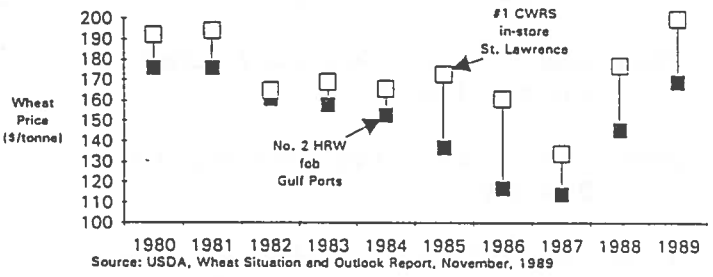
under contract. In all other years, with the exception of 1987/88, producers who grew PS wheat clearly had the advantage in terms of delivery options. This definitely holds implications for interest costs and opportunity costs for farmers. The entire quota record for HRS and PS wheat is show in Appendix 3.

Some controversy exists as to the trends concerning Canadian HRS wheat price premiums in relation to competitors' wheat prices, especially American Hard Red Winter wheat. It is assumed that due to similarities in quality, PS wheat prices follow HRW wheat prices quite closely. Various years produce differing price premiums for protein content based on supply and demand for high quality wheats. These factors are in turn based on weather conditions in major wheat growing countries. Veeman (1987) and Wilson (1989) have demonstrated that the price premium for protein is growing over time. The price gap between Canadian HRS wheat and the largest type of medium quality wheat, U.S. HRW wheat is shown in Figure 5. It can be seen that this price gap has grown throughout the 1980's.

Carter, et al., (1986) argue that it is the medium quality wheat market which is growing most quickly. This growing demand is not, however, reflected in the prices shown in Figure 5. The Canada Grains Council (1986) has broken down the demand for wheat into several groups. The most quickly growing demand for wheat comes from developing countries which are mainly interested in medium quality wheat. If the demand for high quality wheat is growing, it is doing so only in developed countries which are becoming more self-sufficient in wheat over time. Thus, the outlook is for a shrinking market in high quality wheat and the price premium that they command may be reduced. The domestic market is also changing as consumers switch to French style breads made with medium quality wheat as opposed to the usual high-rising pan breads made with HRS wheat. Farmers likely consider some of these trends in world demand but their greatest concern is the immediate return.

A final factor to be considered is whether Canadian producers can gain more by specializing in hard high-protein wheat production than by competing with American and European medium and soft wheats. If the medium quality wheats are being heavily subsidized through export subsidies in the U.S. and Europe, Canada may not be able to compete on the same level. If a large scale switch was made to the production of medium quality wheat in Canada, the world market may become even more competitive. Thus, Canadian farmers would be better off staying in the specialized high protein market. Carter, et al., (1986) state that Canada would be a small player in the medium wheat market and thus would not incite retaliation by either the U.S. or Europe. At present, however, these two regions are extremely sensitive to any market intrusion and the results of added competition can not be predicted. The impact of this issue is topic which requires further study.

Figure 5
Price Premium -- 1 CWRS vs No.2 HRW



Source: USDA, Wheat Situation and Outlook Report, November, 1989

Conclusion

The results of this study generally agree with other studies on the subject. When simple returns are viewed, all regions of the prairies could benefit by growing PS wheat. When added costs are considered, the results are modified. Producers in the more arid regions of the prairies would likely benefit by holding to their practice of growing HRS wheat while the more humid regions should consider the added benefits of growing PS wheat. Other factors such as delivery options, agronomic characteristics, and market trends must also be considered. As world demand evolves, the result for each region of the prairies will likely change.

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APPENDIX 1
SPRING WHEAT YIELD COMPARISON

Crop Zones	--------Hard Red Spring Wheat-------- bu./ac. 1984	1985	1986	1987	1988	1989	6 year Average	Prov. Ag. Yield Est.	-----HY320 Wheat----- bu./ac. % of HRS Wht	CWB Yield Estimates	% of HRS Wht
MANITOBA											
1 & 2	27.0	38.1	34.1	27.8	17.1	22.2	27.7	31.9	115	34.6	125%
3	33.8	39.9	32.5	31.5	19.1	31.4	31.4	37.0	118	41.1	131%
4	30.7	34.5	29.7	30.4	21.2	32.6	29.9	29.3	98	38.5	129%
5	30.0	38.1	31.5	28.0	27.9	30.7	31.0	34.4	111	40.0	129%
Province	31.1	39.6	33.1	30.1	18.4	28.8	30.2	33.8	112		
SASKATCHEWAN											
1	15.9	9.6	28.8	26.1	8.9	22.4	18.6	21.6	116	23.1	124%
2	20.3	23.6	34.8	28.2	11.1	21.5	23.2	27.6	119	29.0	125%
3	24.1	31.3	31.3	28.0	16.7	22.8	25.7	31.1	121	33.7	131%
4	27.2	33.0	29.8	27.7	19.0	30.0	27.8	33.1	119	35.8	129%
Province	21.7	24.5	31.6	27.9	13.4	23.4	23.8	28.3	119		
ALBERTA											
1 & 2	18.9	18.5	35.2	29.8	22.2	28.7	25.6	29.9	117	31.7	124%
3	29.6	22.4	36.0	24.5	30.6	31.0	29.0	35.4	122	38.0	131%
4	39.3	20.5	45.7	37.7	49.1	46.5	39.8	48.2	121	51.3	129%
5	32.9	20.5	35.2	32.5	39.0	37.8	33.0	38.3	116	42.5	129%
6	30.6	20.3	26.5	30.5	42.9	32.2	30.5	N/S	N/S	N/S	N/S
Province	25.1	18.8	34.9	28.8	29.2	31.3	28.0	33.3	119		

N/S - not generally suited to region

Sources:Statistics Canada, Crop District Area, Yield and Production, 1988
Manitoba Agriculture, 1989 Field Crop Variety Recommendations for Manitoba
Saskatchewan Agriculture, Varieties of Grain Crops for Saskatchewan, 1989
Alberta Agriculture, Varieties of Cereal and Oilseed Crops for Alberta - 1989
Canadian Wheat Board, Grain Matters (various issues)

APPENDIX 2
SPRING WHEAT AND TRADE COMPARISON

6-Year Average Price by Grade - CWB Total Price ($/tonne)

----Hard Red Spring Wheat----				-----Prairie Spring Wheat-----		
1CW	2CW	3CW	CF	1CPS	2CPS	CF
$162.09	$156.80	$145.18	$124.02	$141.59	$139.29	$124.02

10-Year Average Grade Pattern (%)

Crop Zones	----Hard Red Spring Wheat----					-----Prairie Spring Wheat-----			
	1CW	2CW	3CW	CF	Weighted Avg Price	1CPS	2CPS	CF	Weighted Avg Price
	----Percent-----				($/tonne)	----Percent-----			($/tonne)
MANITOBA									
1 & 2	21	37	34	8	151.34	39	53	8	138.97
3	17	50	28	5	152.81	42	53	5	139.49
4	8	37	41	14	147.87	27	59	14	137.77
5	6	30	46	18	145.87	21	61	18	137.02
SASKATCHEWAN									
1	75	15	7	3	158.97	82	15	3	140.72
2	48	25	18	9	154.30	60	31	9	139.30
3	22	33	31	14	149.77	39	47	14	138.05
4	185	29	36	17	148.00	33	50	17	137.45
ALBERTA									
1 & 2	51	27	16	6	155.67	64	30	6	139.85
3	11	30	37	22	145.87	26	52	22	136.53
4	2	18	46	34	140.42	11	55	34	134.35
5	1	12	43	45	138.67	7	48	45	132.58
6	5	14	47	35	141.70	12	53	35	134.22

Sources:Ulrich and Furtan, 1984
Canadian Wheat Board Annual Reports (various years)

Appendix 3
CWB Quotas Issued 1984/85 to 1989/90

	CWRS			CPS		
Crop Year	Series	Date	Bushels	Series	Date	Bushels
1984/85	"A"	Aug 1	2.9		Full Contract Delivery	
	"B"	Aug 30	1.8			
	"C"	Oct 16	Open			
	"D"	Nov 2	5.1			
	"E"	May 21	Open			
1985/86	"A"	Aug 1	1.8	"A"	Aug 1	1 carlot
	"B"	Sep 13	1.8	"B"	Sep 13	Total
	"C"	Oct 4	5.1			Production
	"D"	Dec 18	2.9			
	"E"	Feb 6	2.9			
	"F"	Mar 4	10.1*			
	"G"	Mar 4	*			
	"H"	Mar 5	1.8			
	"I"	Apr 16	2.9			
	"J"	May 21	13.0			
	"L"	June 18	10.1			
	"K"	June 26	20.0			
	"M"	June 26	2.9			
			10.1			
1986/87	"A"	Oct 10	2.9	"A"	Nov 4	2.9
	"B"	Dec 12	2.9	"B"	Nov 14	2.9
	"C"	Mar 27	2.9	"C"	Dec 12	5.0
	"D"	Jun 3	2.0	"D"	Mar 27	5.0
	"E"	Jul 10	1.0	"E"	May 22	15.1
1987/88	"A"	Aug 27	2.9	"A"	Sep 11	5.0
	"B"	Sep 4	2.9	"B"	Sep 28	5.0
	"C"	Sep 28	10.0	"C"	Nov 2	5.0
	"D"	Oct 16	2.9	"D"	Jan 29	10.0
	"E"	Dec 7	2.9	"E"	Mar 22	10.0
	"F&G"	Mar 28	2.9	"F"	Jun 1	20.0
	"H"	Jun 1	20.0			
1988/89	"A"	Aug 1	2.9	"A"	Aug 1	10.0
	"B"	Aug 23	2.9	"B"	Sep 16	10.0
	"C"	Sep 26	2.9	"C"	Dec 1	20.0
	"D"	Nov 8	2.9	"D"	Dec 21	20.0
	"E"	Dec 21	5.0	"E"	Feb 23	5.0
	"F"	Jan 30	10.0	"F"	Jun 2	10.0
	"G"	Mar 28	10.0			
	"H"	May 11	10.0			
	"I"	Jun 2	10.0			
	"J"	Jun 2	2.9			
1989/90	"A"	Aug 1	2.9	"A"	Aug 1	10.0
	"B"	Sep 27	2.9	"B"	Sep 27	10.0
	"C"	Jan 5	2.9	"C"	Jan 5	20.0
	"D"	Mar 9	2.9			

* Quotas issued on the same day apply to different train runs.
Source:CWB. Unpublished Board Orders.