RURAL ECONOMY

Statistical Overview of Field Crop Acres, Yields, and Prices

in Western Canada

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Statistical Overview of Field Crop Acres, Yields, and Prices in Western Canada

Background for GE^{3}LS research on Crop Adaptation Genomics Program

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Table of Contents

List of Figures and Tables

Introduction

This study is a statistical overview of acres, yields, and prices for major field crops in western Canada. The period of study is from 1908 to 2006. The field crops considered in this study are wheat, rye, barley, oats, canola, flax, and summer fallow. The provinces covered in this study are Manitoba, Saskatchewan, Alberta, and British Columbia. The objective of the report is to provide background analysis for future research on the economics of increased cold tolerance in cereal crops in Western Canada.

Acres, yields, and prices are examined for each crop in each province. Inflation is taken into account so all nominal prices are converted to real prices with a base year 2005. Wheat yields for Manitoba, Saskatchewan, and Alberta are compared with each other based on regression analysis to determine if the historical trend in yields differs between the three provinces.

Unless otherwise noted, “wheat” refers to all wheat including spring, winter, and durum wheat. However, winter wheat is a crop of interest in the cold tolerance study. As a result, winter wheat acreage and yields are examined and compared with spring wheat in a separate part of this report.

Data

All data for this study are collected from CANSIM II, Statistics Canada's electronic database. The crop year is from August 1 to July 31. Area is measured in seeded hectares. Yields are measured in kilograms per hectare. Real prices are measured in Canadian dollars per metric ton.

All area and yield data are annual and are extracted from CANSIM II directly. Nominal prices before 1985 are collected directly from Table 10010 in CANSIM II as annual data. However, nominal prices from 1985 to 2006 are monthly data from Table 20043 (i.e., annual prices for that time period are unavailable through CANSIM). Annual prices for wheat for the period from 1985 to 2006 are calculated as a weighted average of monthly CWB Wheat prices and monthly CWB Durum prices from the same crop year (including July prices). Average monthly CWB Barley prices from each crop year are used as annual barley price for the period from 1985 to 2006. Annual prices of oats, rye, canola, and flax from 1985 to 2006 are also calculated by averaging monthly prices for each crop year. Nominal prices are deflated by annual Consumer Price Index for all items in Canada which is also from CANSIM II to obtain real prices for analysis. That is, all prices are converted to the base year 2005 prices.

Methodology

Acres, yields, and prices for major field crops are examined in this study. Data are collected for the period from 1908 to 2006 (CANSIM II). Graphical analysis is used for

acres, yields, and prices for the four western provinces and a review of any trends is done accordingly. The area data for four provinces are summed to form the field crop area for western Canada. Graphical analysis and a review of any trends are also undertaken for these values. Wheat yields are examined within a regression analysis to determine the general trend over time, and to allow an interprovincial comparison regarding the degree of yield change over time. As noted earlier, winter wheat is also examined separately with respect to acreage and yields.

Statistical Overview Results

Manitoba

Field Crop Acres

An overall increasing trend can be found in Manitoba wheat acreage from 1908 to 2006, with large year to year variations (Figure 1 and Figure 2). Wheat is the major field crop for the majority of the study period, although there are a few years when summer fallow actually had higher acreages. Wheat goes from 1,197,000 hectares in 1908 to 1,432,800 hectares in 2006, with a low of 567,000 hectares in 1970 and a high of 2,209,600 hectares in 1990. The average over the whole period of study is 1,256,600 hectares. Canola acres increase from 600 hectares in 1943 to 1,003,600 hectares in 2006. This dramatic increase has resulted in canola now being the second most important field crop in Manitoba in terms of area, next to spring wheat.

Of the remaining crops, barley and oats are probably the most significant. Barley shows dramatic variability during the study period in terms of acres, starting at 268,000 hectares

in 1908 and ending with 376,400 hectares in 2006; the highest area grown was 957,000 hectares in 1953, with the low point being 168,000 hectares in 1910. Oats acreage is relatively stable from 1908 until the mid-1970's, with an average of 608,588 hectares. Since that time, oats acres have been more variable, decreasing to a low of 145,700 hectares in 1990 and then increasing slightly, ending at 386,500 hectares in 2006. Rye acreage increases from 3,000 hectares in 1908 to a high of 171,000 hectares in 1922. Subsequent to that, rye acreage trends down with 34,400 hectares being grown in 2006. Flax shows an increasing trend from 9,000 hectares in 1908 to 546,000 hectares in 1965. Since the mid-1960's flax acreage has trended downward, ending with 153,800 hectares in 2006. Summer fallow increases in area from 463,000 hectares in 1913 to a peak of 1,619,000 hectares in 1970 followed with a decreasing trend, and 138,000 hectares in 2006.

Field Crop Yields

All field crops examined in this analysis display an increasing trend in yield, with year to year variability over the study period (Figure 3). Wheat yields go from 1,145 kilograms per hectare in 1908, to a high of 3,000 kilograms per hectare in both 2003 and 2004, with slightly lower yields (i.e., 2,900 kilograms per hectare) in 2006. Rye yield starts at 1,000 kilograms per hectare in 1923 and ends at 2,500 kilograms per hectare in 2006. Barley yield also shows an upward trend from 1,390 kilograms per hectare in 1908 to 3,400 kilograms per hectare in 2006. During the same period, oat yields increase from 1,290 kilograms per hectare in 1908 to 2,800 kilograms per hectare in 2006. An upward trend can also be observed in yield of canola, from 835 kilograms per hectare in 1943 to 1,800

kilograms per hectare in 2006. Flax increases in yield from 790 kilograms per hectare in 1908 to 1,300 kilograms per hectare in 2006.

Field Crop Real Prices

As noted earlier, nominal prices are adjusted to real prices, using 2005 as the base year. An overall decreasing trend is present for all field crop prices over the period of study (Figure 4). Wheat prices decrease from $654.18 per tonne in 1914 to $118.13 per tonne in 2005. Rye prices start at $530.42 per tonne in 1923, reach a high of $1490.34 per tonne in 1947, and then decline to $103.69 per tonne in 2005. Barley prices have a steady decreasing trend during the period from $442.01 per tonne in 1914 to $67.85 per tonne in 2004. Oats prices fall from $548.10 per tonne in 1914 to $130.51 per tonne in 2005. Canola prices increase from $534.81 per tonne in 1952 to a high of $1277.09 per tonne in 1974. They then fall, ending with $262.60 per tonne in 2005. Flax prices have large year to year variations. They start at $760.26 per tonne in 1914 and end at $257.55 per tonne in 2005. Over the period of study, flax prices have three peak values, $1843.66 per tonne in 1919, $2132.02 per tonne in 1947, and $1703.37 per tonne in 1973.

Saskatchewan

Field Crop Acres

Total field crop area in Saskatchewan shows an increasing trend from 1908 to 2006 (Figures 5 and 6). Wheat is the major crop for the majority of the study period except some years in which summer fallow has the highest acreage. Wheat acreage starts at 970,000

hectares in 1908, and ends at 5,948,900 hectares in 2006, experiencing a low of 3,238,000 hectares in 1970 and a high of 8,765,400 hectares in 1986. Rye only contributes a small amount to total field crop area. It increases from 1,000 hectares in 1908 to 80,900 hectares in 2006 with a high of 595,000 hectares in 1948. Barley acreage has an increasing trend, going from 33,000 hectares in 1908 to 1,456,900 hectares in 2006 with a high of 2,255,000 hectares in 1971. Oat acreage increases from 376,000 hectares in 1908 to a high of 2,477,000 hectares in 1943. Oats then decrease to a low of 304,000 hectares in both 1984 and 1985, followed with a slight increase ending at 829,600 hectares in 2006. Canola displays a steady increasing trend from 700 hectares in 1943 to 2,590,000 hectares in 2006. Canola is now the second most important field crop in Saskatchewan in terms of area, next to spring wheat. Area devoted for flax shows an increasing trend from 45,000 hectares in 1908 to 659,600 hectares in 2006, although it experiences its highest point of 890,000 hectares in 1943. Summer fallow increases from 1,123,000 hectares in 1913 to a high of 9,712,000 hectares in 1970 and then decreases to 3,177,000 hectares in 2006.

Field Crop Yields

All field crops in Saskatchewan display an increasing trend in yield, with year to year variations over the period of study (Figure 7). Wheat increases from 975 kilograms per hectare in 1908 to 2,100 kilograms per hectare in 2006. Rye starts at 1,000 kilograms per hectare in 1908 and ends in 2,200 kilograms per hectare in 2006. Barley also shows an upward trend from 1,275 kilograms per hectare in 1908 to 2,600 kilograms per hectare in 2006. During the same period, oat yields increase from 1,195 kilograms per hectare to 2,400 kilograms per hectare. An upward trend can also be observed in canola yields,

increasing from 715 kilograms per hectare in 1943 to 1,500 kilograms per hectare in 2006. Flax increases in yield from 645 kilograms per hectare in 1908 to 1,200 kilograms per hectare in 2006.

Field Crop Real Prices

As with Manitoba prices, Saskatchewan field crop prices are first converted to a real basis, using 2005 as the base year. An overall decreasing trend can be found in Saskatchewan field crop prices over the period of study (Figure 8). Wheat price decreases from $618.82 per tonne in 1908 to $100.71 per tonne in 2005, experiencing a high of $975.06 per tonne in 1917. Rye prices start at $636.50 per tonne in 1914, peak at $1355.80 per tonne in 1947, and then decrease to $81.12 per tonne in 2005. Barley prices display a steady decreasing trend during the period, going from $406.65 per tonne in 1914 to $72.78 per tonne in 2004. Oat prices fall from $512.74 per tonne in 1914 to $117.82 per tonne in 2005. Canola prices increase from $965.72 per tonne in 1949 to a high of $1273.00 per tonne in 1974. Following that, canola price decreases to $250.01 per tonne in 2005. Flax displays large year to year variability in its real prices. It starts at $707.22 per tonne in 1914 and ends with $205.69 per tonne in 2005. Over the period of study, flax price has three peak values; $1788.78 per tonne in 1919, $2132.02 per tonne in 1947, and $1635.42 per tonne in 1973.

Alberta

Field Crop Acres

The overall area of field crops in Alberta shows an increasing trend from 1908 to 2006 (Figure 9 and Figure 10). Wheat is the major crop in approximately 70% of the years over

the period of study. The exceptions are 1943, and 1953 to 1980. In these years summer fallow has the highest acreage. Wheat acres increase from 110,000 hectares in 1908 to a high of 3,507,000 hectares in 1940. Wheat area then displays large year to year variations experiencing a low of 1,052,000 hectares in 1970 and ending at 2,741,100 hectares in 2006. Rye area has an increasing trend early in the study period, going from 3,000 hectares in 1908 to 244,000 hectares in 1922. After that, rye fluctuates in area ending at 44,500 hectares in 2006. Barley area shows a steady increase from 53,000 hectares in 1908 to 1,740,100 hectares in 2006. Oats increases from 210,000 hectares in 1908 to a high of 1,457,000 hectares in 1943. After 1943, oats has an obvious declining trend, ending at 485,600 hectares in 2006. Canola increases from 3,200 hectares in 1955 to 1,740,100 hectares in 2006. Canola is now the third largest field crop in Alberta in terms of area. Flax has large year to year variations from the1940's to the mid-1970's with a high of 283,000 hectares in 1970. After 1970, flax area shows a falling trend, ending at 28,300 hectares in 2006. Summer fallow increases from 467,000 hectares in 1917 to a high of 3,602,000 hectares in 1970, followed with a decreasing trend to the present, ending with 981,000 hectares in 2006.

Field Crop Yields

As with the other two provinces, Alberta field crops display an increasing trend in yield with year to year variations over the period of study from 1908 to 2006 (Figure 11). Wheat yield starts at 1,690 kilograms per hectare in 1908 and ends at 2,900 kilograms per hectare in 2006. Rye yield goes from 1,165 kilograms per hectare in 1908 to 2,600 kilograms per hectare in 2006. Barley yield also shows an upward trend, going from 1,585 kilograms per

hectare in 1908 to 3,200 kilograms per hectare in 2006. During the same period, oat yields increase from 1,675 kilograms per hectare to 2,500 kilograms per hectare. An upward trend can also be observed in the yield of canola, going from 625 kilograms per hectare in 1955 to 1,900 kilograms per hectare in 2006. Flax yield increases from 950 kilograms per hectare in 1908 to 1,600 kilograms per hectare in 2006.

Field Crop Real Prices

All field crops display a decreasing trend in real prices (base year is 2005) over the period of study (Figure 12). Wheat price decreases from $601.14 per tonne in 1914 to $103.00 per tonne in 2005. Rye prices start at $459.69 per tonne in 1914, peak at $1428.24 per tonne in 1947, and end at $89.03 per tonne in 2005. Barley price has a steady decreasing trend during the period, going from $406.65 per tonne in 1914 to $82.06 per tonne in 2004. Oat prices fall from $477.38 per tonne in 1914 to $111.59 per tonne in 2005. Canola price increases from $628.92 per tonne in 1955 to a high of $1277.09 per tonne in 1974, and then decreases to $252.93 per tonne in 2005. Flax has significant year to year variations in its real price. It starts at $724.90 per tonne in 1914 and ends at $249.99 per tonne in 2005. As was the case in Manitoba and Saskatchewan, flax price displays three peak values over the study period; $1799.76 per tonne in 1919, $2121.67 per tonne in 1947, and $1635.42 per tonne in 1973.

British Columbia

Field Crop Acres

Total field crop area in British Columbia shows an increasing trend over the period of study (Figure 13 and Figure 14). Wheat acreage increases from 3,800 hectares in 1910 to 14,100 hectares in 2006, experiencing a high of 65,000 hectares in 1980. Rye increases from 200 hectares in 1910 to 2,400 hectares in 2006, experiencing a significant increase of 3,800 hectares from 1982 to 1983 and a significant decrease of 4,700 hectares from 1983 to 1984 (data unavailable from 1911 to 1917). Barley area has a steady increasing trend, going from 800 hectares in 1910 to 34,400 hectares in 2006. Oats initially increases from 13,400 hectares in 1910 to a high of 48,700 hectares in 1939. This is followed by a decreasing trend, reaching a low of 20,200 hectares in 1979. After that, oats area again has an upward trend ending up with 36,400 hectares in 2006. Canola increases from 6,100 hectares in 1967 to a high of 109,300 hectares in 1979. Canola area then decreases significantly to 25,500 hectares in 1981, followed by year to year fluctuations and an ending area of 26,300 hectares in 2006. Flax area increases from 550 hectares in 1924 to a high of 5,500 hectares in 1956 and then decreases to 100 hectares in 1971. After 1971, data for flax area in British Columbia are unavailable.

Field Crop Yields

Wheat yield increases from 1475 kilograms per hectare in 1910 to 3,200 kilograms per hectare in 2005 (Figure 15). Rye yield increases from 1,000 kilograms per hectare in 1910 to 2,800 kilograms per hectare in 2002. However, there is some variability in this trend, with a low of 1300 kilograms per hectare in 1992 and a high of 3,200 kilograms per hectare

in 1994. Data on rye yields are unavailable for the years between 1911 and 1917, in 2000, and then from 2003 to the end of the study period. Barley yield starts at 1,375 kilograms per hectare in 1910 and ends at 2,200 kilograms per hectare in 2006 with large year to year variations from 1949 up to present. Oat yields have large year to year variations, starting at 2,030 kilograms per hectare in 1910 and ending at 1,900 kilograms per hectare in 2006. Canola has an increasing trend in yield, going from 555 kilograms per hectare in 1967 to 1,100 kilograms per hectare in 2006 with some large year to year variations in the latter part of the study period.

Field Crop Real Prices

Consistent with the other provinces, all field crops have a decreasing trend in real prices (base year of 2005) over the period of study (Figure 16). Wheat decreases in price from $795.63 per tonne in 1914 to $101.39 per tonne in 2005. Rye price has an overall decreasing trend, going from $1044.82 per tonne in 1918 to $89.03 per tonne in 2005. The exception is an obvious increase in rye price between 1940 and 1947. Barley price also decreases from $742.58 per tonne in 1914 to $82.06 per tonne in 2004. Oats price starts at $707.22 per tonne in 1914 and decreases to $111.59 per tonne in 2005. Canola increases in price from $497.36 per tonne in 1967 to $1252.53 per tonne in 1974, followed by a declining trend to $252.93 per tonne in 2005. Flax price starts at $809.01 per tonne in 1924 and decreases to a low of $286.07 per tonne in 1932. Flax price then increases to a high of $2163.07 dollars per tonne in 1947. After that, the trend in flax price is again decreasing, ending with $357.87 per tonne in 1971. No price data are unavailable for flax in British Columbia after 1971.

Western Canada

Field Crop Acres

Figures 17 and 18 show the increasing trend in the area of field crops as a whole in Western Canada from 1908 to 2006. Wheat is the leading field crop in western Canada during nearly 80% of the period of study, except in those years when summer fallow area exceeds wheat area. Wheat acreage has an overall increasing trend with large year to year variations, starting at 2,277,000 hectares in 1908 and ending at 10,136,900 hectares in 2006. Rye contributes only a small part to the total acreage of field crops. Barley has a relatively steady increase in acreage, going from 354,000 hectares in 1908 to 3,607,800 hectares in 2006 with a peak of 5,466,300 hectares in 1971. An increasing trend can also be found in the area of flax, going from 56,000 hectares in 1908 to 841,700 hectares in 2006. Summer fallow increases from 1,586,000 hectares in 1923 to a peak of 14,933,000 hectares in 1970. In 1970, summer fallow has a predominant role over the total acreage of all field crops in Western Canada. After 1970, the acreage of summer fallow decreases, ending at 4,296,000 hectares in 2006.

The pattern in oats is not as consistent as for some other crops. Oats area initially increases from 1,121,000 hectares in 1908 to 4,400,900 hectares in 1921. This is followed by a slight falling trend, but oats climbs back to a high of 4,593,800 hectares in 1943. There is again a downward trend to 957,100 hectares in1990, followed by increased area again, ending at 1,738,100 hectares in 2006.

Since its introduction, canola has shown an increasing trend in area, going from 1,300 hectares in 1943 to 5,360,000 hectares in 2006. Despite large year to year variability in area since the late 1960's, it has still become the second most important field crop in western Canada in terms of acreage now.

Comparison of Wheat Yield Trends between Manitoba, Saskatchewan, and Alberta

As discussed in earlier sections of this document, wheat yields in Manitoba, Saskatchewan, and Alberta have trended upwards over the period from 1908 to 2006. Around this general trend there have been large year to year variations due to fluctuating growing conditions (Figure 19). Simple regression models were established to estimate historical yield trends in Saskatchewan, Alberta, and Manitoba, using the following form:

$$Yield = \phi + \alpha T + \beta D + \gamma (T \cdot D) + e \qquad \text{Equation (1)}$$

where $Yield$ is the annual yield of wheat in kilograms per hectare; T is a time trend variable (i.e., $T = year$); D is a dummy variable (i.e., $D = 0$ for years up to and including 1945; and 1 otherwise); $(T \cdot D)$ is an interaction variable which is the product of the time trend and dummy variable; e is error term.

Table 1: Regression Results for the Wheat Yield Trend, Manitoba
R-squared = 0.7278

Variable	Coefficient	P-Value
Constant	1061.0	0.000
T	3.9	0.390
D	-747.8	0.000
$T \cdot D$	19.0	0.000

Table 2: Regression Results for the Wheat Yield Trend, Saskatchewan
R-squared = 0.5898

Variable	Coefficient	P-Value
Constant	1192.4	0.000
T	-9.2	0.065
D	-798.5	0.000
$T \cdot D$	27.1	0.000

Table 3: Regression Results for the Wheat Yield Trend, Alberta
R-squared = 0.7089

Variable	Coefficient	P-Value
Constant	1385.3	0.000
T	-9.0	0.070
D	-1271.2	0.000
$T \cdot D$	35.2	0.000

The time trend variable has a positive but statistically insignificant coefficient for Manitoba and negative significant coefficients for the other two provinces. The coefficients on the dummy variable are negative and significant for all three provinces. Coefficients for the interaction terms are positive and significant for all three provinces. This last result indicates that wheat yields increased faster after 1945.

From the regression results (Tables 1 to 3) it can be determined that, up to 1945, wheat yields increased by 3.9 kilograms per hectare, -9.2 kilograms per hectare, and -9.0 kilograms per hectare for Manitoba, Saskatchewan, and Alberta, respectively, per year, although the time trend variable in Manitoba is not statistically significant. After 1945,

wheat yields increase by 22.9 kilograms per hectare, 17.9 kilograms per hectare, and 26.2 kilograms per hectare for Manitoba, Saskatchewan, and Alberta, respectively, per year. The time trend and interaction variables are jointly significant at a 1 % level in all three provinces.

Statistical testing on the trend coefficients provides evidence that the historical trend in wheat yields differs amongst the three Prairie provinces, although the trends in Saskatchewan and Alberta are not significantly different from each other. As indicated by the regression results, both Saskatchewan and Alberta display a slight downward yield trend until 1945, followed by an upward trend after 1945. Manitoba has an upward trend in all wheat yields during the entire period of study, but has a much faster annual increase after 1945.

Winter Wheat

Winter Wheat Acreage

Compared to spring wheat, which is the most commonly grown wheat in Western Canada, winter wheat has only a small part of total wheat acreage (Figures 20 to 23). Winter wheat's share of total wheat acreage in Western Canada ranges from 0.39 % to 3.94 % between 1976 and 2006. In Manitoba, winter wheat acres increase from 6,900 hectares in 1981 to 133,500 hectares in 2006. During the past five years, Manitoba has had an average increase of 10,520 hectares per year in winter wheat acreage. During the same time period in Saskatchewan, winter wheat increases from 20,000 hectares to 121,400 hectares. By

contrast, winter wheat in Alberta has displayed an overall downward trend in area from 121,000 hectares in 1976 to 56,700 hectares in 2006.

Winter Wheat Yields

Both spring and winter wheat have shown an upward trend in yields, with large year to year variations due to fluctuating growing conditions (Figures 24 to 26). Descriptive statistics for wheat yields are provided in Table 4.

Table 4: Comparison of Yields between Winter Wheat and Spring Wheat (1981-2006)

Province	Wheat	Mean (kg/ha)	Standard Deviation
Saskatchewan	Winter	2035	515
	Spring	1914	335
Alberta	Winter	2556	602
	Spring	2387	404
Manitoba	Winter	2615	929
	Spring	2296	391

On average, winter wheat has a higher yield than spring wheat. However, the variability in winter wheat yield is also higher, suggesting greater production risk.

To compare yield trends between winter and spring wheat, a simple model was established and estimated, as follows:

$$Log(Yield) = \beta_0 + \beta_1 T + \beta_2 AB + \beta_3 MB + \beta_4 \text{Winter} + \beta_5 (T \cdot \text{Winter}) + e$$

where $Yield$ is the wheat yield, which is converted to a natural log value for use as the dependent variable; T is a time trend variable (i.e., $T = year - 1980$); AB is a binary

variable (i.e., $AB = 1$ for Alberta; and 0 otherwise**)**; MB is a binary variable (i.e., $MB = 1$ for Manitoba; and 0 otherwise); Winter is a binary variable (i.e., Winter=1 for winter wheat; and 0 for spring wheat); ($T \cdot \text{Winter}$) is an interaction variable which is the product of the time variable and the dummy variable representing winter; e is error term.

The time period considered in the regression analysis is from 1981 to 2006. The study area covers Manitoba, Saskatchewan, and Alberta. This results in 156 observations. The regression results are reported in Table 5.

Table 5: Regression Results of Winter Wheat Yields versus Spring Wheat Yields
R-squared = 0.4151

Variable	Estimated Coefficient	P-value
T	0.0112	0.001
AB	0.2303	0.000
MB	0.2049	0.000
Winter	-0.1131	0.111
T x Winter	0.0128	0.006
constant	7.3792	0.000

All coefficient estimates are positive and statistically significant, with the exception of the dummy variable representing winter wheat.

Overall wheat yield increases by (0.0112+0.0128*winter)*100 % per year, holding other factors constant. The time variable and the interaction variable are jointly statistically significant at a 1 % level. The estimated coefficient on the interaction variable, 0.0128, is the slope difference between the regression of winter wheat yields on time and the regression of spring wheat yields on time. In other words, compared to spring wheat, winter

wheat yields increase by an extra 1.28% every year. Alberta and Manitoba have 23.03% and 20.49% higher yields, respectively, than does Saskatchewan.

The effect of winter wheat on the overall wheat yield is represented by (-0.1131+0.0128*T)*100 %, holding other factors constant. The dummy variable representing winter and the interaction variable are jointly statistical significant at a 1 % level. The estimated coefficient on the interaction variable -0.1131 is the intercept difference between the regression of winter wheat yields on time and the regression of spring wheat yields on time. It can be determined that, in first eight years of the analysis, winter wheat has a lower yield than spring wheat. However, from that point to the end of the study period, winter wheat yield exceeds spring wheat yield due to the faster rate of increase (i.e., an increase of extra 1.28 percentage points per year) for winter wheat yields. It should be noted that due to data limitations and functional form, the above model may not capture all differences in yields between winter wheat and spring wheat.

Summary

From what has been discussed in this paper, it can be concluded that wheat has a leading place in field crops in Western Canada in terms of acreage. Canola has shown a stable upward trend after its introduction into Western Canada, and has become the second most important crop grown in this area in terms of acreage in recent years. By contrast, the use of summer fallow has shown a declining pattern over the past 35 years. Barley has an overall upward trend in acreage during the period of study. Other field crops mentioned in

this study (i.e., oats, rye, and flax) have displayed variable patterns and are not as important, again in terms of acres grown, as the wheat, canola and barley.

All field crops have displayed an upward trend in yields. This trend has been accompanied, however, by large year to year variations due to fluctuating growing conditions. Real crop prices all have trended downward in the period of study.

Wheat yields in the three Prairie Provinces are examined and compared to each other using statistical regression analysis. Saskatchewan and Alberta wheat yields have a decreasing trend over the first part of the study period (i.e., up to and including 1945) and an increasing trend after that. In contrast, wheat yields in Manitoba display an increasing trend through the entire study period, but with an increased annual trend after 1945.

Winter wheat takes only a small part in total wheat acreage in the Prairie Provinces. In recent years, however, winter wheat acreage has shown a relatively large increase in Manitoba and Saskatchewan. A comparison between winter wheat yields and spring wheat yields is implemented by checking descriptive statistics and then estimating a regression model. From the regression results, it can be seen that winter wheat has a lower yield than spring wheat during the first years of the analysis, but then has a higher yield in the ensuing years.

All data used in this study are aggregate data; that is, at a provincial level. The wheat yield regressions could be further improved if less aggregated data were available. In summary,

this study provides crop researchers and interested people with a selected history concerning field crops, particularly wheat, in Western Canada. The analysis also provides some rough estimates concerning the difference in wheat yields between the three Prairie Provinces and between winter wheat and spring wheat.

List of Reference

CANSIM II, Statistics Canada's electronic database

http://dc1.chass.utoronto.ca.login.ezproxy.library.ualberta.ca/cansim2/

Appendix

Figure 1: Line Chart of Manitoba Crop Acres (1908-2006)

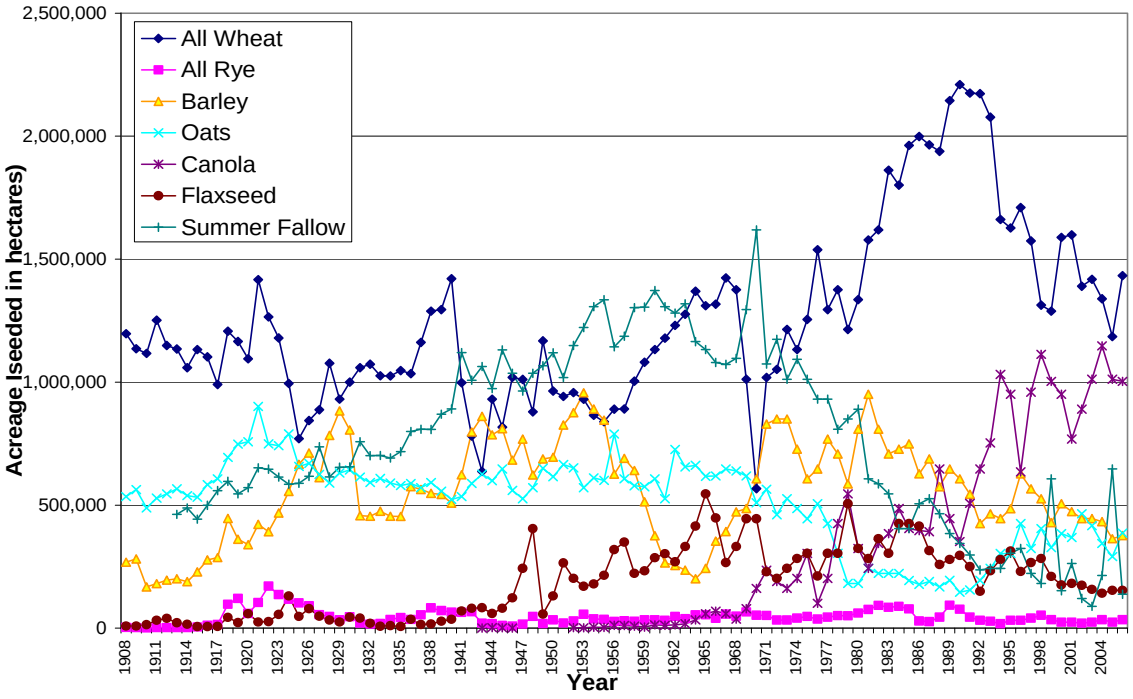

Figure 2: Stacked Area Chart of Manitoba Crop Acres (1908-2006)

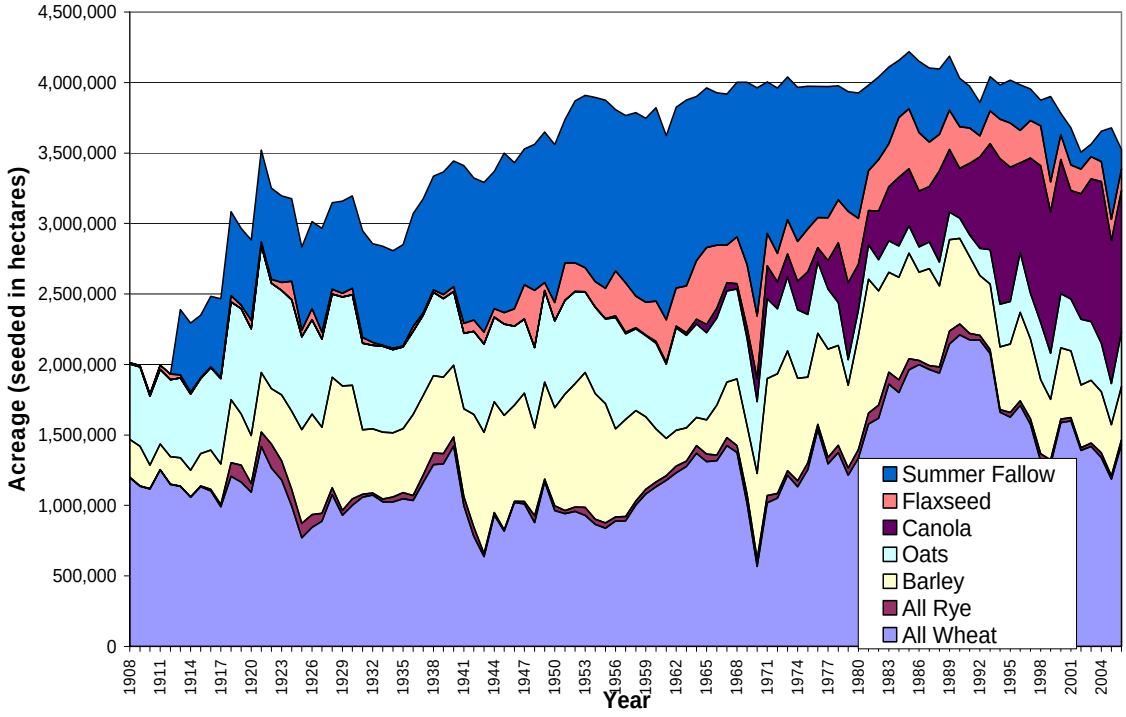

Figure 3: Crop Yields in Manitoba (1908-2006)

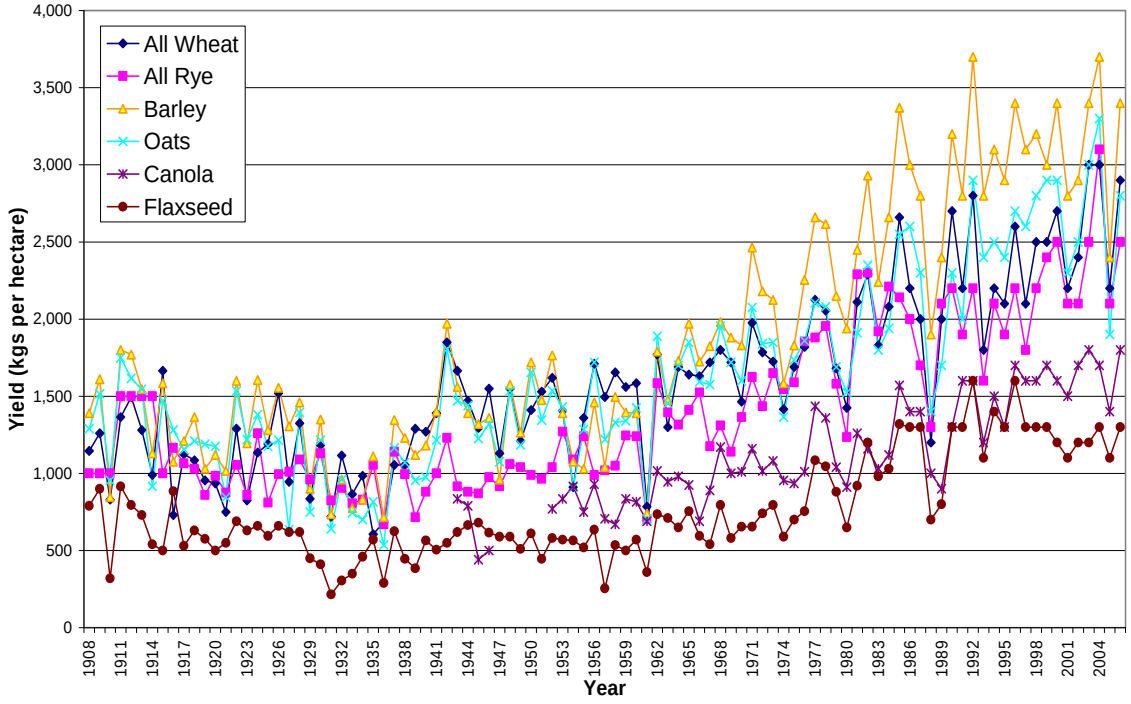

Figure 4: Real Prices of Crops in Manitoba (1908-2006) Base Year: 2005

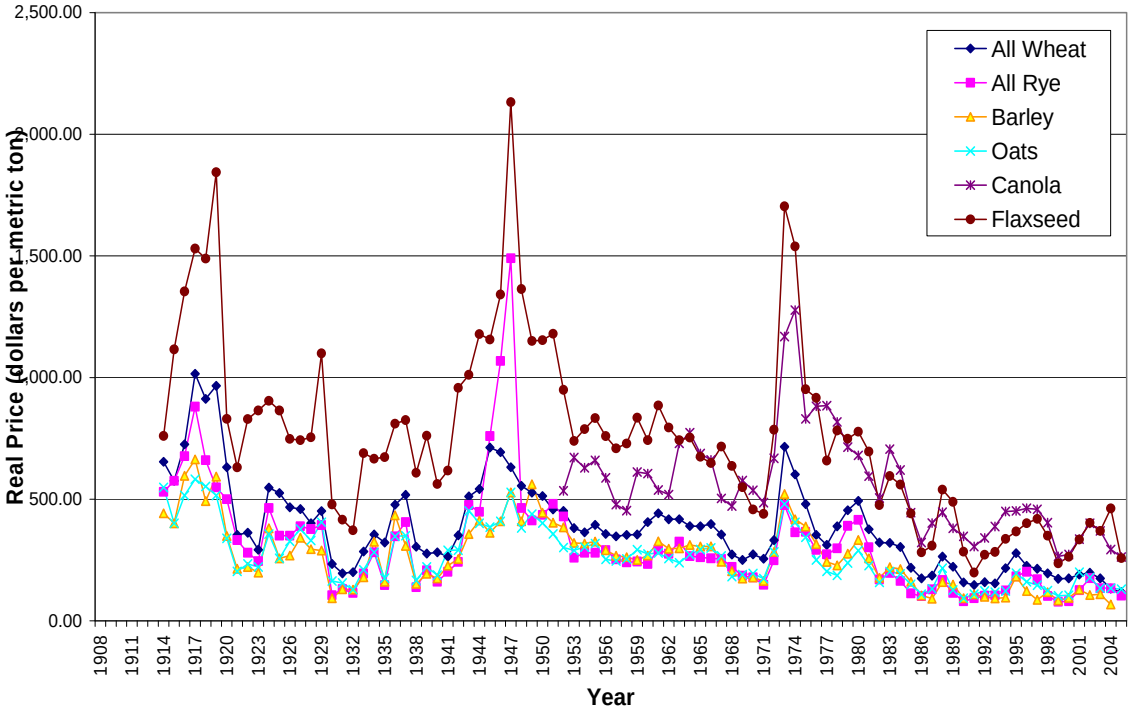

Figure 5: Line Chart of Saskatchewan Crop Acres (1908-2006)

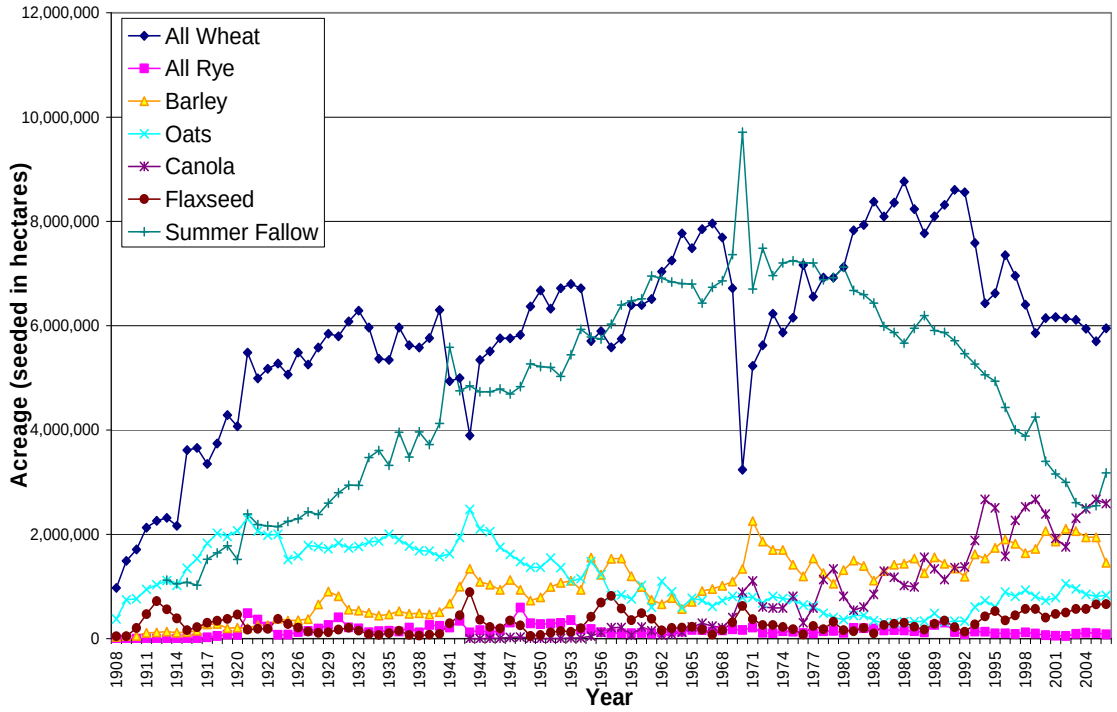

Figure 6: Stacked Area of Saskatchewan Crop Acres (1908-2006)

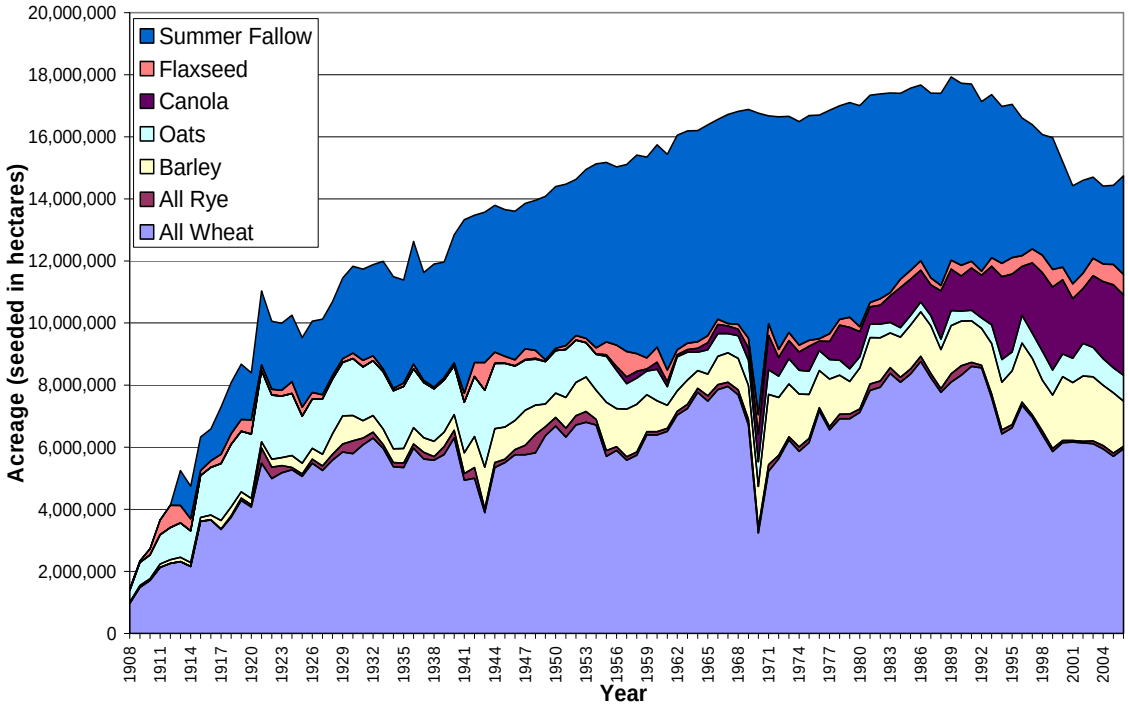

Figure 7: Crop Yields in Saskatchewan (1908-2006)

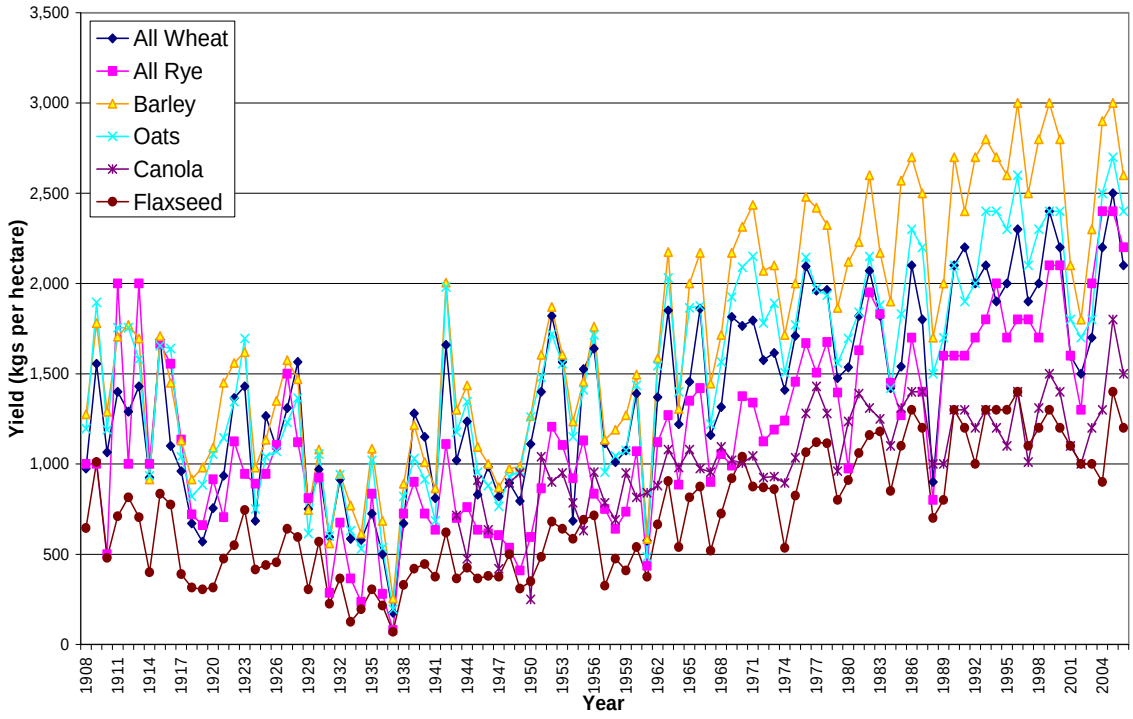

Figure 8: Real Prices of Crops in Saskatchewan (1908-2006) Base Year 2005

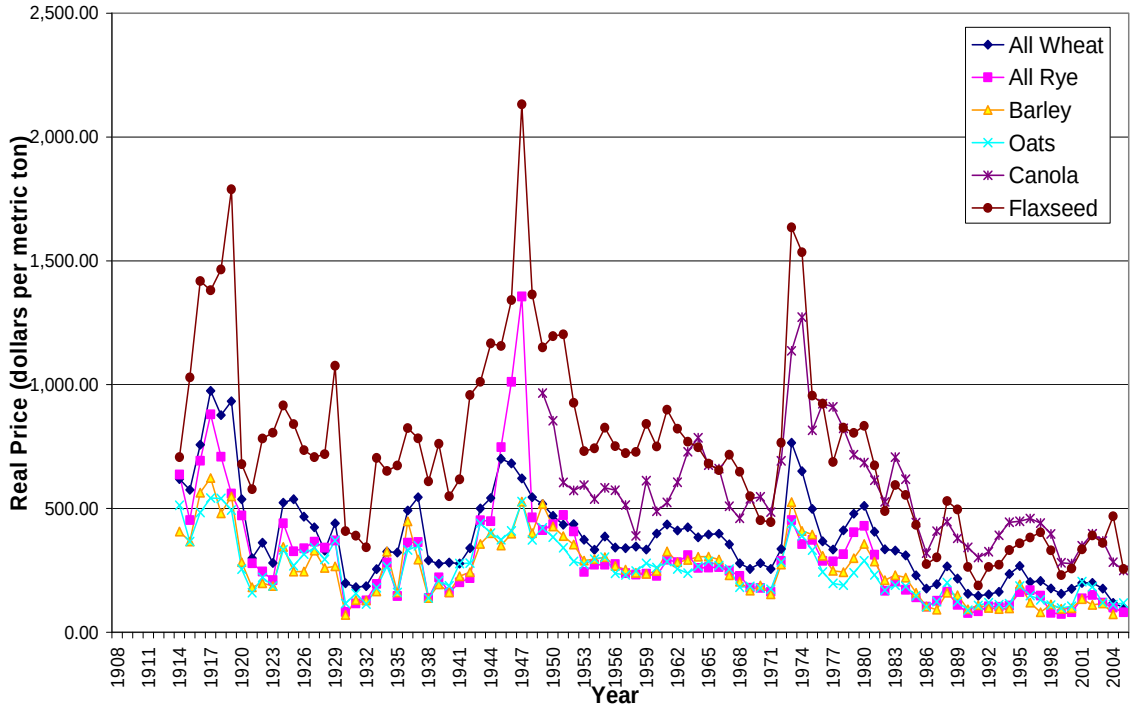

Figure 9: Line Chart of Alberta Crop Acres (1908-2006)

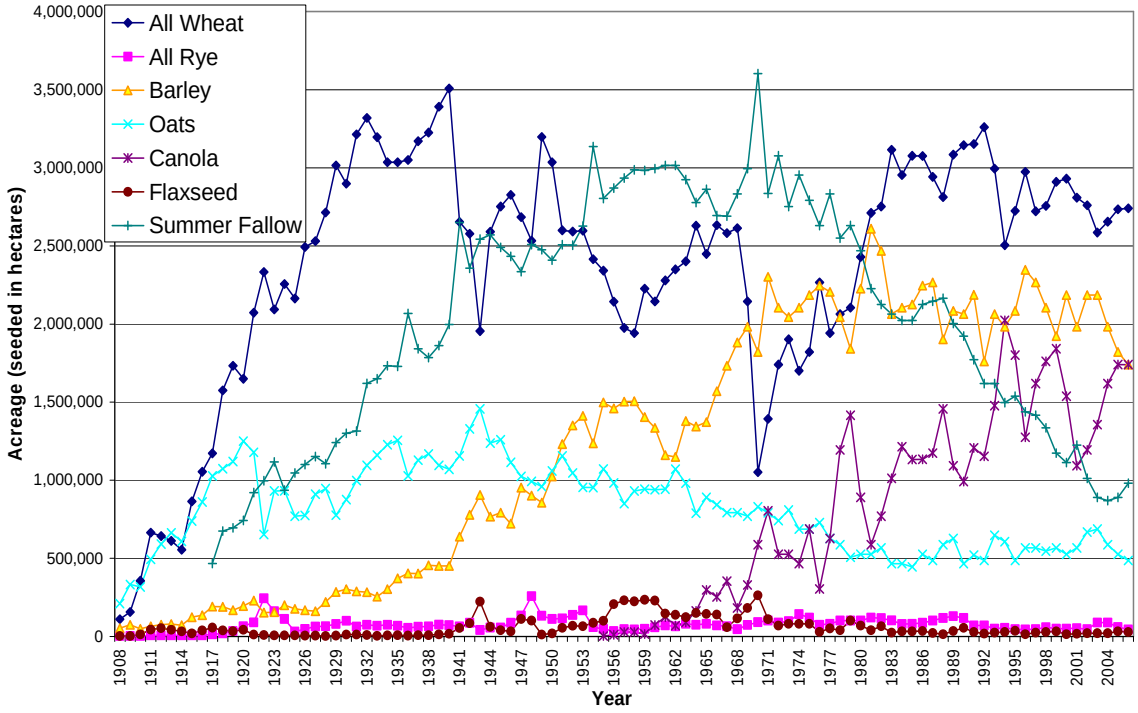

Figure 10: Stacked Area of Crop Acres in Alberta (1908-2006)

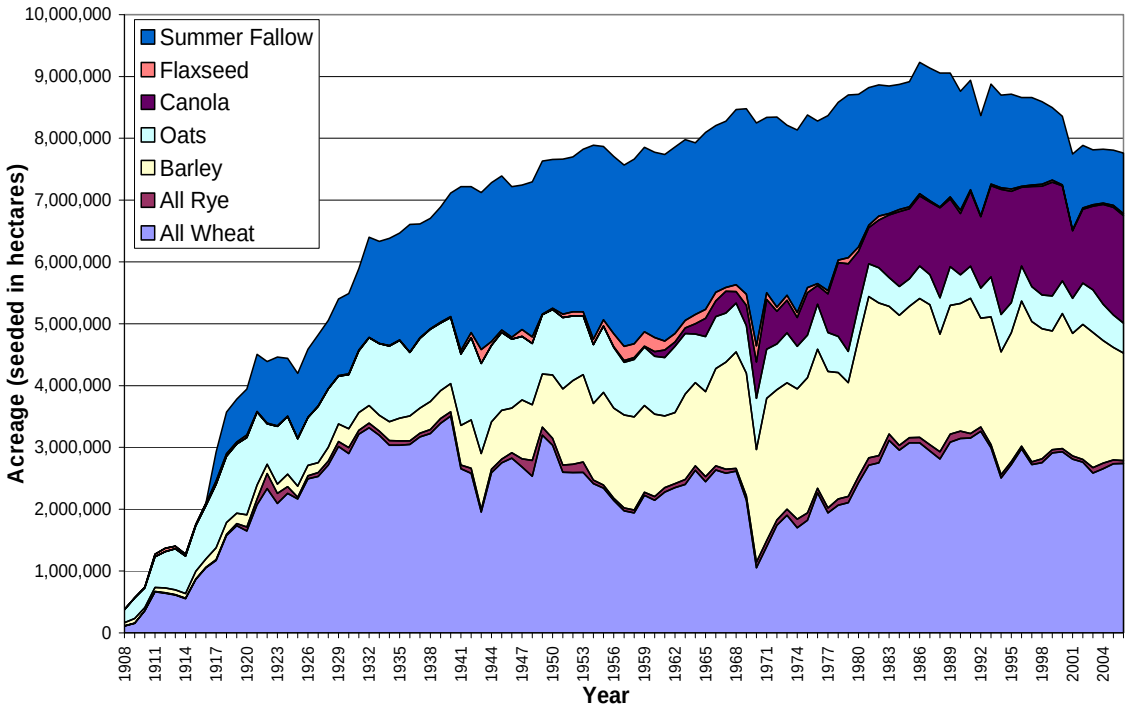

Figure 11: Crop Yields in Alberta (1908-2006)

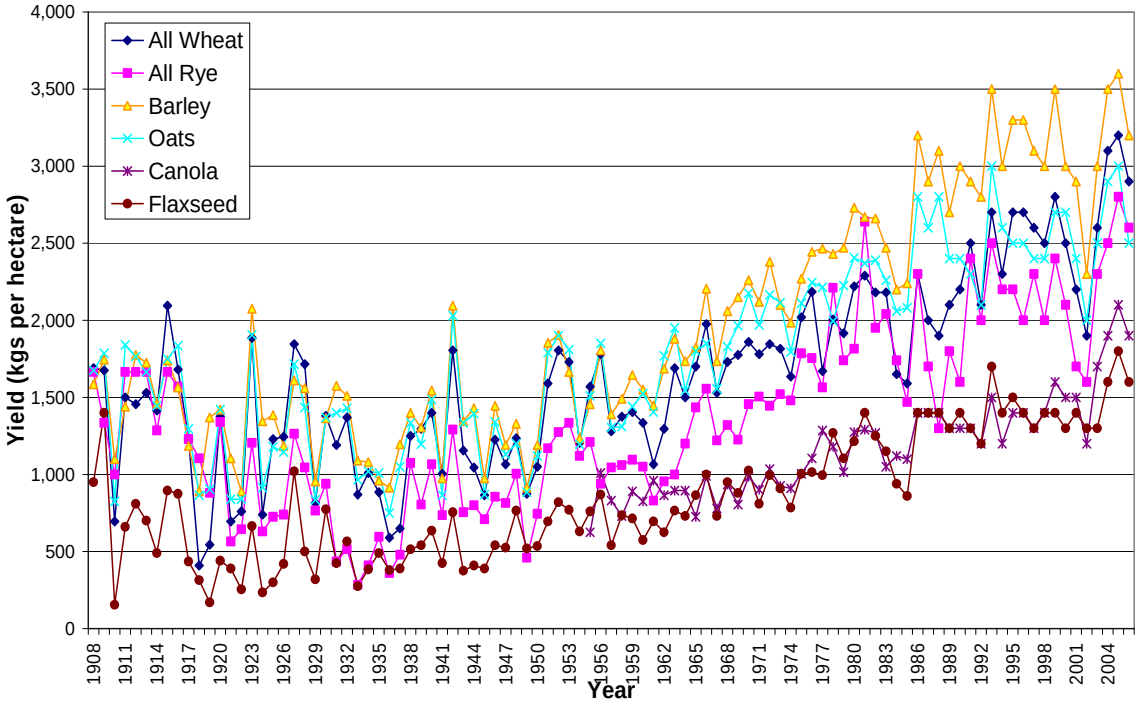

Figure 12: Real Prices of Crops in Alberta (1908-2006) Base Year 2005

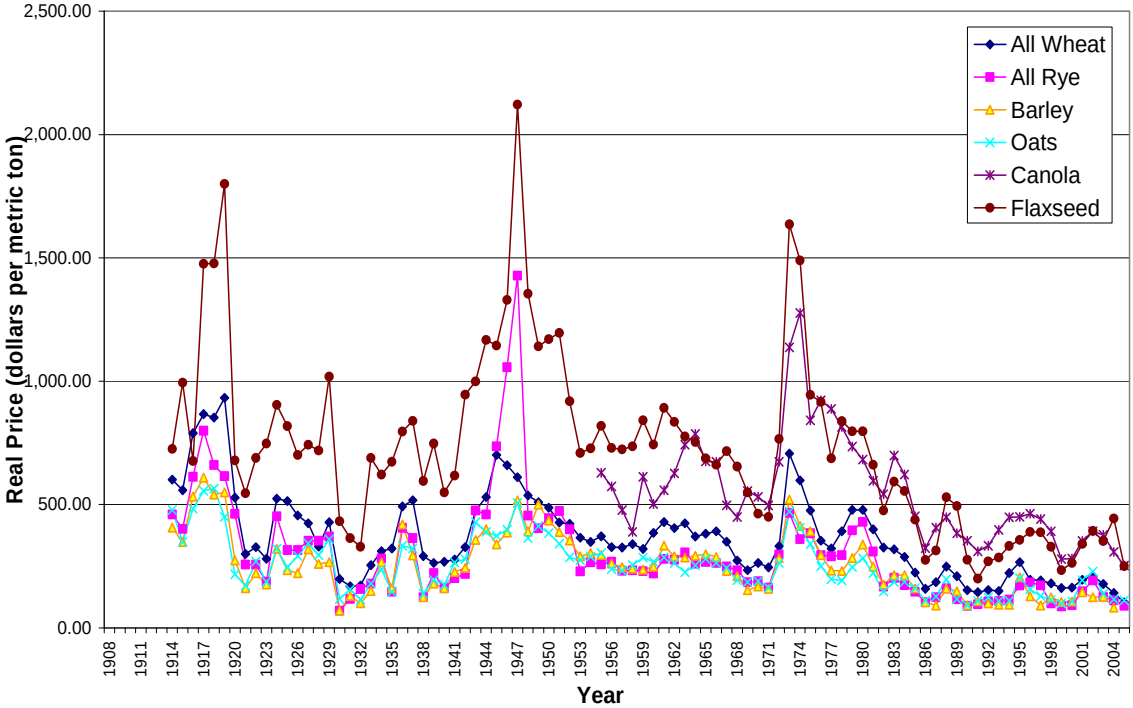

Figure 13: Line Chart of British Columbia Crop Acres (1908-2006)

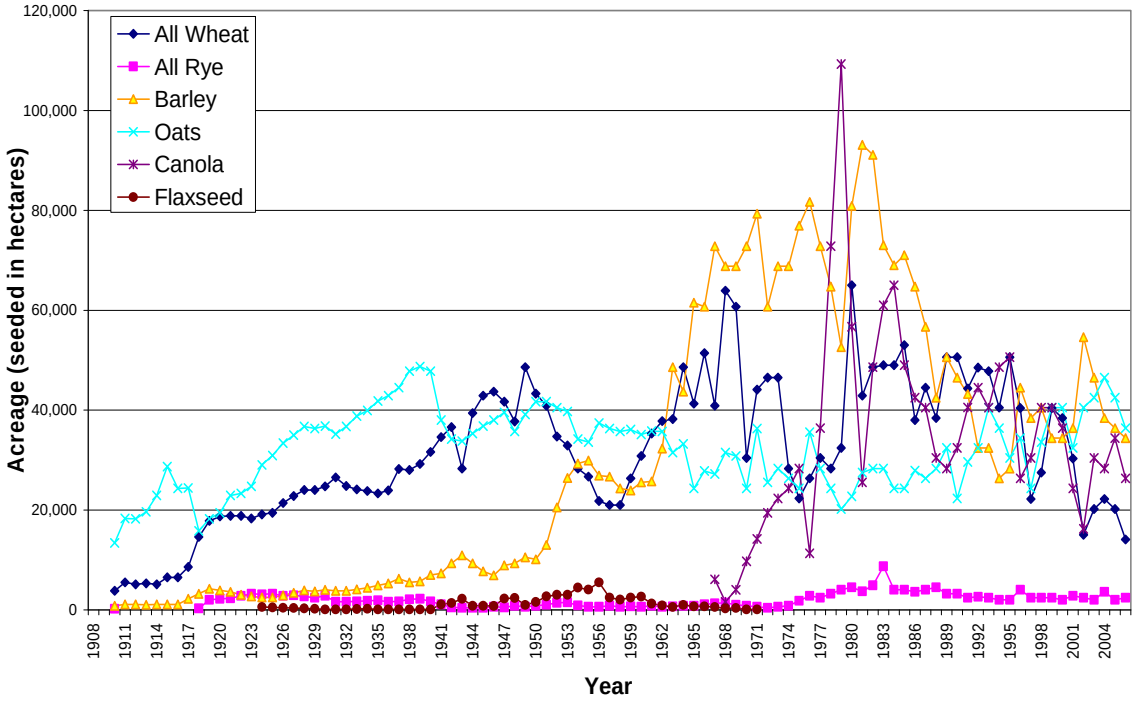

Figure 14: Stacked Area Chart of British Columbia Crop Acres (1908-2006)

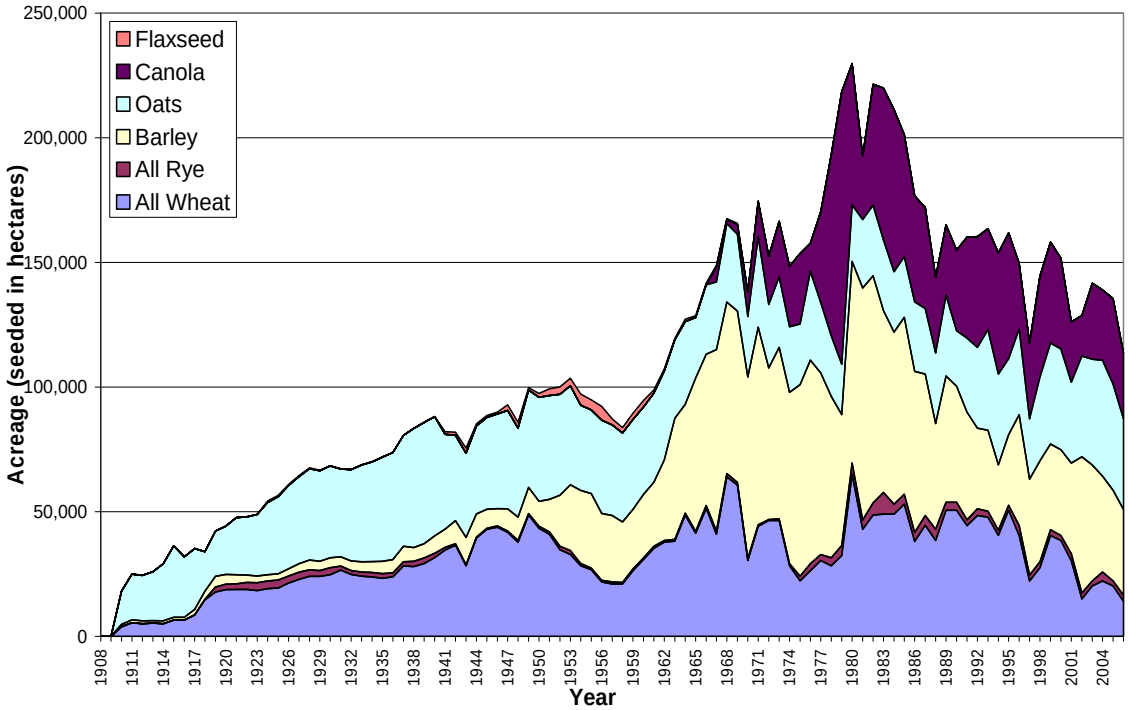

Figure 15: Crop Yields in British Columbia (1908-2006)

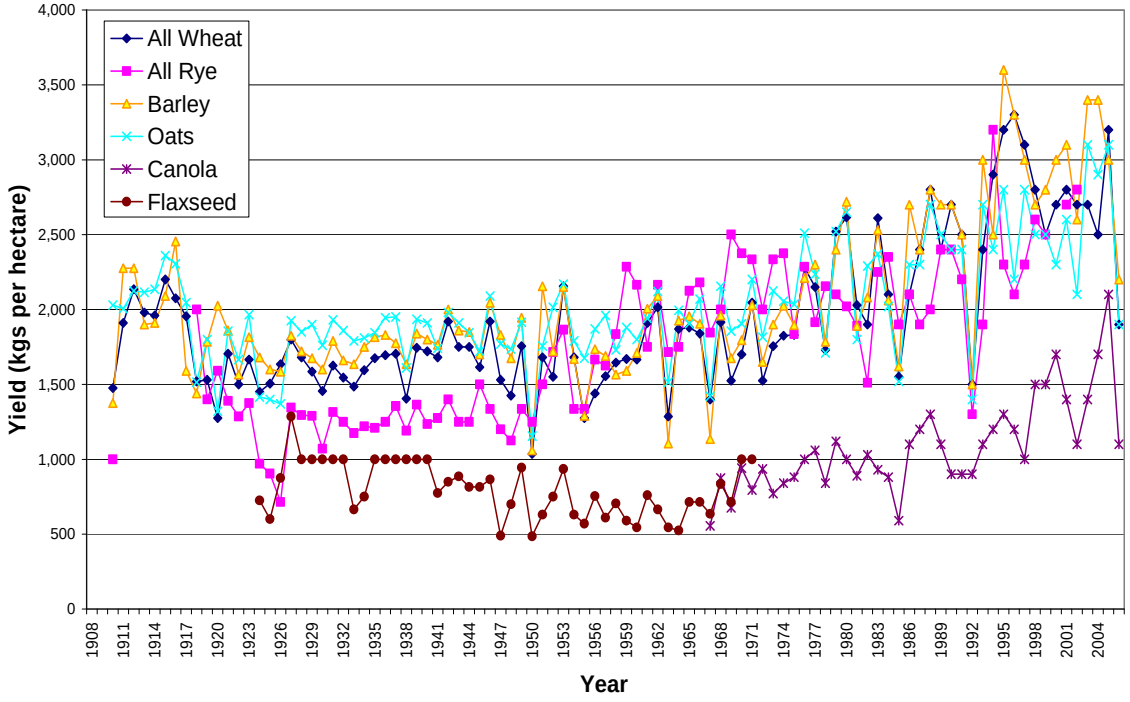

Figure 16: Real Prices of Crops in British Columbia (1908-2006) Base Year 2005

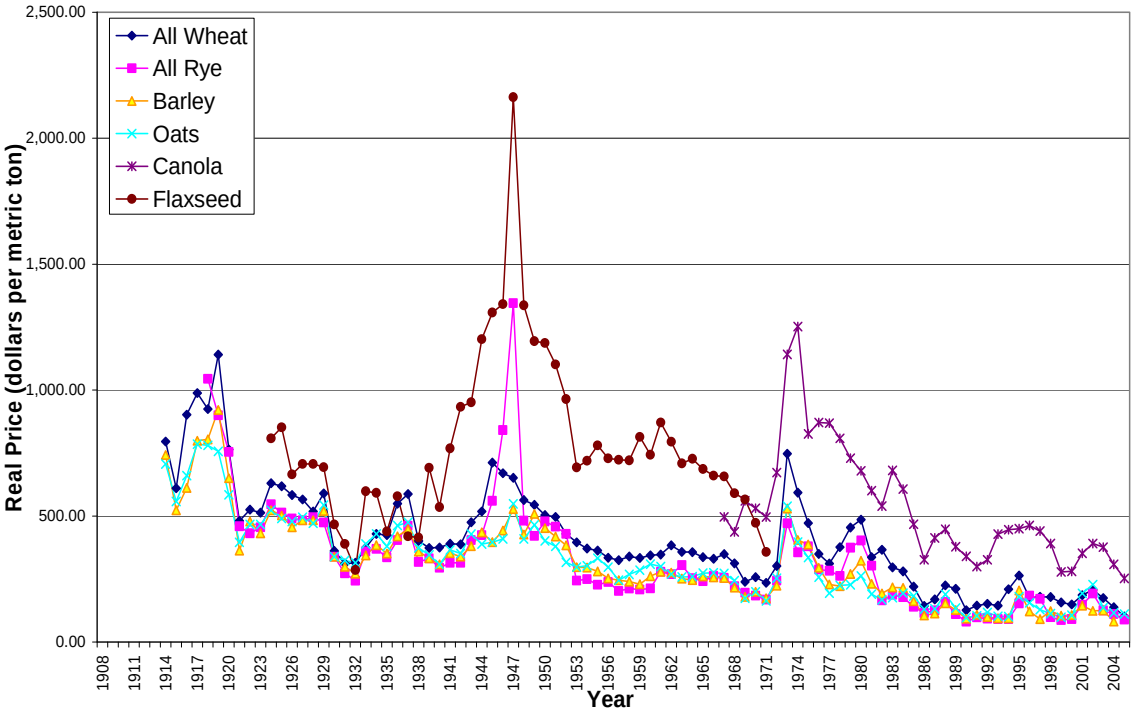

Figure 17: Line Chart of Crop Acres in Western Canada (1908-2006)

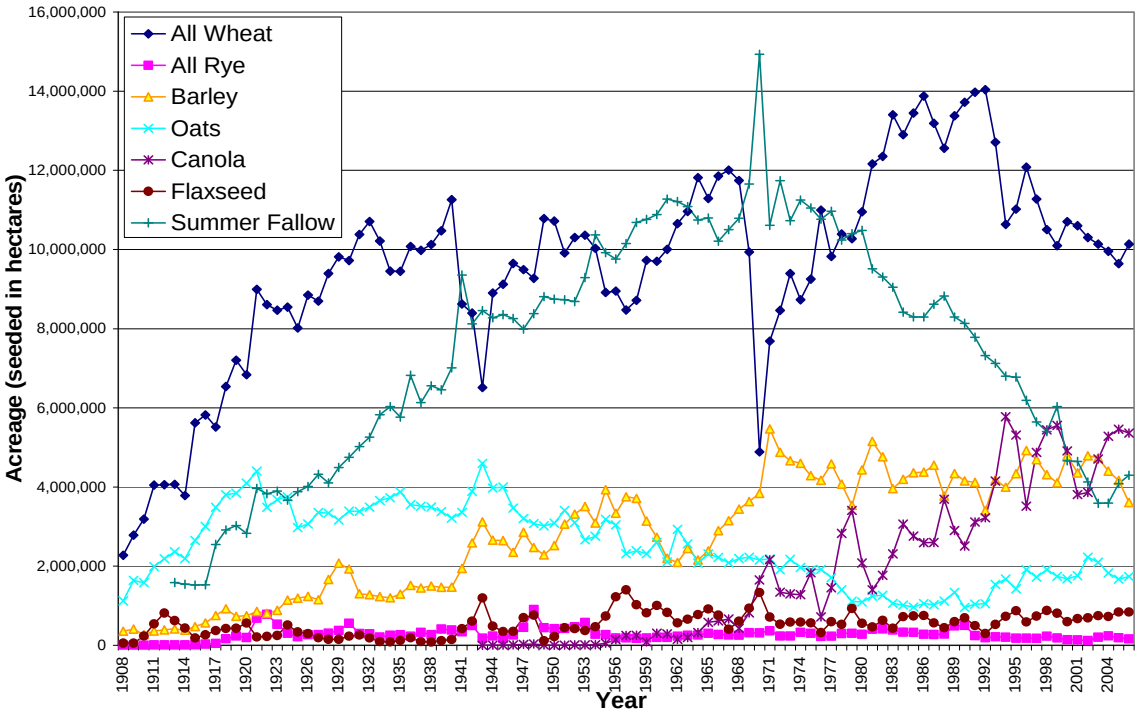

Figure 18: Stacked Area Chart of Crop Acres in Western Canada (1908-2006)

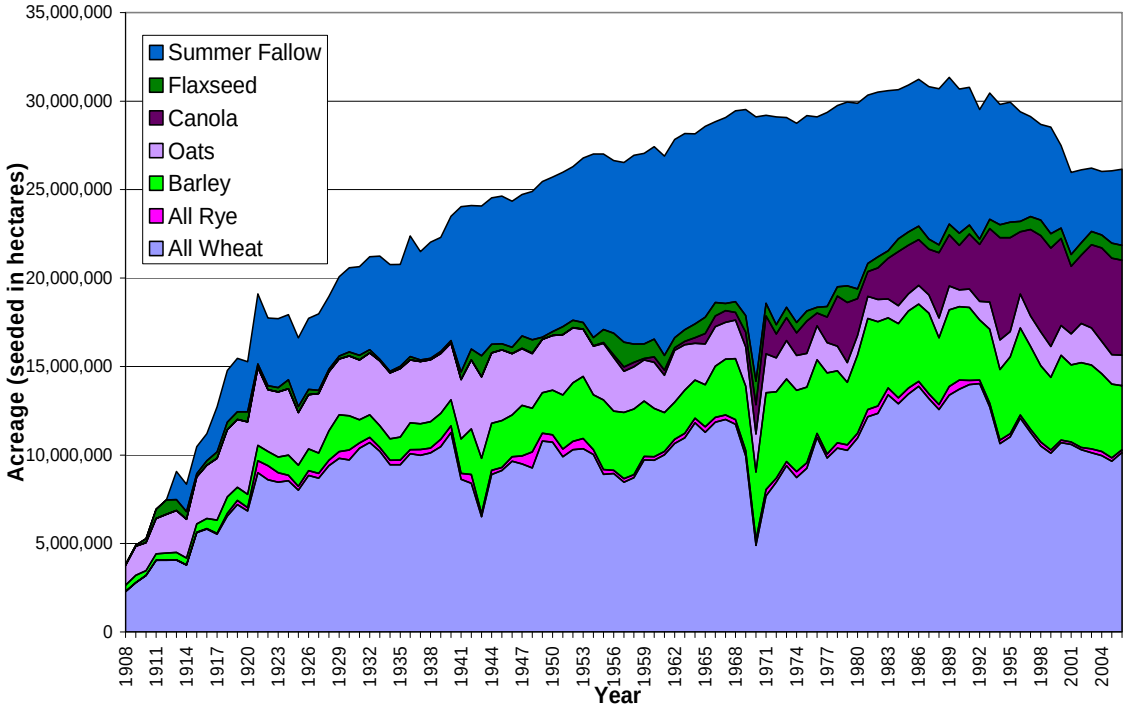

Figure 19: Yields of All Wheat (1908-2006)

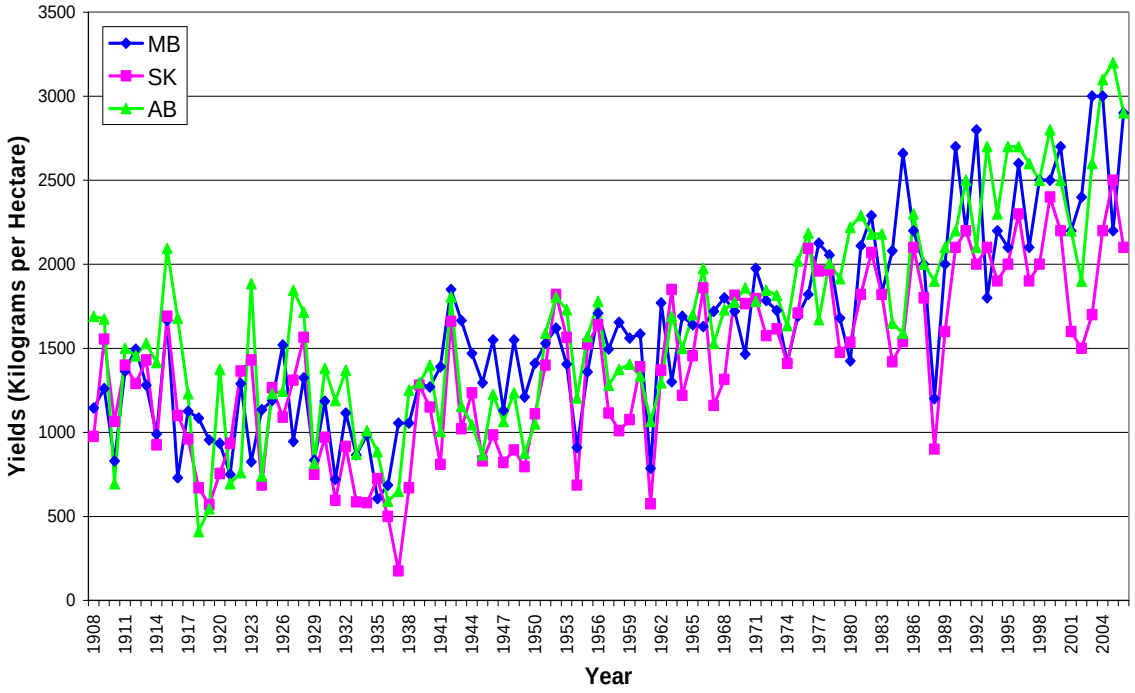

Figure 20: Wheat Acreage in Manitoba (1908-2006)

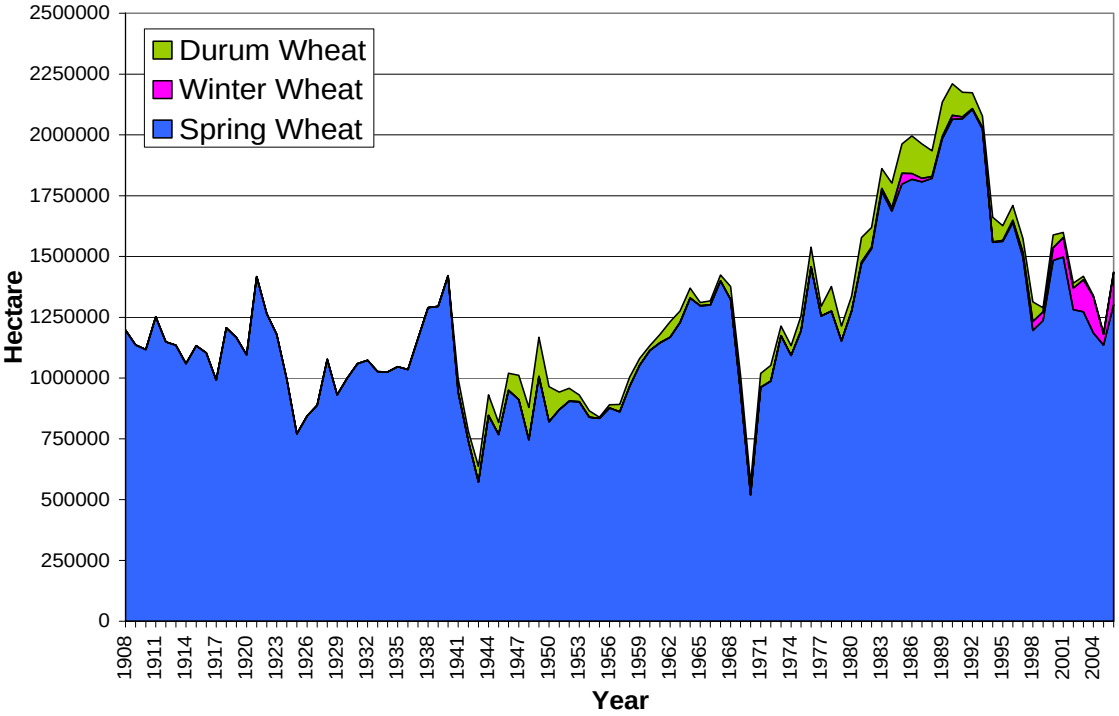

Figure 21: Wheat Acreage in Saskatchewan (1908-2006)

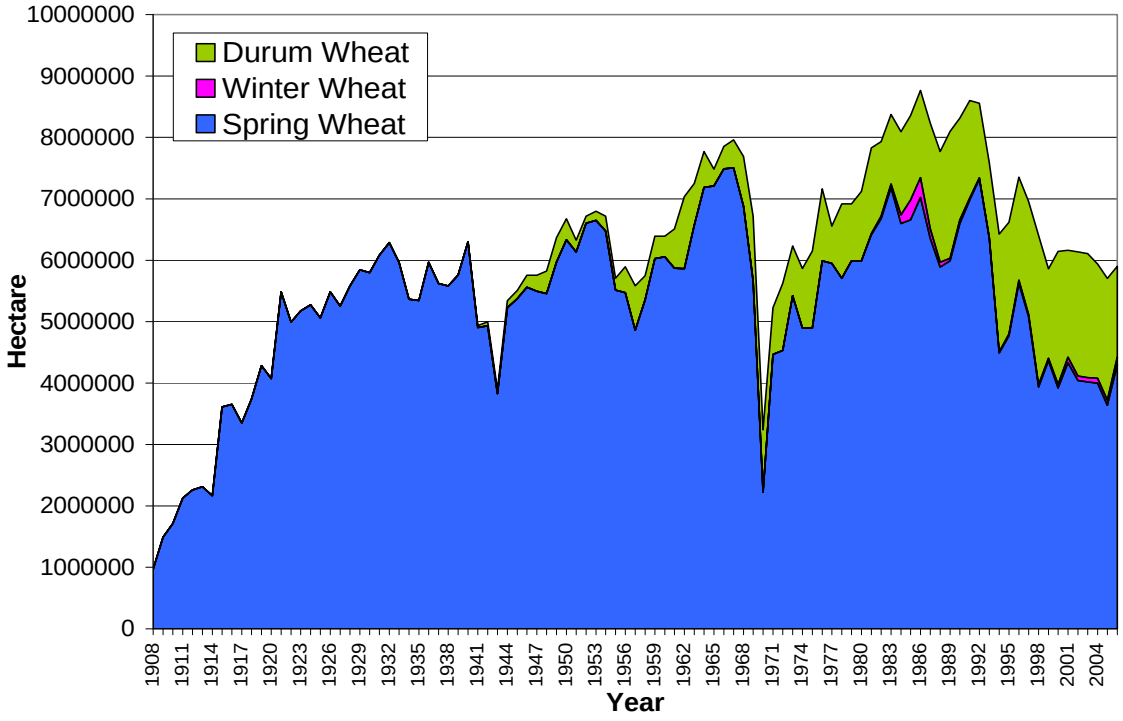

Figure 22: Wheat Acreage in Alberta (1908-2006)

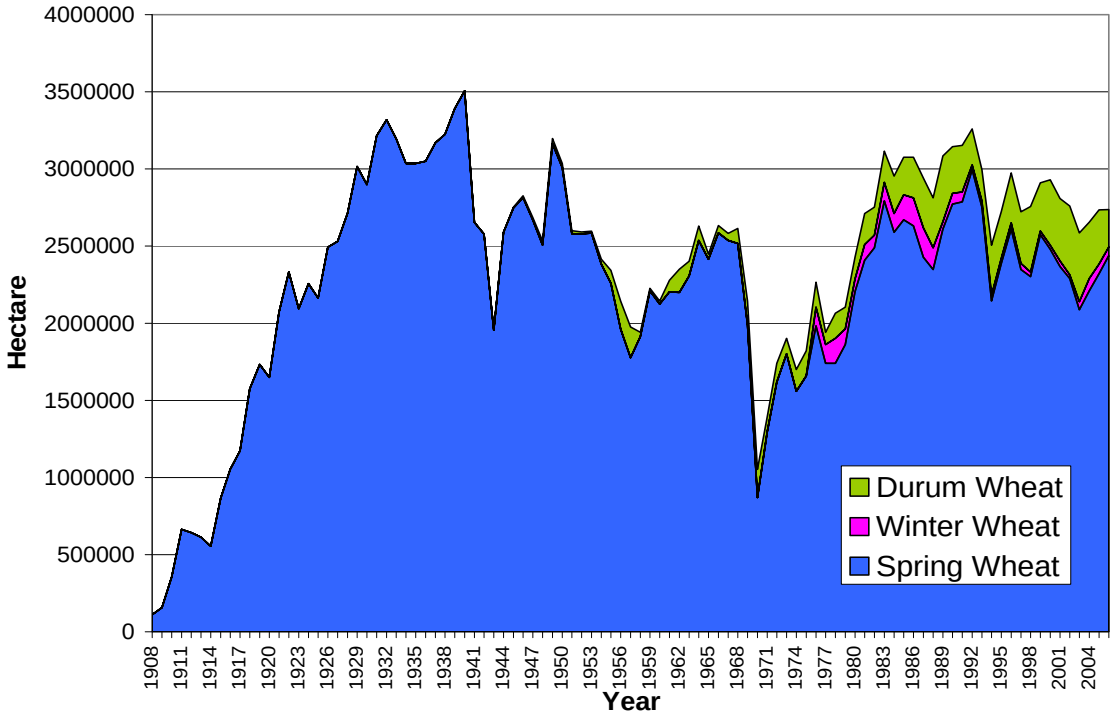

Figure 23: Wheat Acreage in Western Canada (1908-2006)

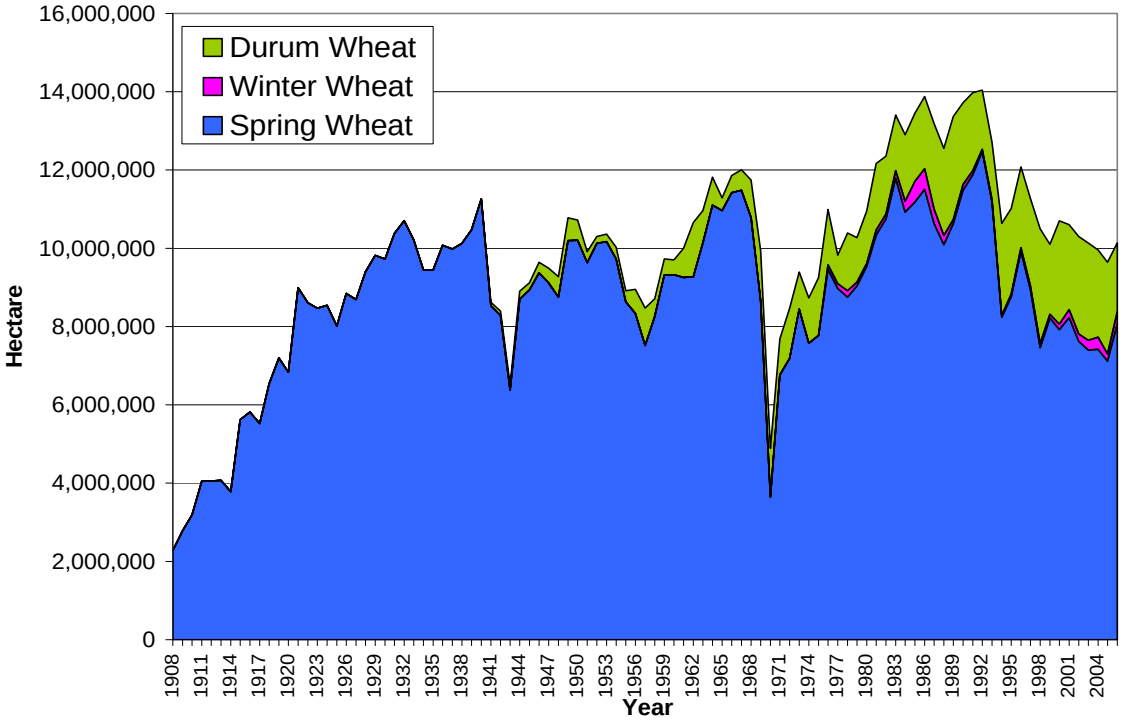

Figure 24: Winter Wheat Yields vs. Spring Wheat Yields in Manitoba (1981-2006)

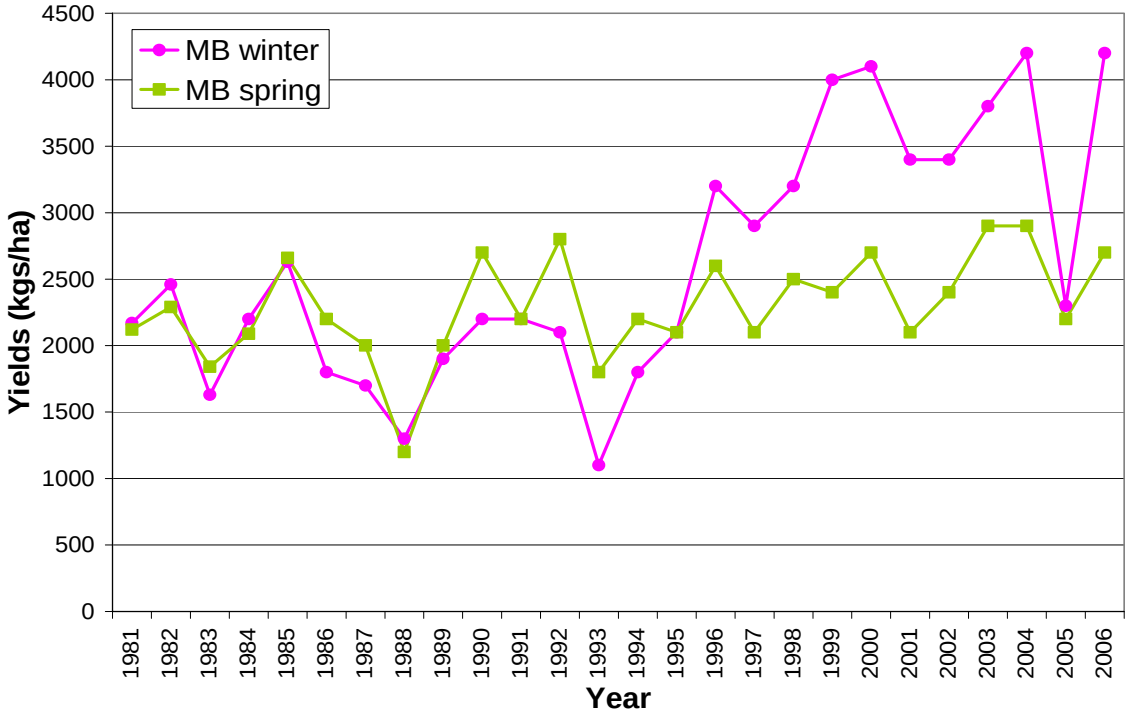

Figure 25: Winter Wheat Yields vs. Spring Wheat Yields in Saskatchewan (1981-2006)

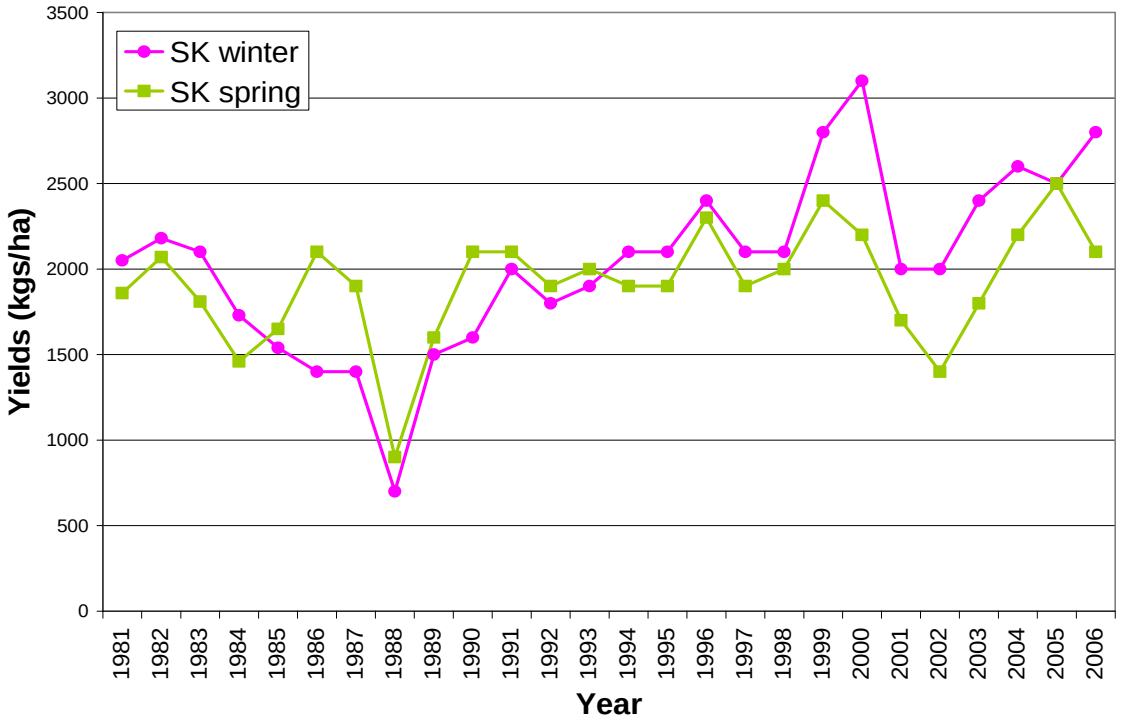

Figure 26: Winter Wheat Yields vs. Spring Wheat Yields in Alberta (1981-2006)