RURAL ECONOMY

An Historical Overview of Crop Acres in Western Canada: A Graphical and Statistical Approach

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Staff Paper 98-08

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Introduction

The purpose of this study is to examine acreage, yields, and average farm prices for different cereal crops in the Western Prairie Region of Canada and to summarize trends. The crop groups considered in this study are all wheat (including durum, spring and winter wheat), oats, barley, all rye, flaxseed, canola, specialty crops and summer fallow. Specialty crops are further broken down into tame hay, mixed grains, dry peas, fodder corn, lentils, sunflower seed and mustard seed.

Province wide trends in total area as well as crop proportions are observed independently for Manitoba, Saskatchewan, Alberta and British Columbia (High Prairie focus). Major crops are compared throughout the four regions to evaluate which regions are the major producers of any given crop throughout the study period.

Historical per hectare crop yields for the major crops are examined, recognizing overall trends, as well as high and low points where either weather or technological innovation may be the causal agent. Crops will be compared concerning their different levels of yields and how they change over time with respect to one another.

This study also looks at trends in farm gate crop prices with consideration given to inflation (real 1997 dollars) and nominal prices. Historical prices of major field crops are compared and differences in trends between crops are identified for Alberta. Relative risk is assessed for all wheat, oats, barley, all rye, flaxseed and canola in Manitoba, Saskatchewan, Alberta and British Columbia when available. By comparing coefficients of variation, relative risk is also assessed.

Acreage response functions are then derived using variables such as price, last year's summer fallow area, last year's crop area, etc. and used to forecast crop area. A

function has been derived for each major crop in each Prairie Province with consideration to seemingly unrelated regressions. These regressions will provide statistical support for trends observed from graphs.

Data Description

All of the area, production and yield statistics for this study were collected from Statistics Canada's electronic database CANSIM. The source for the electronic CANSIM database was Statistics Canada publication SDDS 3401 STC (22-002). The majority of farm price information was also collected from CANSIM database with the exception of 1985 to the present, which was extracted from the Canadian Grains Industry, Statistical Handbook (1994 & 1997).

Crop year refers to the period August 1 to July 31. Therefore, a year reference, such as 1990, refers to the crop year beginning in that year (August 1, 1990 to July 31, 1991).

The area data collected represent seeded hectares of a given crop in the specified province and most data sets cover the crop years from 1908 to the present with a forecast for 1998 based on the most recent data. Not all of the desired data sets were complete with values from 1908 to 1998. For some specialty crops (i.e., lentils, fodder corn, mustard seed), data were not available as early as 1908. Even though these crops carry a relatively small weight, it is unknown exactly how these specialty crops behaved in these years so one should be careful in making conclusions about specialty crops throughout this early period. Area data for some specialty crops (i.e., fodder corn, mixed grains and tame hay) did not include a 1998 forecast. Data for crop year 1998, for simplicity, were projected to be the same as in 1997 for these specialty crops.

Yield data, as given by the CANSIM database, represent the total reported production for a particular crop divided by the total number of seeded hectares in a given crop year. Yield is reported in kilograms per hectare. Yield, production and average farm price data sets were lacking in the same places as the area data sets.

Average farm price in the CANSIM database was calculated as the total reported income from a particular crop divided by the total reported production of that crop in a given crop year. The CANSIM database only had average farm gate prices up to 1984. For 1985 to the present, prices were extracted and calculated from data in the Canadian Grains Industry, Statistical Handbook (1994 & 1997). Oats, all rye, flaxseed and canola prices were extracted directly, as weighted averages were provided. All wheat and barley prices were calculated by averaging payments to producers and Winnipeg Commodity Exchange cash grain prices.

Real prices were then created by converting the nominal prices to base year 1997 using the annual Consumer Price Index (CPI) as found in the CANSIM database. The CPI used was a general one for all products in Canada.

Analysis

Crop Area

Manitoba Crop Area (Figures 1a & 1b)

The total field crop area in Manitoba shows an increasing trend over the study period from 2,500,000 hectares in 1913 to 4,800,000 hectares in 1998. All wheat is the major crop for the majority of the study period with the exception of summer fallow in crop years 1941 to 1963 and 1969 to 1973. Summer fallow shows a dramatic decrease in area following 1970 from 1,600,000 hectares in 1970 to 200,000 hectares in 1998.

During this same period, all wheat increases dramatically from 570,000 hectares in 1970 to a high of 2,210,000 hectares in 1990 and then decreases to 1,311,000 hectares by 1998. The extra area created by the great decrease in all wheat in the 1970 crop year was taken up by increased summer fallow area. The year 1970 coincided with government programs designed to decrease wheat acres.

Canola has increased with a large year to year variation in area to a high of 1,032,000 hectares in 1998, making it the second most important crop in Manitoba in 1998, in terms of area (second to all wheat). Oats remain relatively stable at about 700,000 hectares (with some variation) until 1970 at which time the area in oats production begins to decrease reaching a low of 145,000 hectares in 1990 with a slight increase back to 445,000 hectares in 1998. Barley area, having a low of 201,000 hectares in 1964 and a high of 957,000 hectares in 1953, has varied in its contribution to the province's field crop area, from being the second largest contributor to the second smallest contributor. Specialty crops have continually increased between 1913 to 1998, ending in 915,000 hectares in 1998, representing the third largest area.

Saskatchewan Crop Area (Figures 2a & 2b)

The total field crop area in Saskatchewan shows an increasing trend from 5,200,000 hectares in 1913 to 18,500,000 hectares in 1998. All wheat is the major crop for the majority of the study period with the exception of summer fallow in crop years 1941, 1955 to 1961 and 1969 to 1978. In 1970, Saskatchewan also experienced a dramatic dip in the area of all wheat production and a dramatic increase in summer fallow area. Summer fallow after this increase in 1970 shows a dramatic decrease in area from 9,712,000 hectares to 3,946,000 hectares in 1998. All wheat, following the low point in

1970, increases over the next few crop years to 8,765,000 hectares in 1985 and then begins to decrease back down to an area of 6,252,000 hectares in 1998.

Canola increases in area in Saskatchewan after its introduction in 1943 to a high of 2,671,000 hectares in 1994. Canola's increase accelerated into the 1970's and again into the 1980's and 1990's. Area of oats in production decreased from 1913 to 1998 with much of the 1920's, 1930's and 1940's areas close to 2,000,000 hectares and the 1960's to the present areas close to 750,000 hectares. Barley has been increasing in area in Saskatchewan starting at a low of 134,000 hectares in 1913, with a high point in 1971 of 2,255,000 hectares and ending up at 1,821,000 hectares in 1998. Specialty crops have been constantly increasing since the 1930's, when they had a relatively insignificant portion of the area, to 1998 when they are produced in an area of 2,517,000 hectares, the third largest crop area.

Alberta Crop Area (Figures 3a & 3b)

As in Saskatchewan and Manitoba the total field crop area in Alberta shows an increasing trend from 1913 to 1998 with a total increase of about 10,000,000 hectares throughout this period. All wheat is the major crop for the majority of the study period with the exception crop years 1943 and 1953 to 1980 where summer fallow uses the most area. Summer fallow in Alberta, as in Saskatchewan and Manitoba, had a generally increasing trend until 1970 where it peaks, in this case at a high of 3,602,000 hectares and then begins to fall decreasing until 1,336,000 hectares in 1998. All wheat has its highest period in the 1930's, with approximately 3,250,000 hectares of production. Wheat production then decreases to around 2,750,000 hectares through the 1940's and even

lower in the 1950's and 1960's. In 1970 all wheat decreases to 1,052,000 hectares and slowly increases to a high of 3,115,000 hectares in 1983 before leveling off.

Canola, from its introduction in 1943, increases in area. As all wheat is low during the 1970's canola increases in area rapidly with significant year to year variation. Canola, with a high of 2,023,000 hectares in 1994, is now the fourth-largest crop in Alberta (next to all wheat, specialty crops and barley). Oats has a decreasing trend from 1943 at 1,457,000 hectares to today at 587,000 hectares. Barley has an increasing trend from 1913 to 1998. Barley increased in the 1940's from an area less than 500,000 hectares to an area close to 1,500,000 hectares in the early 1950's and again increased through the 1970's. In the 1970's and the 1980's barley crop area appears to fluctuate opposite to canola. Barley with an area of 2,266,000 hectares in 1998 is the third largest crop in Alberta. Specialty crops with a steady increase from 71,200 hectares in 1913 to 2,624,300 hectares in 1994 followed by a slight decrease to 2,365,500 hectares in 1998 are now the second largest group of crops in Alberta. Recall that tame hay is included in this category.

British Columbia Crop Area (Figures 4a & 4b)

The total area of field crops in British Columbia increased from the period of 1913 to 1998. Specialty crops are the major group of crops throughout the entire study period. The increase in total crop area is largely due to the increase in specialty crops. They increase from a low of 54,000 hectares in 1918 to a high of 380,000 hectares in 1998. The overwhelming majority of this 'specialty crops' category is tamed hay, as depicted in Figure 6. All other specialty crops have relatively small production areas.

Canada Crop Area (Figures 5a & 5b)

Canada shows an increase in total crop area devoted to the crops discussed above over time, from 15,000,000 hectares of production in 1913 to an area of 37,500,000 hectares in 1998. The proportions of the individual crops within Canada act much the same as discussed for Alberta and Saskatchewan with the exception of a much greater proportion of the total area being for specialty crops. These crops, which are considered specialty crops in western Canada, are relatively more important in eastern Canada.

Specialty Crops Area (Figure 6)

Specialty crops in the western prairie region of Canada consist mostly of tame hay. Tame hay was included with specialty crops to simplify the graphs discussed above. Making-up more than ninety percent of all of the specialty crop area, the increase in tame hay is the major reason for the increase in specialty crops from 200,000 hectares in 1908 to 6,200,000 hectares in 1998.

All Wheat Area (Figure 7)

Saskatchewan has had the most area invested in all wheat production throughout the period from 1908 to 1998 with the exception of the crop year 1908 where Manitoba was the major producer. Manitoba remains relatively constant over the study period with only a slight increase over the entire period while following, on a smaller scale, the decreases and increases with the other provinces. There is a trend of growth from 1908 to 1940 where we see the start of a decrease in area, hitting a low of 3,894,000 hectares, 1,954,000 hectares and 637,000 hectares in 1943 in Saskatchewan, Alberta and Manitoba respectively. This is followed by more growth until the late 1960's where we see a great decrease in all wheat area, with a decrease of 4,700,000 hectares, 1,600,000 hectares and

900,000 hectares for Saskatchewan, Alberta and Manitoba respectively. The area in all wheat production for all provinces then increases through the 1970's and 1980's.

Oats Area (Figure 8)

Saskatchewan was the major producer of oats up until about 1957. At this time its area drops, decreasing from a large area of 2,477,000 hectares in 1943 to an area closer to that of Alberta and Manitoba of about 750,000 hectares in the 1960's and 1970's. Annual production for all three provinces was below 500,000 hectares during parts of the 1980's. A small increase is then seen into the 1990's. Over all, the trend for area in oats production is decreasing.

Barley Area (Figure 9)

The over all trend for barley is increasing with large year to year variability. Throughout the latter half of the study period, Alberta leads the way with the most area in barley production, upwards of 2,000,000 hectares into the 1970's through to the present. Manitoba, with under 1,000,000 hectares in barley production, devotes the smallest area to barley crops relative to the other prairie provinces.

Canola Area (Figure 10)

The over all trend is an increasing one with an accelerated increase into the 1970's and an even faster increase into the 1980's and 1990's. Canola, similar to barley, has large year to year variability. Saskatchewan and Alberta have comparable areas throughout the study period. Saskatchewan placed 730,000 more hectares in canola production than did Alberta in 1998. Manitoba devotes the smallest area to canola production and had 1,032,000 canola hectares in 1998.

Summer Fallow Area (Figure 11)

Summer fallow in all three Prairie Provinces increases from 1913 to 1970 when it then begins to decrease. Saskatchewan has the most area in summer fallow in any given year with Alberta having the second most. The two relatively significant increases in summer fallow area are in 1941 and 1970. In 1970 summer fallow areas peak at 9,712,000 hectares, 3,602,000 hectares and 1,619,000 hectares for Saskatchewan, Alberta and Manitoba respectively. Summer fallow areas then decrease back down to an area in 1998 of 3,946,000 hectares, 1,336,000 hectares and 202,000 hectares for Saskatchewan, Alberta and Manitoba respectively.

Acreage Response Functions

Simple acreage response functions were evaluated to determine the most important factors that influence changes in various crop acres. Variables such as area of crop x, price of crop x, price and area of other significant crops, area of summer fallow, and a time trend variable were used. All of these variables, with the exception of the time trend variable, were last year's data relative to the year of predicted area. Shazam was used to run a series of regressions supplying an output of coefficients, standard errors and t-ratios in its simplest form. Shazam was further used to run a seemingly unrelated regressions (SUR) test on the twelve regressions, with the expectation of improved (increased accuracy) output values.

The system method of regression analysis, which involves seemingly unrelated regressions, is found beneficial with a chi-squared test. The chi-squared value of 1161.1 is higher than the values required to reject the hypothesis that the covariances are equal to zero.

Therefore, we see an increase in accuracy when running these twelve regressions using a systems approach. All areas are entered as unscaled hectares and all prices in real 1997 Canadian dollars per tonne. The `Time Trend` variable, included to statistically assess the impact of time, is the year of predicted area minus 1914. For example if you were predicting the area of all wheat in Manitoba for crop year 1999, the `Time Trend` variable would be equal to 85. The beginning data point for each crop is 1914 and therefore this is used as year 1 of the `Time Trend` variables.

Manitoba Acreage Response Functions

Table 1: Acreage Response Function for All Wheat in Manitoba
R-SQUARE = 0.8613

MANITOBA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years All Wheat Price ($ / tonnes)	998.4	253.8	3.934
Last Years All Wheat Area (hectares)	0.84	0.0417	20.25
Last Years Barley Price ($ / tonnes)	-561.78	356.1	-1.577
Time Trend	2976.1	1138	2.615
Last Years Flaxseed Price ($ / tonnes)	-211.61	93.95	-2.252
Last Years Canola Area (hectares)	0	0.1055	-0.034
Constant	12103	85320	0.142

Four of the six variables used in the Manitoba acreage response for wheat were statistically significant. The first two variables that affect wheat area are last years wheat price and last years wheat area. Both of these variables have a positive significance. This means that if wheat area in one year is high then wheat area in the next is also expected to be high. Likewise for the wheat price, if price is high in one year crop producers may devote more area to wheat the next year. The next variable that shows significance is the time trend. Throughout the study period the general trend is an increase in all wheat area over time, and confirms the results discussed above from Figure 1a and 1b. The last variable which shows significance is that of last year's

flaxseed price (used as a representative price for oil seed crops). This variable shows a negative relationship with all wheat area. Farmers may change their land base to oilseed crops and away from wheat when oilseed prices are high.

As an example of how to use this acreage response function, we can use it to predict the acreage of all wheat in Manitoba for the 1997 / 1998 crop year. Given the following facts:

1996/97 all wheat price = $174 / tonne
1996/97 all wheat area = 1,709,700 hectares
1996/97 barley price = $141 / tonne
1996/97 Flaxseed price = $302 / tonne
1996/97 Canola area = 635,400 hectares
Time Trend = 83

The acreage of all wheat in Manitoba in 1997 is predicted to be:

All wheat area 1997/98 = (998.4*174)+(0.84*1709700)+(-561.78*141)+(2976.1*83)+
(-211.61*302)+(0*635400)+12103
= 1,725,872 hectares

This estimation contains about ten percent error as the true area for all wheat in Manitoba, as recorded by Statistics Canada, for the crop year 1997/98 is 1,574,200 hectares.

Table 2: Acreage Response Function for Barley in Manitoba
R-SQUARE = 0.7771

MANITOBA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Barley Area (hectares)	0.8	0.0497	16.16
Last Years Barley Price ($ / tonnes)	645.03	302.4	2.133
Last Years All Wheat Area (hectares)	-0.06	0.037	-1.672
Last Years All Wheat Price ($ / tonnes)	-170.8	189	-0.904
Time Trend	-798.92	813.6	-0.982
Last Years Flaxseed Price ($ / tonnes)	-99.79	71.72	-1.391
Last Years Canola Area (hectares)	0.15	0.0752	1.979
Last Years Oats Price ($ / tonnes)	-192.87	335.6	-0.575
Constant	227100	73860	3.075

Three variables are significantly related to barley area in Manitoba (Table 2). Last year's barley area and price are positively related to barley area. Last year's canola area is positively related to barley area. This relationship with canola area could represent a crop rotation where barley crops follow canola crops.

Table 3: Acreage Response Function for Oats in Manitoba
R-SQUARE = 0.8846

MANITOBA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Oats Area (hectares)	0.86	0.0627	13.79
Last Years Oats Price ($ / tonnes)	101.23	190.4	0.532
Last Years All Wheat Price ($ / tonnes)	24.11	120.5	0.2
Time Trend	-632.86	534.4	-1.184
Last Years Flaxseed Price ($ / tonnes)	-13.98	48.5	-0.288
Last Years Summer Fallow Area (hectares)	0.03	0.0277	1.243
Constant	44865	51430	0.872

As seen in Table 3, only one variable was found significant in predicting oats area in Manitoba, and that is last year's oats area.

Table 4: Acreage Response Function for Canola in Manitoba
R-SQUARE = 0.8977

MANITOBA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Canola Area (hectares)	0.61	0.055	11.1
Last Years Canola Price ($ / tonnes)	-2.81	22.13	-0.127
Time Trend	3309.3	704.9	4.695
Last Years All Wheat Price ($ / tonnes)	58.42	105.7	0.553
Last Years All Wheat Area (hectares)	-0.02	0.0202	-1.157
Last Years Summer Fallow Area (hectares)	-0.09	0.0289	-2.996
Last Years Barley Price ($ / tonnes)	-199.27	143.5	-1.388
Constant	51725	49150	1.052

Table 4 shows the output for the acreage response function for canola in Manitoba. There are three significant variables. Both last year's canola area and time trend show a positive relationship. This positive time trend relationship confirms our earlier observations about an increasing canola area. Last year's summer fallow is the

other significant variable and shows a negative relationship. Therefore, a crop year following a crop year with lots of summer fallow area will show a decreased amount of canola area if all other things remain equal. This could be due to cereal crops being more likely to be grown following a year of summer fallow.

Alberta Acreage Response Functions

Table 5: Acreage Response Function for All Wheat in Alberta
R-SQUARE =0.8039

ALBERTA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years All Wheat Price ($ / tonnes)	755.94	474	1.595
Last Years All Wheat Area (hectares)	0.91	0.0316	28.87
Last Years Barley Price ($ / tonnes)	-464.09	661.2	-0.702
Time Trend	-3095.4	2222	-1.393
Last Years Flaxseed Price ($ / tonnes)	-107.92	152.6	-0.707
Last Years Canola Area (hectares)	0.19	0.0924	2.044
Constant	236840	157600	1.503

Alberta's last year's wheat area shows a significant positive relationship with this year's wheat area (Table 5). The other variable, which shows a significant relationship, is that of last year's canola area. Canola area shows a positive relationship possibly representing a typical rotation of canola followed by wheat.

Table 6: Acreage Response Function for Barley in Alberta
R-SQUARE = 0.9703

ALBERTA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Barley Area (hectares)	0.7	0.0625	11.13
Last Years Barley Price ($ / tonnes)	767.31	506.2	1.516
Last Years All Wheat Area (hectares)	-0.08	0.0275	-2.782
Last Years All Wheat Price ($ / tonnes)	-190.23	279.5	-0.681
Time Trend	10430	2634	3.96
Last Years Flaxseed Price ($ / tonnes)	-31.98	89.9	-0.356
Last Years Canola Area (hectares)	-0.02	0.0548	-0.372
Last Years Oats Price ($ / tonnes)	-301.92	486.4	-0.621
Constant	117440	103500	1.135

In Alberta barley area shows a significant positive relationship with last year's barley area and a time trend variable (Table 6). This statistically supports our observations of an increasing barley area in Alberta. We also see a negative significant relationship with last year's all wheat area.

Table 7: Acreage Response Function for Oats in Alberta
R-SQUARE = 0.8331

ALBERTA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Oats Area (hectares)	0.6	0.0634	9.394
Last Years Oats Price ($ / tonnes)	581.79	292.8	1.987
Last Years All Wheat Price ($ / tonnes)	-215.78	192.4	-1.121
Time Trend	-4578.6	971.4	-4.713
Last Years Flaxseed Price ($ / tonnes)	-73.4	75.49	-0.972
Last Years Summer Fallow Area (hectares)	0.07	0.0217	3.279
Constant	388770	81880	4.748

As seen in Table 7, both last year's oats area and price are significantly positively related to this year's oats area. We can also see a positive relationship with last year's summer fallow area possibly suggesting a rotation involving summer fallow and oats. In support of earlier observations, we see a significant negative relationship with the time trend variable implying a decreasing oats area in Alberta over time.

Table 8: Acreage Response Function for Canola in Alberta
R-SQUARE = 0.9142

ALBERTA VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Canola Area (hectares)	0.6	0.0548	11.03
Last Years Canola Price ($ / tonnes)	43.71	47.18	0.926
Time Trend	8108.4	1648	4.921
Last Years All Wheat Price ($ / tonnes)	150.19	231.8	0.648
Last Years All Wheat Area (hectares)	0	0.0154	-0.215
Last Years Summer Fallow Area (hectares)	-0.06	0.0227	-2.713
Last Years Barley Price ($ / tonnes)	-532.09	311.1	-1.71
Constant	5094.5	83110	0.061

Canola area in Alberta (Table 8), like in Manitoba, has a significant positive relationship with last year's canola area and time trend variable. In addition, there is a significantly negative relationship with last year's summer fallow area.

Saskatchewan Acreage Response Functions

Table 9: Acreage Response Function for All Wheat in Saskatchewan
R-SQUARE = 0.7786

SASKATCHEWAN VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years All Wheat Price ($ / tonnes)	1393.7	1048	1.33
Last Years All Wheat Area (hectares)	0.73	0.0695	10.57
Last Years Barley Price ($ / tonnes)	-680.59	1499	-0.454
Time Trend	15517	11310	1.372
Last Years Flaxseed Price ($ / tonnes)	-273.7	373.6	-0.733
Last Years Canola Area (hectares)	-0.1	0.2499	-0.385
Last Years Summer Fallow Area (hectares)	-0.04	0.0676	-0.563
Constant	1140500	478300	2.384

The only significant variable (Table 9) for all wheat area in Saskatchewan is last year's all wheat area and it is a positive relationship.

Table 10: Acreage Response Function for Barley in Saskatchewan
R-SQUARE = 0.8608

SASKATCHEWAN VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Barley Area (hectares)	0.69	0.062	11.17
Last Years Barley Price ($ / tonnes)	649.42	574.1	1.131
Last Years All Wheat Area (hectares)	-0.04	0.0285	-1.499
Last Years All Wheat Price ($ / tonnes)	-808.58	358.2	-2.257
Time Trend	3279.6	4526	0.725
Last Years Flaxseed Price ($ / tonnes)	-85.17	132.6	-0.642
Last Years Canola Area (hectares)	0.09	0.0883	1.001
Last Years Oats Price ($ / tonnes)	512.36	619	0.828
Last Years Summer Fallow Area (hectares)	0.02	0.0243	0.886
Constant	361650	188600	1.918

Table 10 shows that barley area in Saskatchewan is positively related to last years barley area and negatively related to last years wheat price. Thus, barley area is partially dependent on all wheat price expectations in Saskatchewan.

Table 11: Acreage Response Function for Oats in Saskatchewan
R-SQUARE = 0.9272

SASKATCHEWAN VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Oats Area (hectares)	0.71	0.0472	14.96
Last Years Oats Price ($ / tonnes)	703.89	500.7	1.406
Last Years All Wheat Price ($ / tonnes)	-465.61	307.8	-1.513
Time Trend	-6695.9	1851	-3.618
Last Years Flaxseed Price ($ / tonnes)	-16.69	129.7	-0.129
Last Years Summer Fallow Area (hectares)	-0.01	0.0172	-0.437
Constant	681140	139300	4.889

The acreage response function for oats in Saskatchewan (Table 11) simply reinforces what we have already observed about oats in Saskatchewan in Figure 8 above, which shows a decreasing oats area over time. Oats area is significantly and positively related to last year's oats area and negatively related to the time trend variable.

Table 12: Acreage Response Function for Canola in Saskatchewan
R-SQUARE = 0.8827

SASKATCHEWAN VARIABLES	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO
Last Years Canola Area (hectares)	0.68	0.0639	10.69
Last Years Canola Price ($ / tonnes)	16.79	56.52	0.297
Time Trend	7520.6	2898	2.595
Last Years All Wheat Price ($ / tonnes)	138.78	285.9	0.486
Last Years All Wheat Area (hectares)	0	0.0153	-0.063
Last Years Summer Fallow Area (hectares)	-0.02	0.0196	-0.842
Last Years Barley Price ($ / tonnes)	-622.73	400.1	-1.557
Constant	5188.8	131000	0.04

Table 12 shows two variables as being positively related to canola area in Saskatchewan. These variables are last year's canola area and the time trend variable.

This too reinforces what has been said earlier about a general increase in barley area in Saskatchewan over time.

Summary of Historical Crop Areas

There are a number of strong trends involving the production area of Western Canadian crops over time that stand out as being significant. Both area in summer fallow and area in oat production have shown a declining trend over time in Western Canada. Increased area has been devoted to the production of canola since its introduction in the 1940's. Barley area has also been increasing particularly in Alberta. The significant specialty crop that is produced in Western Canada is Tame Hay and the area devoted to it is increasing. These increases and decreases in crop area for these different crops are not simply explained as many factors are involved, including overall changes in crop technologies as well as demands.

With the calculated acreage response functions, it is evident that the last years crop area is the most important predictor of this years crop area for any given crop. Other variables were found significant indicating various crop rotations. There was evidence of a physical production constraint affecting acreages.

Crop Yield

Manitoba Crop Yield (Figure 12)

The over all trend for historical yield of major crops (all wheat, oats, barley and canola) in Manitoba is an increasing one with large year to year variation. All crops generally follow the same pattern with crop years of high yield in the same years and crop years of low yield in the same years. Increased yield is most evident following the World War II (1945). Canola shows a lower yield then the other crops from its

introduction in 1943 at a yield of 835 kg/ha to an increased yield of 1,500 kg/ha in 1997. These numbers are consistent with typical oilseed crops. Wheat, oats and barley share relatively the same yield throughout the study period with the exception of a superior barley yield into the 1970's, 1980's and 1990's. These three crops had yields of around 1,300 kg/ha in 1908. Yields decreased in the 1930's and were steady into the mid-1960's. From the mid-1960's to the present yields increased with wheat, oats and barley showing yields of 2,100 kg/ha, 2,600 kg/ha and 3,100 kg/ha in 1997 respectively.

In order to statistically assess the yield trend over the study period in Manitoba, Saskatchewan and Alberta a series of regressions were estimated using trend indicators such as time trend variables, dummy variables and interaction variables. If we were trying to account for all changes in yield over the study period it would be beneficial to run a regression with variables such as price, input cost and some index for weather (i.e. annual precipitation). For the sake of this study, only the general trends are evaluated using simple statistical models. This analysis is not intended to be an exhaustive statistical analysis of yield trends.

A time trend variable was constructed starting at "1" in 1908 and successively increasing over the entire sample period. A dummy variable was also set up based on the apparent rapid increase in yield after 1945 as observed in Figures 12, 13 and 14. The dummy variable consists of all zeros before and including 1945 and all ones after 1945. The last variable, that was setup, was an interaction variable (IV). This variable is equal to the time trend variable multiplied by the dummy variable for each sample. The interaction variable will allow us to statistically test our observation that the yield

increases more rapidly after 1945 by seeing if the slope of the regression line changes significantly.

Note: 1908-1945 Yield = Constant + α(Trend)

1946-1998 Yield = (Constant + Dummy) + (α + IV)(Trend)

Table 13: Regression showing the yield trend of all wheat in Manitoba
R-SQUARE = 0.6393

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	10.023	6.375	1.572
Dummy Variable	-366.470	204.100	-1.796
Interaction Variable	10.219	6.960	1.468
Constant	951.780	118.800	8.013

The regression for yield of all wheat in Manitoba (Table 13) has no significant variables other than the constant. The absolute t-ratio must be greater than 1.98 for a variable in order to be found significant at the 5% level of significance. Our observed trend for all wheat in Manitoba is not statistically significant.

Table 14: Regression showing the yield trend of oats in Manitoba
R-SQUARE = 0.6728

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-2.815	6.418	-0.439
Dummy Variable	-789.550	205.500	-3.843
Interaction Variable	27.001	7.007	3.853
Constant	1,157.600	119.600	9.680

Table 15: Regression showing the yield trend of barley in Manitoba
R-SQUARE = 0.7801

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	1.241	7.144	0.174
Dummy Variable	-1,505.300	228.700	-6.582
Interaction Variable	39.352	7.799	5.046
Constant	1,211.900	133.100	9.104

The interaction variable was found to be significant for the yield of oats and barley in Manitoba (Tables 14 & 15). This supports our observation from Figure 13 that oats and barley yield increases faster after the Second World War (1945). The yields

increased annually at 24.186 kg/ha and 40.593 kg/ha for oats and barley respectively after 1945. No significant yield trend was detected for the period 1908-1945.

Saskatchewan Crop Yield (Figure 13)

The over all trend for historical yield of major field crops in Saskatchewan is an increasing one. The year to year variation throughout the study period is large and appears to be larger than that seen in Manitoba crop yields (Figure 12). Generally, crop yields appear to be positively correlated. As in Manitoba, we see that the increasing yield trend is most visible following the Second World War. Canola shows a lower yield then the other crops from its introduction in 1943 at a yield of 715 kg/ha to a yield of 1,200 kg/ha in 1997. Wheat, oats and barley share relatively the same yield throughout the study period with the exception of a superior barley yield into the 1970's, 1980's and 1990's. Similar to Manitoba, these three crops had yields around 1,200 kg/ha in 1908. Wheat, oats and barley had a yield of 1,900 kg/ha, 2,100 kg/ha and 2,500 kg/ha in 1997 respectively.

Regressions were also run on yields of wheat, oats and barley in Saskatchewan to evaluate yield trends.

Table 16: Regression showing the yield trend of all wheat in Saskatchewan
R-SQUARE = 0.5483

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-4.639	7.186	-0.646
Dummy Variable	-670.970	230.000	-2.917
Interaction Variable	24.865	7.845	3.169
Constant	1,043.500	133.900	7.794

Table 17: Regression showing the yield trend of oats in Saskatchewan
R-SQUARE = 0.6098

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-10.424	7.253	-1.437
Dummy Variable	-905.150	232.200	-3.898
Interaction Variable	34.149	7.918	4.313
Constant	1,198.800	135.100	8.871

Table 18: Regression showing the yield trend of barley in Saskatchewan
R-SQUARE = 0.7173

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-9.494	7.382	-1.286
Dummy Variable	-1,265.300	236.300	-5.354
Interaction Variable	42.273	8.060	5.245
Constant	1,285.800	137.600	9.348

Positive significance was found in the interaction variables for yields of all wheat, oats and barley in Saskatchewan (Tables 16, 17 and 18). This significantly supports our observation that the yield increased faster after 1945. The yields increased annually at 20.226 kg/ha, 23.725 kg/ha and 32.779 kg/ha for wheat, oats and barley respectively after 1945. These regressions also show that barley had the largest positive coefficient supporting our observation that barley has had annual yield increases greater than oats or wheat. The variability of these trends has been greater in Saskatchewan than in Manitoba.

Alberta Crop Yield (Figure 14)

Alberta's historical yields for major field crops act much the same as in Manitoba and Saskatchewan with an over all increasing trend since 1945. Again canola yields less then the other crops and shows little variation in yields starting at 625 kg/ha in 1956 and increasing until 1997 with a yield of 1,300 kg/ha. Again wheat, oats and barley behave in a very similar manner until the 1960's at which time barley assumes a superior yield over

the other two crops. These three crops have yields at about 1,600 kg/ha in 1908 and they increase to 2,400 kg/ha, 2,600 kg/ha and 3,100 kg/ha in 1997 for oats, wheat and barley respectively. The year to year variation in yield is lower since the 1960's.

Regressions were also run for all wheat, oats and barley in Alberta.

Table 19: Regression showing the yield trend of all wheat in Alberta
R-SQUARE = 0.6329

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-3.465	6.925	-0.500
Dummy Variable	-934.030	221.700	-4.213
Interaction Variable	29.095	7.561	3.848
Constant	1,229.300	129.000	9.527

Table 20: Regression showing the yield trend of oats in Alberta
R-SQUARE = 0.7473

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-0.804	6.056	-0.133
Dummy Variable	-1,029.200	193.900	-5.309
Interaction Variable	30.311	6.612	4.585
Constant	1,263.800	112.800	11.200

Table 21: Regression showing the yield trend of barley in Alberta
R-SQUARE = 0.8512

VARIABLE	COEFFICIENT	ST.ERROR	T-RATIO
Time Trend	-0.426	5.608	-0.076
Dummy Variable	-1,527.900	179.500	-8.511
Interaction Variable	40.892	6.122	6.679
Constant	1,342.500	104.500	12.850

In support of the observations that the yield trends are increasing ones since 1945, we have positively significant relationships between the interaction variable and yield of wheat, oats and barley in Alberta. The rates of change in yield after 1945 in Alberta are provided below in Table 22.

Prairie Provinces Yield Growth Comparison

Table 22: Annual Change in Yield Following 1945

	Wheat	Oats	Barley
Manitoba	20.242 kg/ha	24.186 kg/ha	40.593 kg/ha
Saskatchewan	20.226 kg/ha	23.725 kg/ha	32.779 kg/ha
Alberta	25.630kg/ha	29.507 kg/ha	40.466kg/ha

Barley shows the greatest growth rate in yield following 1945. Oats shows a slightly larger growth in yield than wheat across all of the Prairie Provinces. Of the Prairie Provinces, Alberta shows the greatest growth in crop yields for all wheat and oats in contrast to Barley which shows a slightly higher yield growth in Manitoba.

British Columbia Crop Yield (Figure 15)

British Columbia shows little variation in yields from year to year until the 1950's when yield began to show a slow over all increase. With this increase in yield comes increased year to year variation. With all wheat, oats and barley at around 1,750 kg/ha for the first half of the study period and 3,000 kg/ha in 1997 a trend of increasing yield is apparent in the later half of the study period.

Summary of Historical Crop Yields

Crop yields increase after 1945 for canola, wheat, oats and barley. The source of this increase was not investigated but hypothesized to be from a combination of new varieties and improved farm management practices. Historically, crop yields in Alberta have been greater than those in Manitoba and Saskatchewan. Barley had the greatest yield increases of the crops studied. While yields are increasing, acreages are dropping, potentially resulting in relatively stable total crop production. Interestingly, yields may have declined slightly during the period of 1914 to 1945.

Crop Prices

Real Prices of Alberta Crops (Figure 16)

Nominal Prices were deflated by the annual Consumer Price Index, CPI, to obtain real prices. The base year used was 1997. There are three apparent increases in price observed within the study period when considering real prices. During these times, the real price increases substantially over the period of a few years and then decreases substantially over the period of fewer years. These price peaks are followed by a gradual decrease in price over approximately a twenty-year period. The first significant high price period peaked in around 1919 at $476, $516, $785 and $1,514 per tonne for oats, barley, wheat and flaxseed respectively. This high price was then followed by a lower price of $145, $136, $253 and $461 per tonne in about 1921 respectively. The next high price period, although shared by all the major crops, was most exhibited by flaxseed with a high price of $1,799 per tonne in 1947. The most recent high price period occurred in 1973 where the prices consisted of $399, $441, $598, $1,078 and $1,384 per tonne for oats, barley, all wheat, canola and flaxseed respectively.

Over all, the two oilseed crops are the highest priced crops. Oats and barley have relatively the same price range and follow the same trends. Wheat follows these oat and barley price trends but tends to be slightly higher (50 to 100 dollars) in price.

Assessing Risk for Western Canadian Crop Prices

In order to assess the risk of the year to year expected price of a crop it is useful to compare coefficient of variations. Coefficient of variation is tool that allows us to look at standard deviations in relative terms to the size of the mean. It is calculated as follows:

Coefficient of Variation = Standard Deviation / Mean

We can use this statistic to determine which crops are more or less risky.

Table 23: Historical Real Price Statistics for Western Canadian Crops

Crop	Province	n	Years	MEAN	STD. DEV.	CV	CV with Common Time Period
All Wheat	MB	83	1908-96	342.71	150.68	0.44	0.36
	SK	83	1908-96	338.23	148.69	0.44	0.38
	AB	83	1908-96	329.33	142.96	0.43	0.36
	BC	83	1908-96	367.48	165.74	0.45	0.37
Oats	MB	83	1908-96	236.27	98.485	0.42	0.36
	SK	83	1908-96	225.3	94.468	0.42	0.35
	AB	83	1908-96	222.73	93.084	0.42	0.36
	BC	83	1908-96	287.61	137.05	0.48	0.42
Barley	MB	83	1908-96	242.72	105.47	0.43	0.37
	SK	83	1908-96	234.73	100.45	0.43	0.37
	AB	83	1908-96	229.34	100.47	0.44	0.37
	BC	83	1908-96	290.14	139.59	0.48	0.36
All Rye	MB	83	1908-96	273.28	187.95	0.69	0.42
	SK	83	1908-96	267.93	179.45	0.67	0.42
	AB	83	1908-96	265.11	178.9	0.67	0.41
	BC	83	1908-96	274.41	188.99	0.69	0.46
Flaxseed	MB	83	1908-96	674.24	310.18	0.46	0.46
	SK	83	1908-96	666	307.37	0.46	0.46
	AB	83	1908-96	654.24	300.66	0.46	0.45
Canola	MB	45	1952-96	502.51	171.13	0.34	0.35
	SK	48	1949-96	510.21	175.28	0.34	0.36
	AB	42	1955-96	502.26	177.11	0.35	0.35

The prices used in the above analysis are real prices adjusted by CPI with a base year of 1997. With the coefficient of variations (CV) in Table 23, we can see that wheat, oats and barley show relatively the same level of risk with a CV of around 0.43 or around 0.36 when considering data from common time period between 1955 to 1996. Flaxseed has the highest CV at around 0.45 during the common time period indicating the greatest risk. Canola shows a CV of around 0.35 indicating slightly less risk than wheat, oats or barley. All rye is slightly more risky than wheat, oats and barley. All rye has a CV of around 0.41, when considering only those data points that fall into the common time period between 1955 and 1996. Each crop shows their highest level of risk (high CV) in British Columbia with little variation in CV values across Manitoba, Saskatchewan and Alberta.

Nominal Prices of Alberta Crops (Figure 17)

Both due to the increased real price of these field crops and the rapid inflation through the 1970's we see high nominal prices from 1973 to the present. Nominal prices stay at high levels through the 1980's and 1990's although we see decreasing real prices through this period (Figure 16).

Summary of Historical Crop Prices

All crops are dropping in real price. Periodic price peaks are evident on figures 16 and 17, and were not investigated for cause and effect. Canola was found to have the lowest price risk by measure of coefficient of variation. This low level of risk may contribute to the increasing acreage trend for canola.

General Conclusions

Crop acreages in the Western Prairie Region of Canada increased from 1908-1998. This overall increase consists of a progressive growth in all wheat, barley, canola (since its introduction in 1943) and specialty crop areas, with a decrease in oats area. Summer fallow is another major land use that increased until 1970 but has since declined in acreage. Statistically these trends show up in the acreage response functions. Saskatchewan is the dominant producer, by area, of all major crops (all wheat, oats and summer fallow) with the exception of barley for which Alberta is the dominant producer. Canola area sees Alberta and Saskatchewan producing at similar levels.

In general, yield has been increasing with a large degree of year to year variation. Yield began increasing most rapidly after World War II for most major crops in Western Canada. The general trend is most likely due to technological innovation with the introduction of new crop varieties and the yearly variation a factor of weather. Barley

has shown a superior increase in yield since the 1950's. This superior increase resulted in Barley being the biggest yielding crop in Western Canada on average throughout the 1980's and 1990's.

Real price in 1997 dollars has been decreasing with notable peaks in the late teens, late 1940's and the early 1970's. All of the crops follow this same trend to different degrees, with highs and lows at around the same times.

When considering price risk of real prices for crops we see that there is little variation among provinces for any given crop but that British Columbia has a slightly greater risk then the rest of Western Canada. All rye was found to have the greatest risk by a significant margin over the other crops and canola was found to have the least risk. The other crops were similar to one another in their level of risk.

When deriving the acreage response functions it was found that the most significant variable was last year's area of crop x when trying to predict crop x's area this year. Those crops with a strong increasing or decreasing area trend, as seen in the graphs, were further backed up when the time trend variable showed a significant relationship (for instance in Tables 1, 4, 6, 7, 8, 11 and 12). The presence of crop rotations may be implied, when a positive relationship is present between last year's area for crop y and this years area for crop x. An example of this is all wheat and canola in Alberta or oats and summer fallow in Alberta. Prices can have either a positive or a negative influence on this year's area of crop x. We see that last year's crop y price can have a negative relationship on this year's crop x area with barley area and all wheat price in Saskatchewan as an example. We also see that last year's crop x price can have a positive relationship on this years area of crop x with all wheat price.

The historical description of crop acreage, yields and price will be useful to applied research on agricultural policy or the impact of technology and research on western Canadian crop production.

List of References

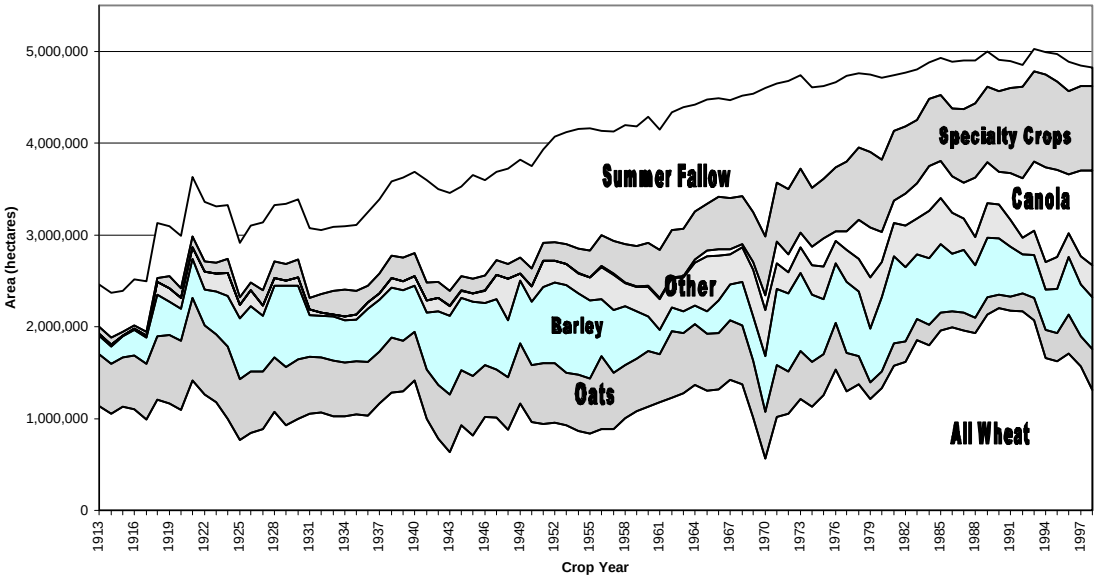
CANSIM database
http://datacentre.chass.utoronto.ca:5680/cansim/cansim.html

Canadian Grain Industry, Statistical Handbook 97, published by Canadian Grains Council. 330-360 Main Street. Winnipeg, Manitoba. R3C 3Z3

Canadian Grain Industry, Statistical Handbook 94, published by Canadian Grains Council. 330-360 Main Street. Winnipeg, Manitoba. R3C 3Z3

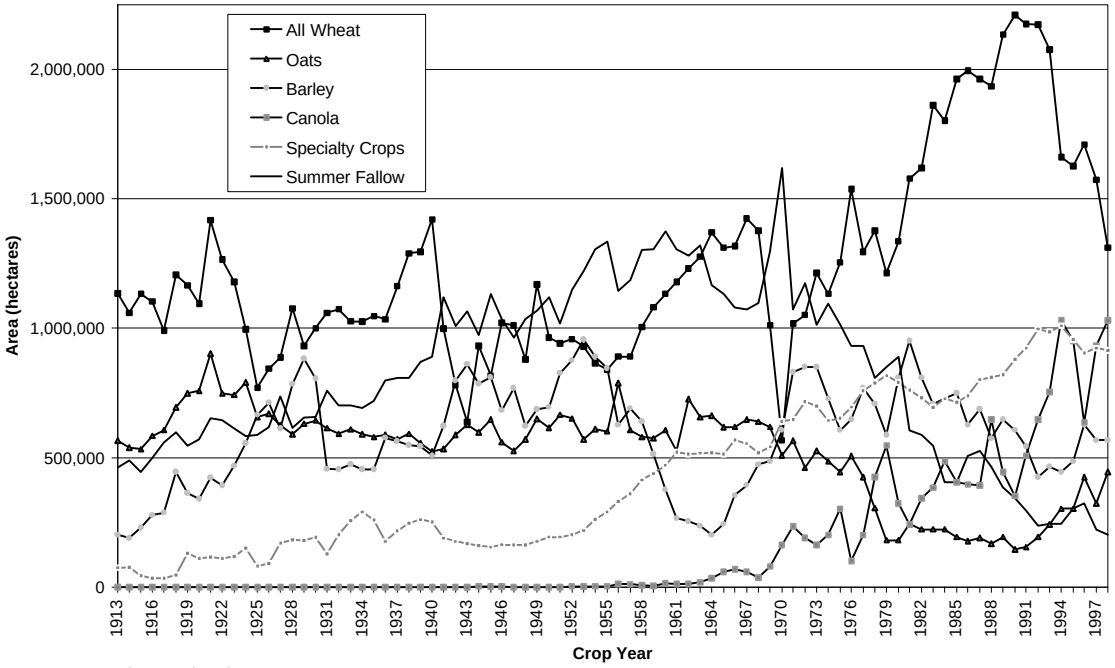
Appendix I

Figure 1a: Stacked Area Graph of Historical Manitoba Field Crop Area Allocations (1913 to 1998)



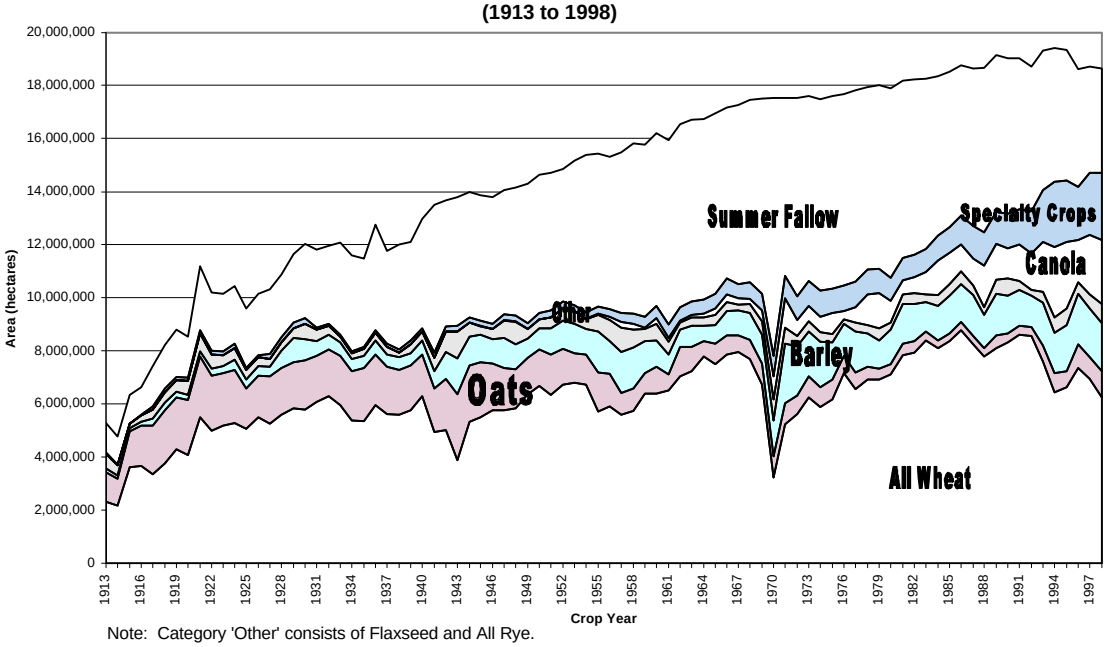
Note: Category 'Other' consists of Flaxseed and All Rye.
The stacked area graph allows one to see the contribution of each crop to the make up of the total crop area in any given year. For example, in 1989 the total Field Crop Area for Manitoba is 5,000,000 hectares, which consists of 2,000,000 hectares of All Wheat, 150,000 hectares of Oats, 600,000 hectares of Barley, etc.
Source: CANSIM

Figure 1b: Graph of Historical Manitoba Field Crop Areas (1913 to 1998)



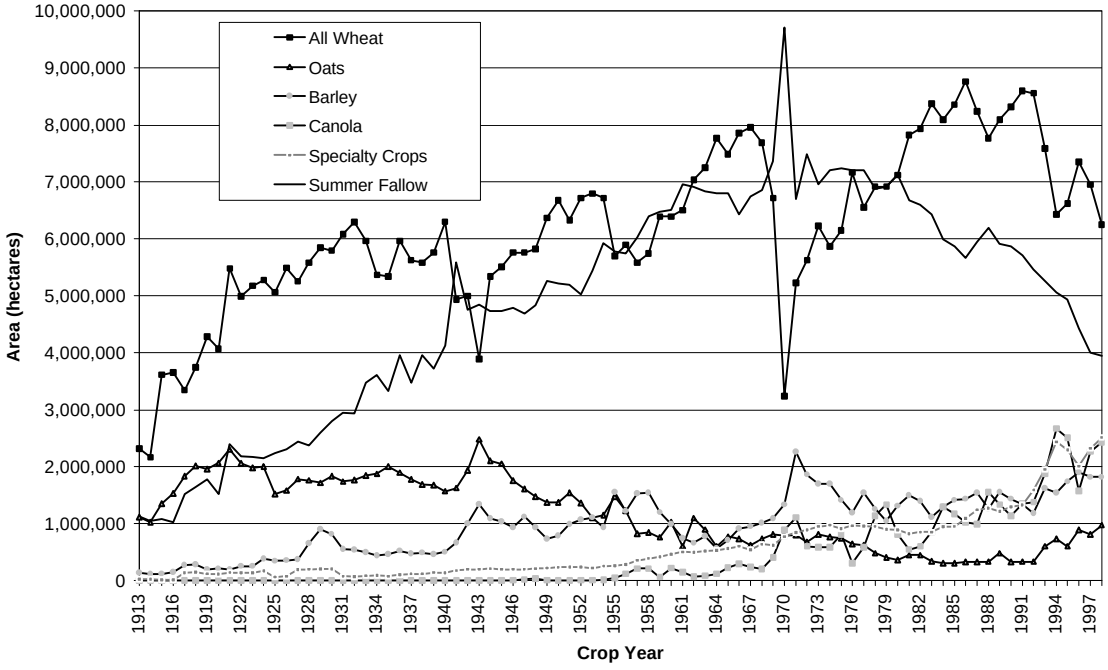
Source: CANSIM

Figure 2a: Stacked Area Graph of Historical Saskatchewan Field Crop Area Allocations (1913 to 1998)



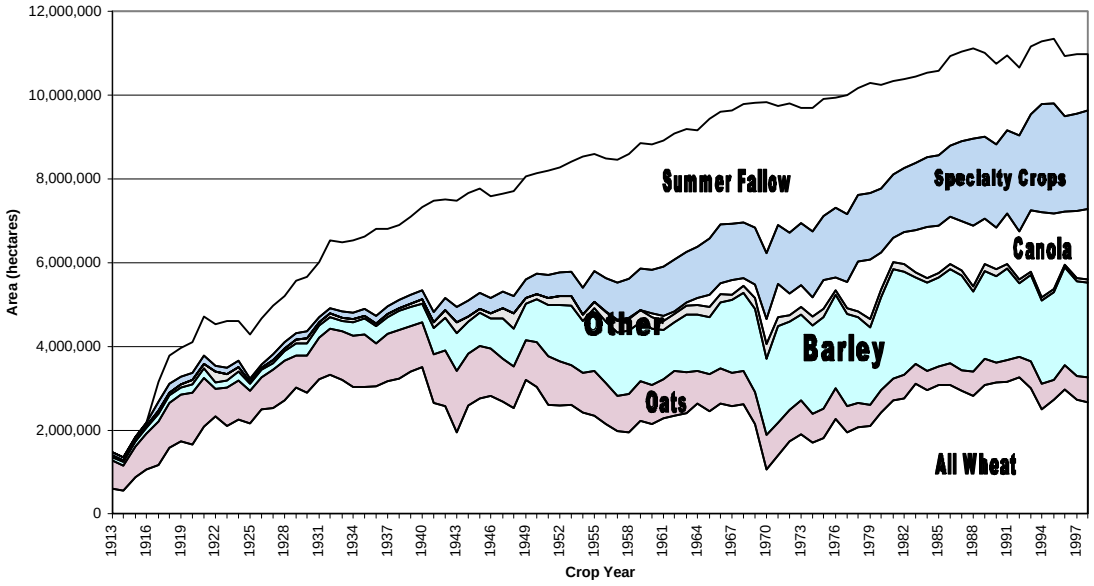
Note: Category 'Other' consists of Flaxseed and All Rye.
The stacked area graph allows one to see the contribution of each crop to the make up of the total crop area in any given year. For Example, in 1979 the total Field Crop area for Saskatchewan is 18,000,000 hectares, which consists of 7,000,000 hectares of All Wheat, 350,000 hectares of Oats, 1,000,000 hectares of Barley, etc.
Source: CANSIM

Figure 2b: Graph of Historical Saskatchewan Field Crop Areas (1913 to 1998)



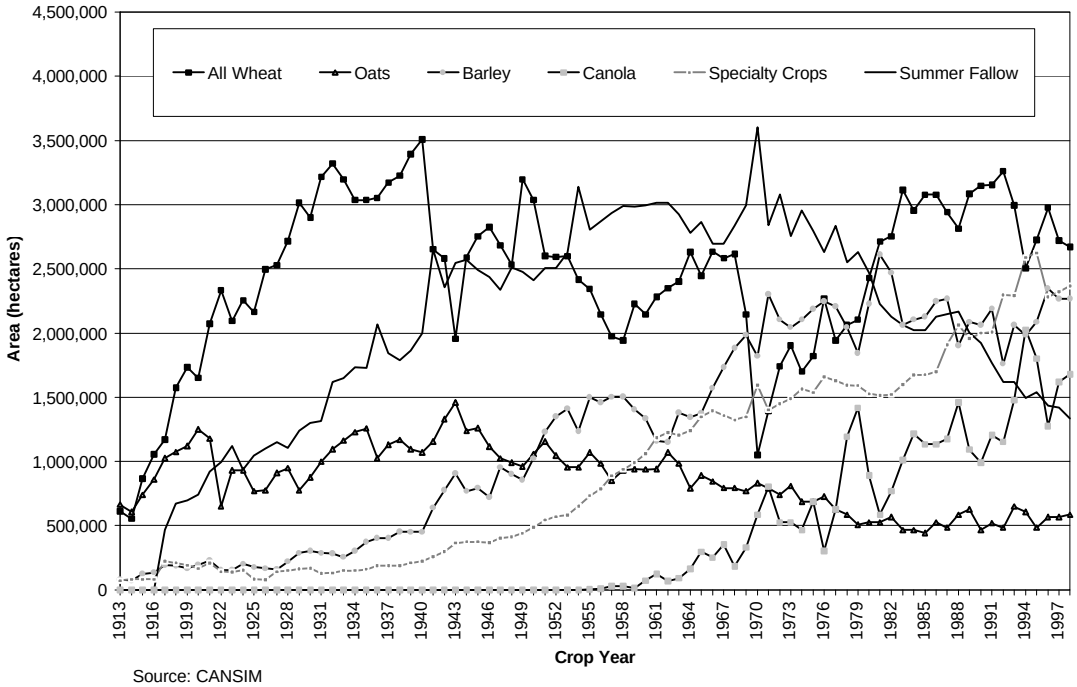
Source: CANSIM

Figure 3a: Stacked Area Graph of Historical Alberta Field Crop Area Allocations (1913 to 1998)



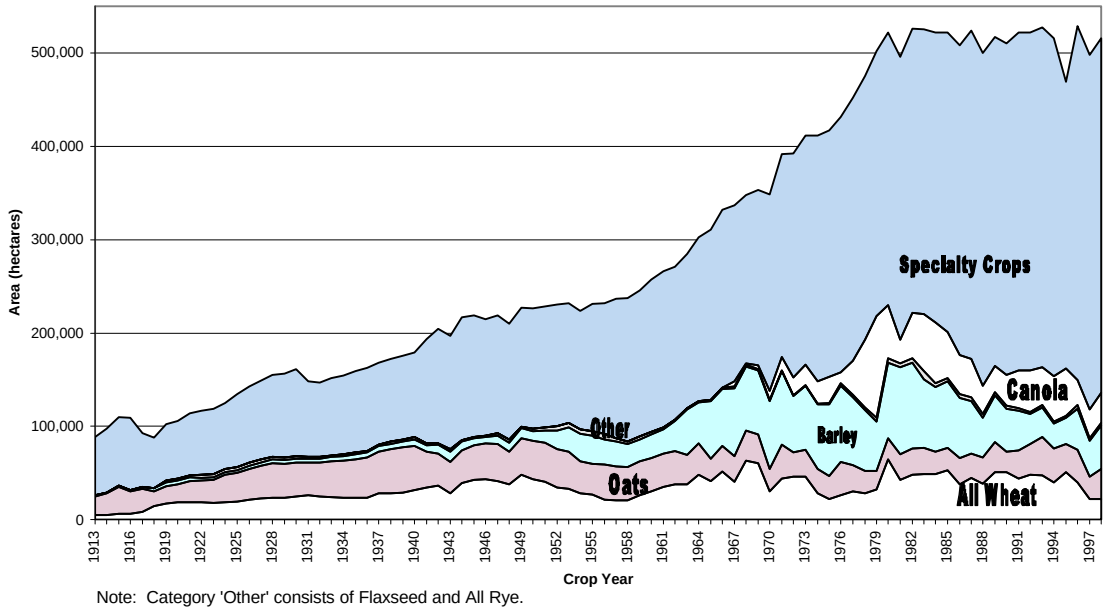
Note: Category 'Other' consists of Flaxseed and All Rye.
The stacked area graph allows one to see the contribution of each crop to the make up of the total crop area in any given year. For example, in 1988 the total Field Crop area for Alberta is 11,000,000 hectares, which consists of 3,000,000 hectares of All Wheat, 600,000 hectares of Oats, 1,900,000 hectares of Barley, etc.
Source: CANSIM

Figure 3b: Graph of Historical Alberta Field Crop Areas (1913 to 1998)



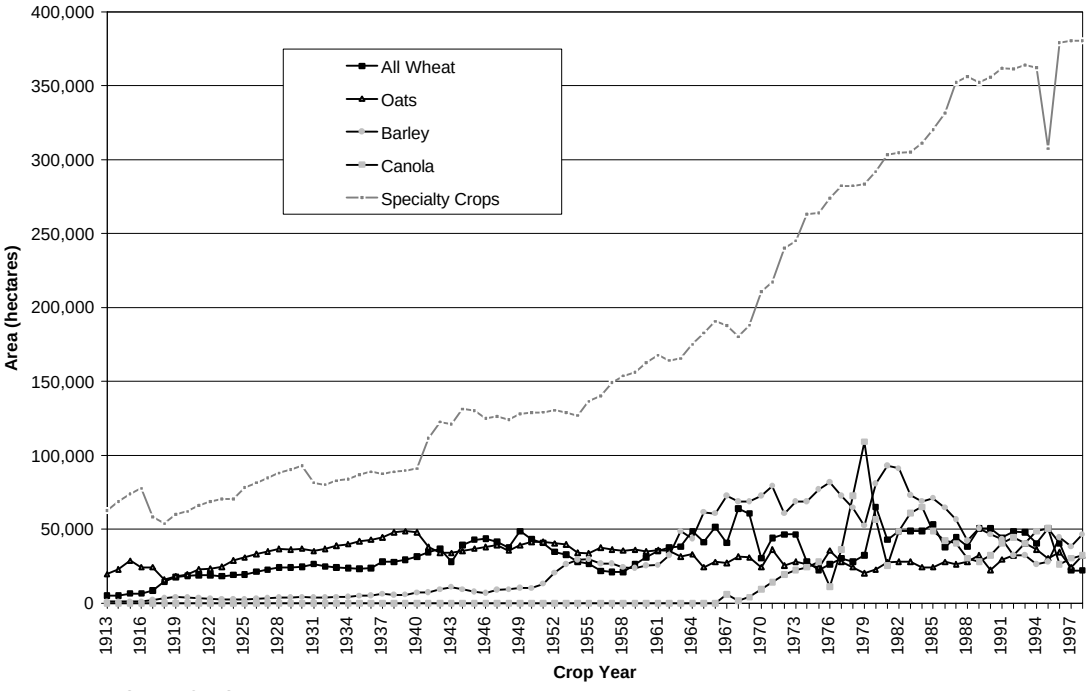
Source: CANSIM

Figure 4a: Stacked Area Graph of Historical British Columbia Field Crop Area Allocations (1913 to 1998)



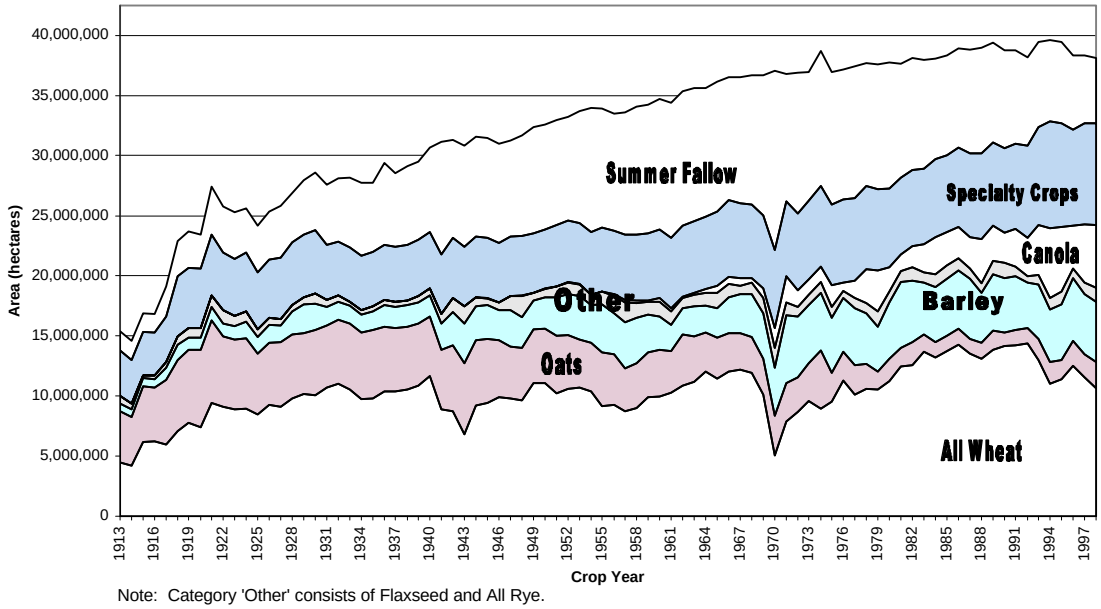
Note: Category 'Other' consists of Flaxseed and All Rye.
The stacked area graph allows one to see the contribution of each crop to the make up of the total area in a given year. For example, in 1981 the total Field Crop area for British Columbia is 500,000 hectares, which consists of 50,000 hectares of All Wheat, 30,000 hectares of Oats, 90,000 hectares of Barley, etc.
Source: CANSIM

Figure 4b: Graph of Historical British Columbia Field Crop Areas (1913 to 1998)



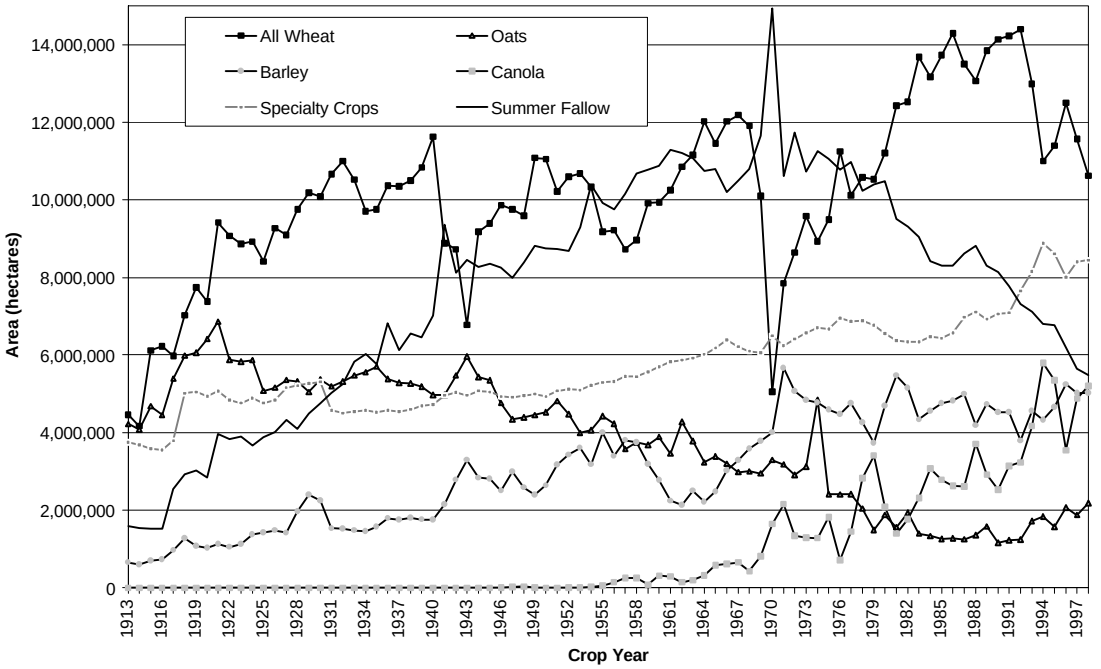
Source: CANSIM

Figure 5a: Stacked Area Graph of Historical Canada Field Crop Area Allocations (1913 to 1998)



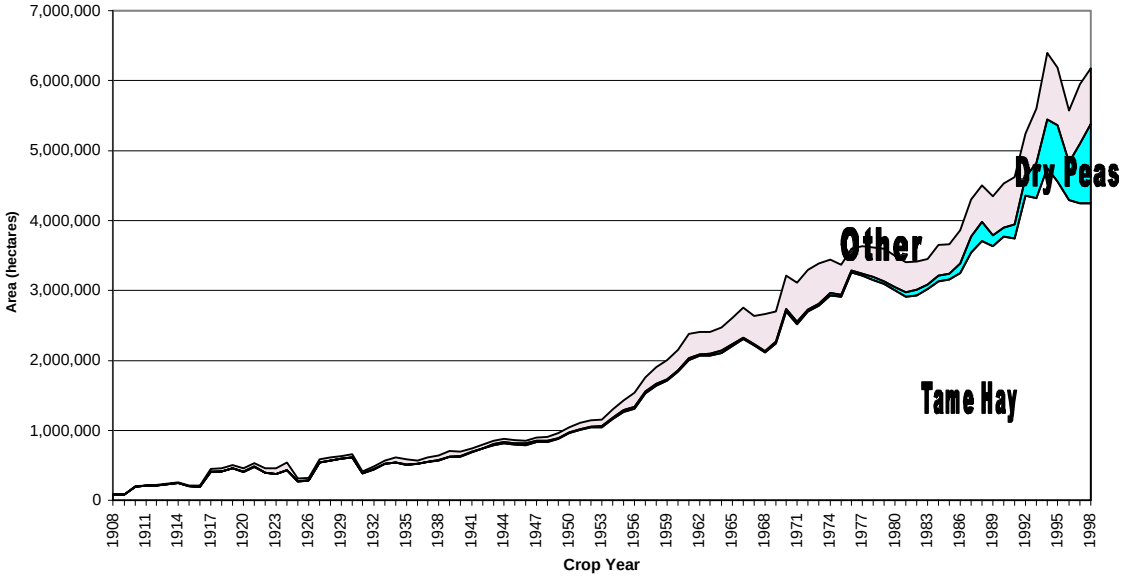
Note: Category 'Other' consists of Flaxseed and All Rye.
The stacked area graph allows one to see the contribution of each crop to the total area in a given year. For example, in 1980 the total Field Crop area is 35,500,000 hectares, which consists of 11,200,000 hectares of All Wheat, 1,900,000 hectares of Oats, 3,700,000 hectares of Barley, etc.
Source: CANSIM

Figure 5b: Graph of Historical Canada Field Crop Areas (1913 to 1998)



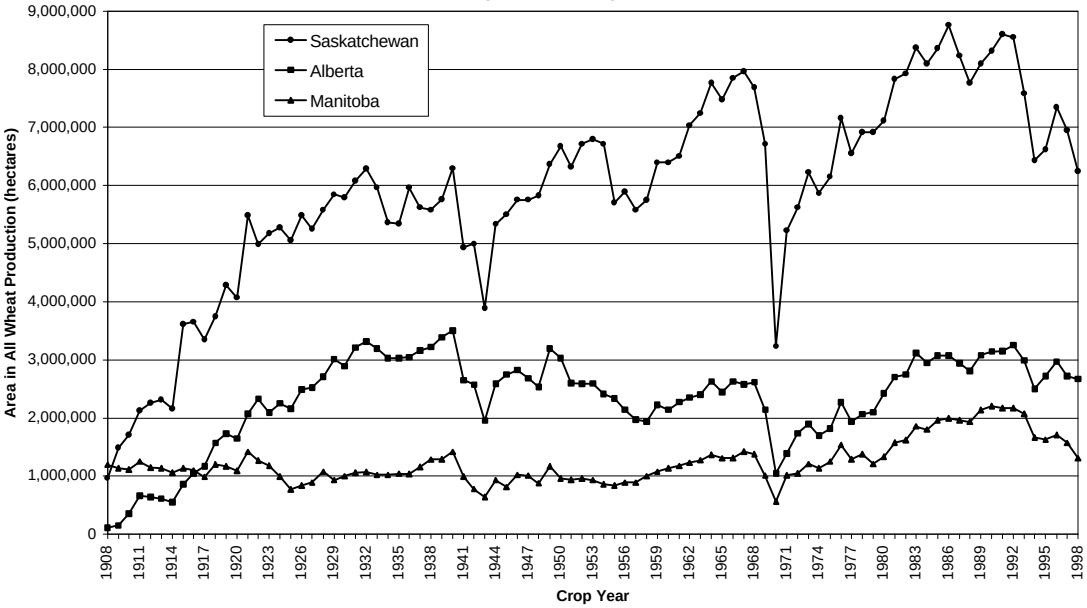
Source: CANSIM

Figure 6: Stacked Area Graph of the Historical Specialty Crop Areas in Western Canada (1908 to 1998)



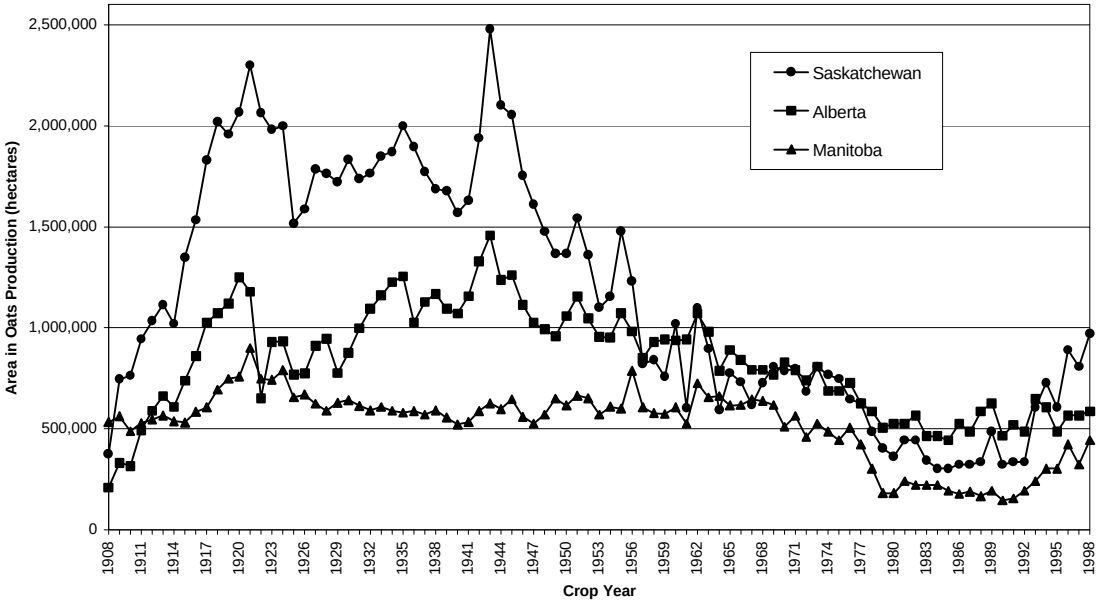
Note: Category 'Other' consists of mixed grains, fodder corn, lentils, sunflower seed and mustard seed.
The stacked area graph allows one to see the contribution of each crop to the make up of the total area in a given year. For example, in 1995 the total Specialty crop area for Western Canada was 6,200,000 hectares, which consists of 4,290,000 hectares of Tame Hay, 910,000 hectares of Dry Peas and 1,000,000 hectares of Other specialty crops.
Source: CANSIM

Figure 7: Historical Area of All Wheat Production in the Prairie Provinces of Canada (1908 to 1998)



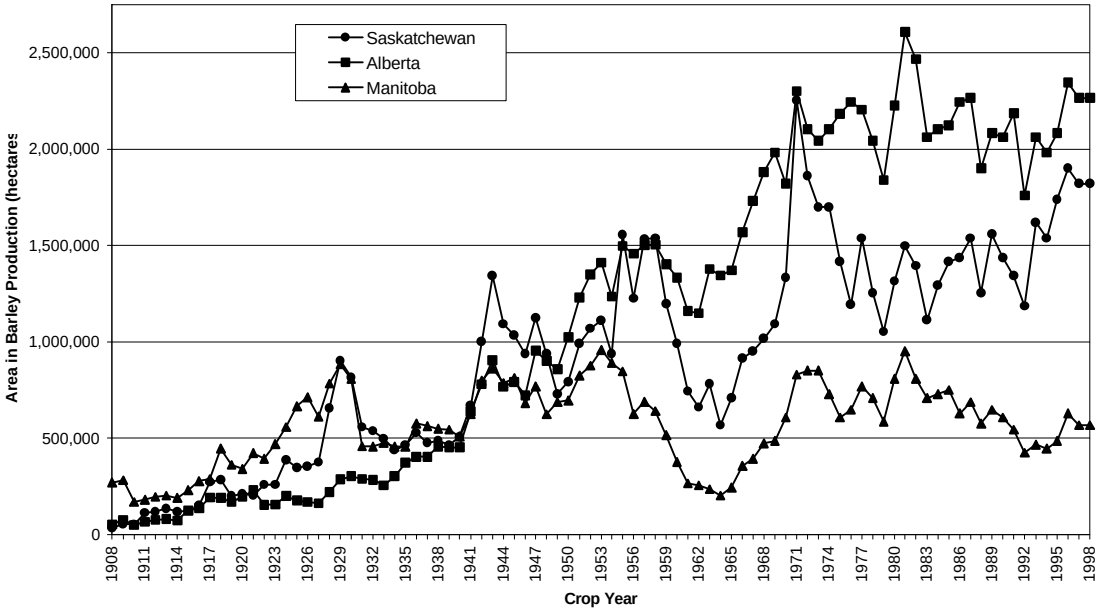
Note: British Columbia is not represented on this graph due to the relatively small number of hectares in production of all wheat. Over the period depicted in this graph British Columbia ranges from a low of 3,800 hectares to a high of 65,000 hectares of area in all wheat production.
Source: CANSIM

Figure 8: Historical Area of Oats Production in the Prairie Provinces of Canada (1908 to 1998)



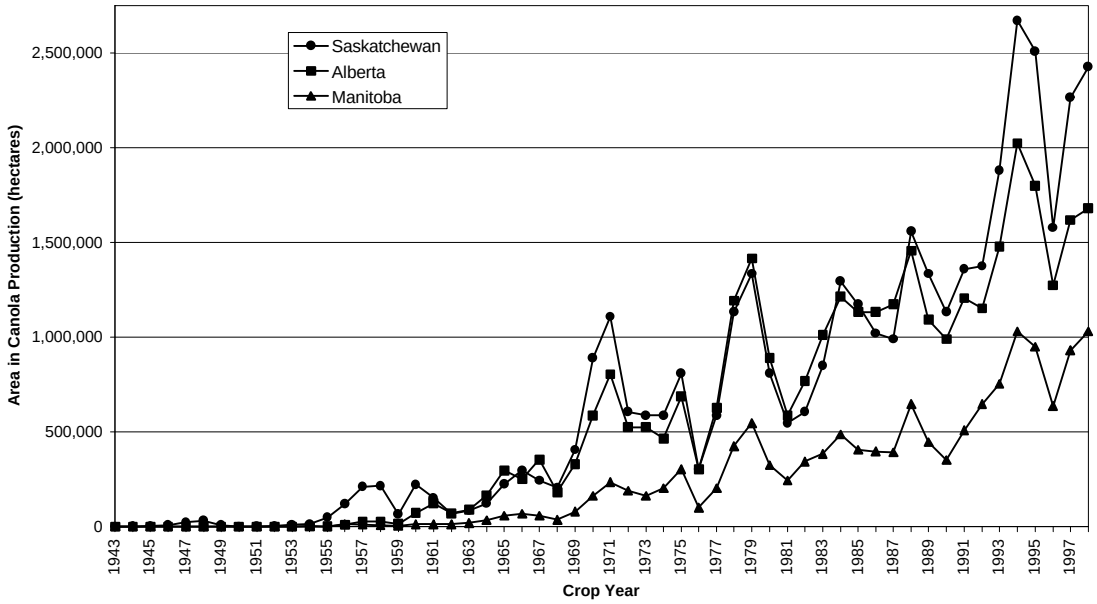
Note: British Columbia is not represented on this graph due to the relatively small number of hectares in production of Oats. Over the period depicted in this graph British Columbia ranges from a low of 13,400 hectares to a high of 48,700 hectares of area in Oats production.
Source: CANSIM

Figure 9: Historical Area of Barley Production in the Prairie Provinces of Canada (1908 to 1998)



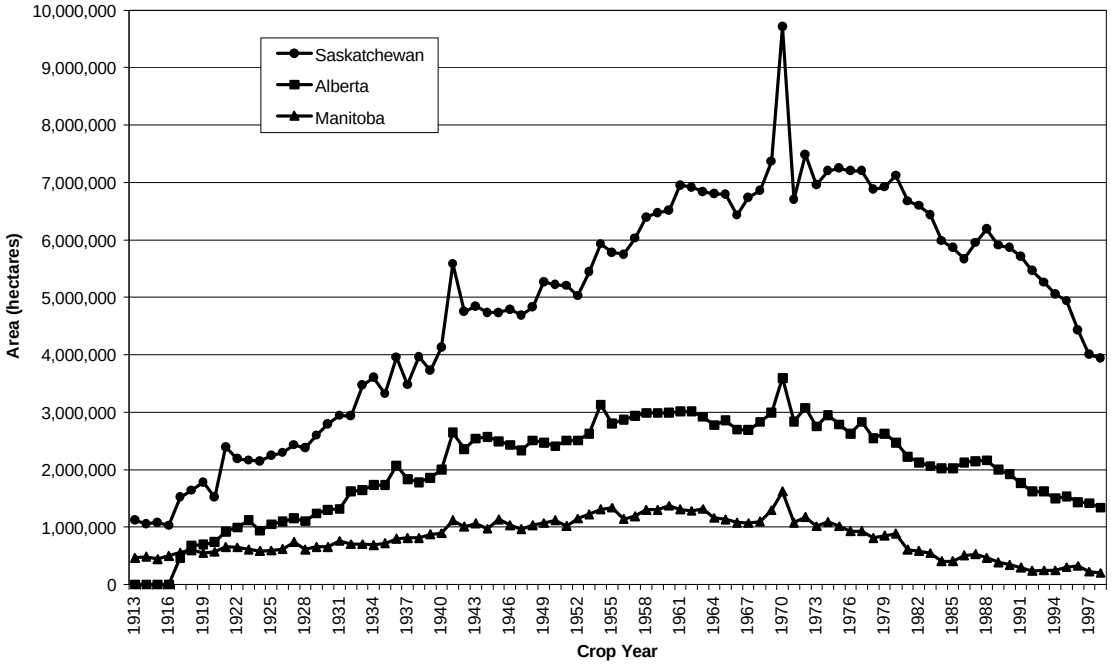
Note: British Columbia is not represented on this graph due to the relatively small number of hectares in production of all wheat. Over the period depicted in this graph British Columbia ranges from a low of 800 hectares to a high of 93,100 hectares of area in Barley production.
Source: CANSIM

Figure 10: Historical Area of Canola Production in the Prairie Provinces of Canada (1943 to 1998)



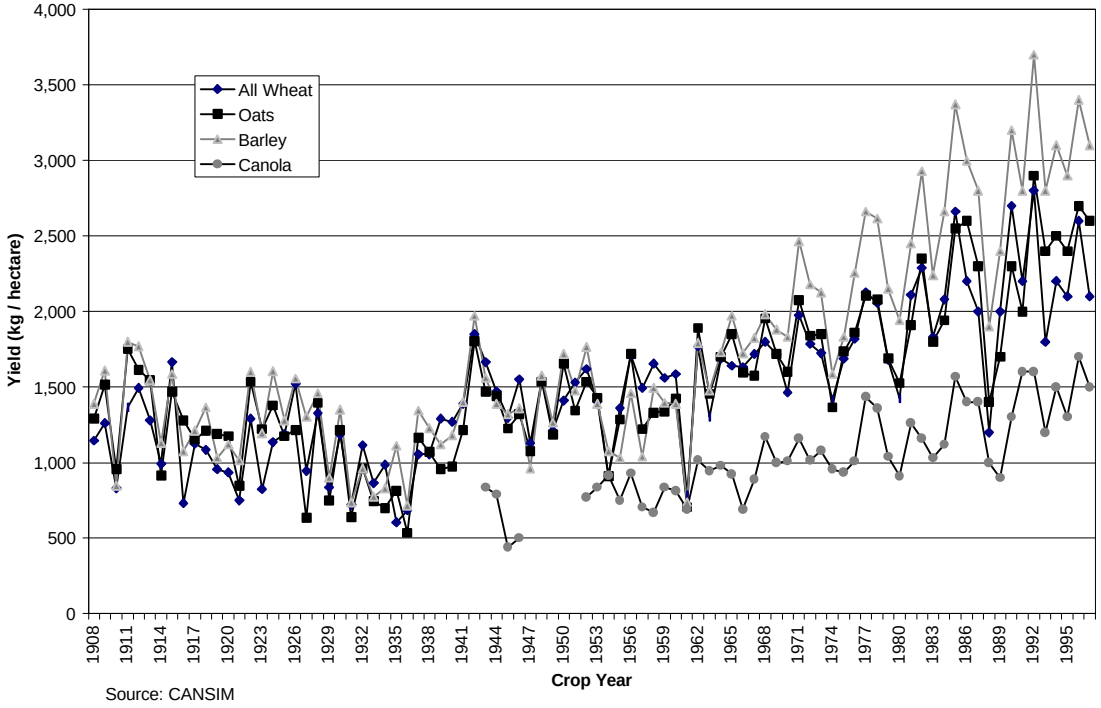
Note: British Columbia is not represented on this graph due to the relatively small number of hectares in production of all wheat. Over the period depicted in this graph British Columbia ranges from a low of 0 hectares to a high of 109,600 hectares of area in Canola production.
Source: CANSIM

Figure 11: Historical Area of Summer Fallow in the Prairie Provinces of Canada (1913 to 1998)



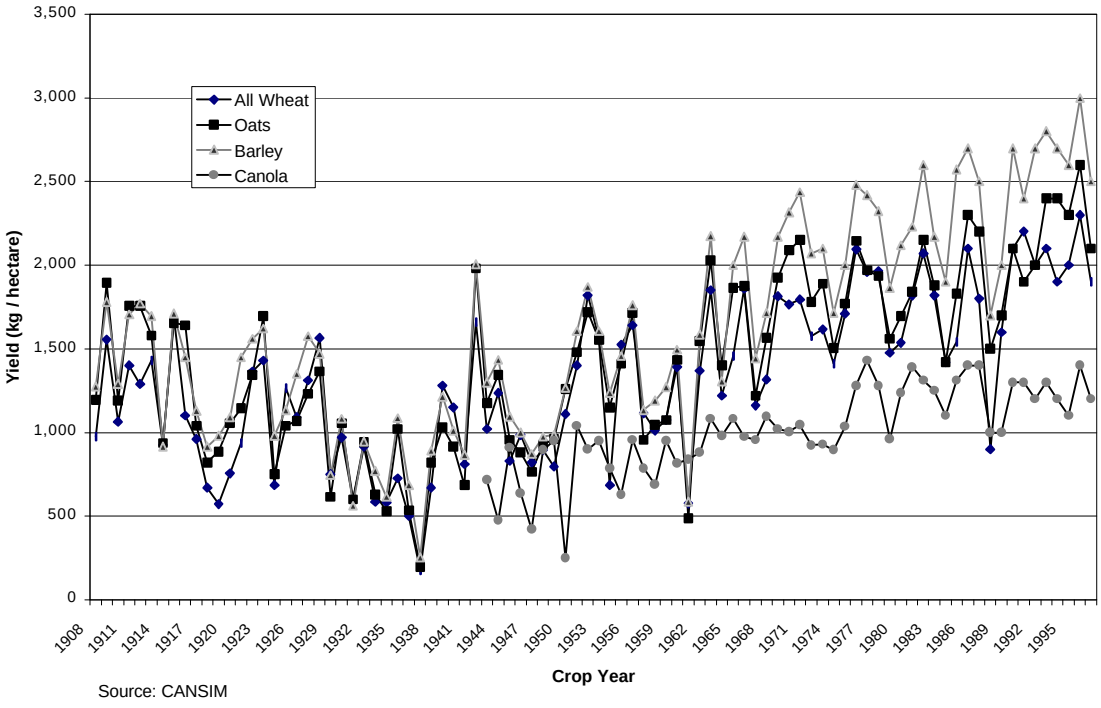
Source: CANSIM Note: Summer fallow areas were not available for

Figure 12: Historical Yield for Crops in Manitoba (1908 to 1997)



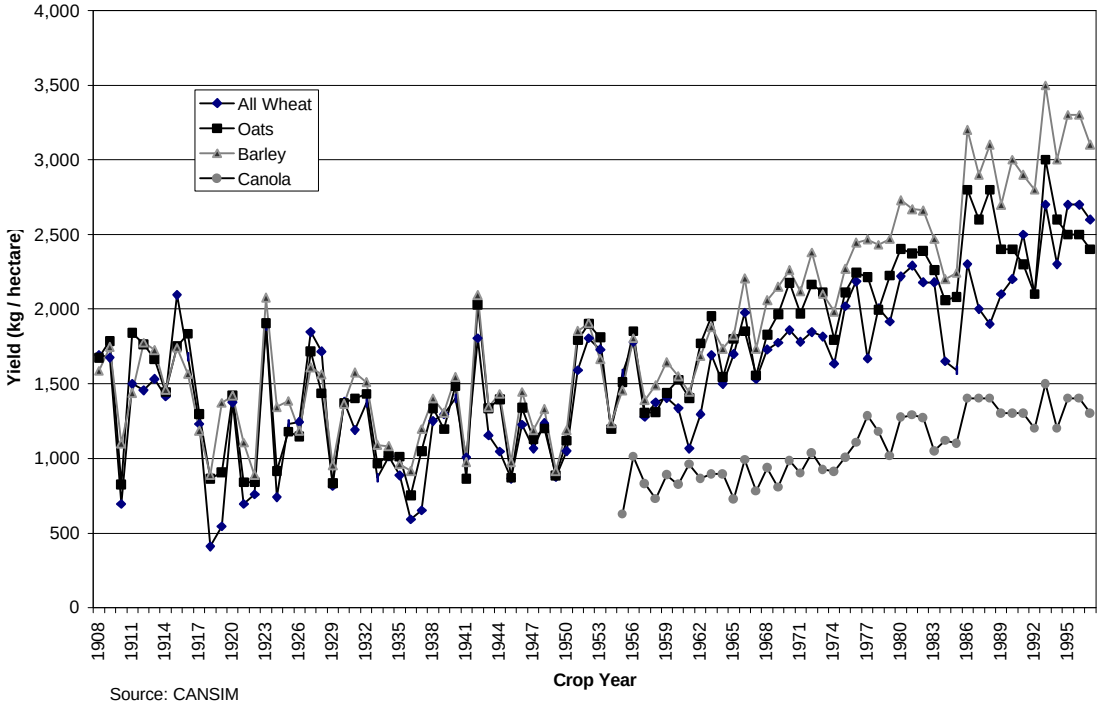
Source: CANSIM

Figure 13: Historical Yield for Crops in Saskatchewan (1908 to 1997)



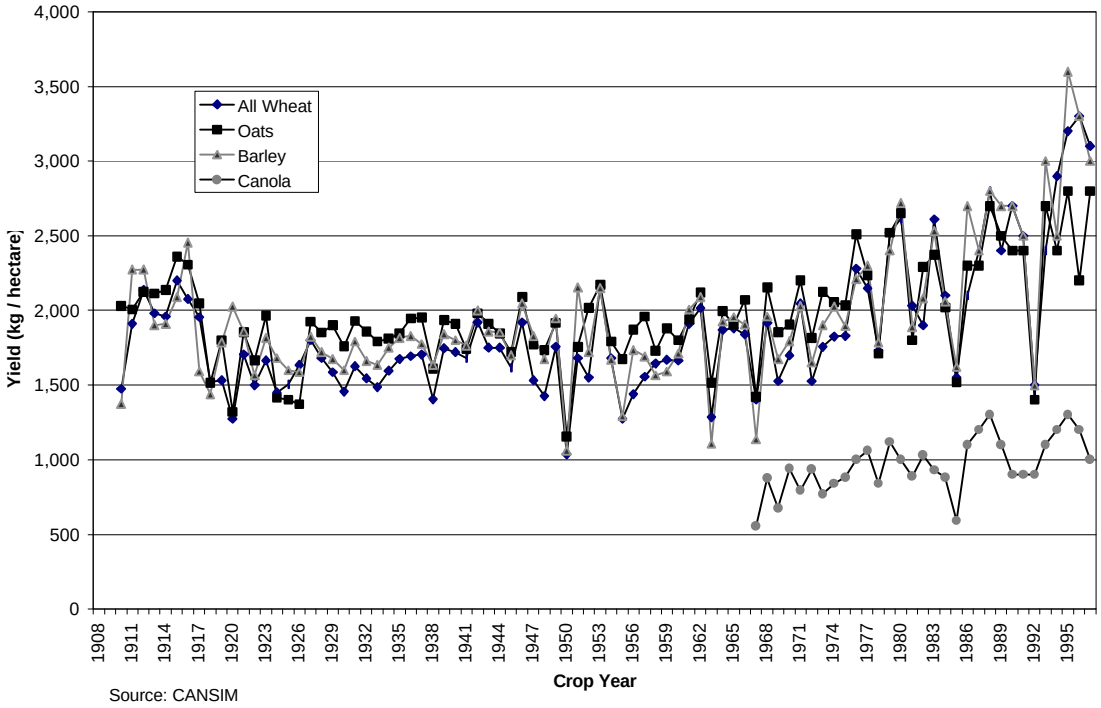
Source: CANSIM

Figure 14: Historical Yield for Crops in Alberta (1908 to 1997)



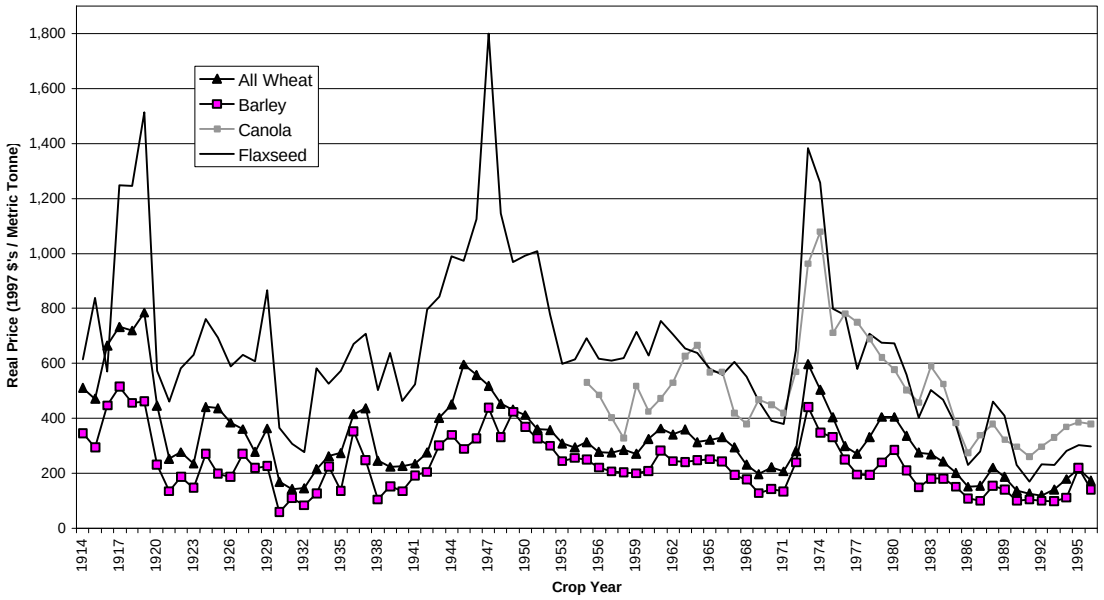
Source: CANSIM

Figure 15: Historical Yield for Crops in British Columbia (1908 to 1997)



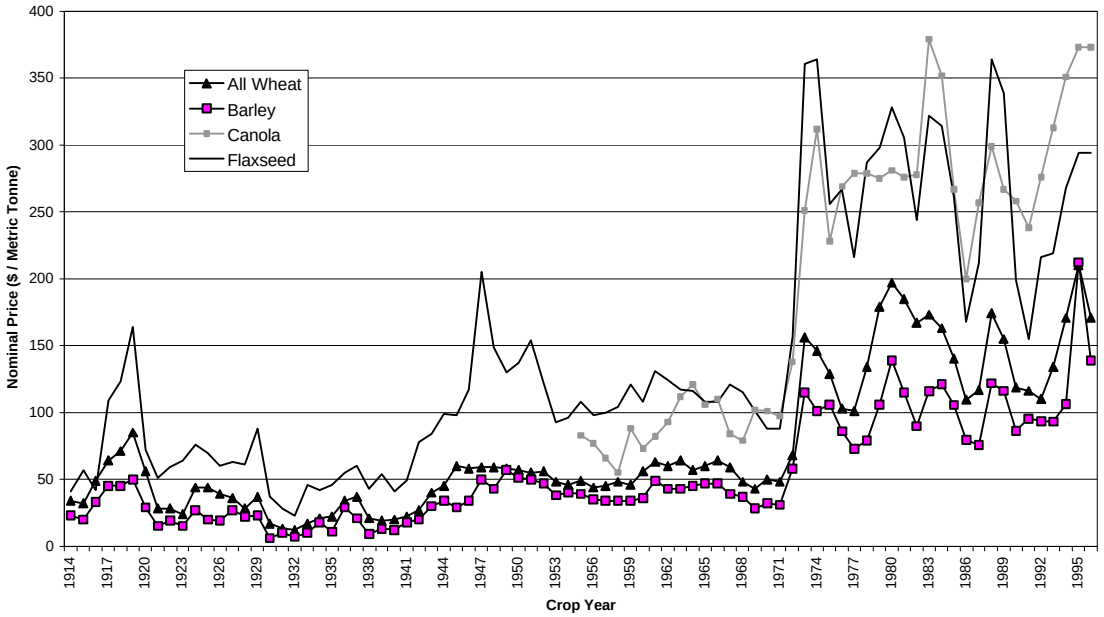
Source: CANSIM

Figure 16: Real Historical Prices of Crops in Alberta (1914 to 1996)



Note: Consumer Price Index with base year 1997 was used to adjust nominal prices to real prices. For the sake of graph simplification the price of Oats was not included in this figure. The price of Oats was nearly identical to the price of Barley, both in years of increase and years of decrease throughout the entire study period (1914 to 1996). On average over this time period Oats was about $6 less in price than Barley.
Sources: CANSIM & Canadian Grain Industry Statistical Handbook

Figure 17: Nominal Historical Prices of Crops in Alberta (1914 to 1996)



Note: No Adjustment was made to prices. For the sake of graph simplification the price of Oats was not included in this figure. The price of Oats was nearly identical to the price of Barley, both in years of increase and years of decrease throughout the entire study period (1914 to 1996).
Sources: CANSIM & Canadian Grain Industry Statistical Handbook