# CONSENSUS-BASED PRAIRIE AGRICULTURE AND AGRI-FOOD SCENARIOS TO 2005

PREPARED FOR

AGRICULTURE & AGRI-FOOD CANADA

PRAIRIE FARM REHABILITATION ADMINISTRATION

AND

RURAL SECRETARIAT

AUGUST, 1999

# TABLE OF CONTENTS

**EXECUTIVE SUMMARY** ..... **I**

**1.0 INTRODUCTION** ..... **1**

1.1 BACKGROUND ..... 1
1.2 OBJECTIVES AND SCOPE ..... 2

**2.0 STUDY METHODOLOGY** ..... **4**

2.1 OVERVIEW ..... 4
2.2 METHODOLOGY ..... 4

**3.0 BASE CASE AND SCENARIO DEVELOPMENT** ..... **9**

3.1 GENERAL ASSUMPTIONS ..... 9
3.2 BASE CASE DEVELOPMENT ..... 11
3.2.1 Outline of the Industry as of 1996 ..... 11
3.2.1.1 Beef ..... 11
3.2.1.2 Pork ..... 12
3.2.1.3 Poultry ..... 13
3.2.1.4 Dairy ..... 15
3.2.1.5 Grains ..... 16
3.2.1.6 Oilseeds ..... 17
3.2.1.7 Specialty Crops ..... 18
3.2.1.8 Horticultural Crops ..... 18
3.2.1.9 Forage ..... 19
3.2.1.10 Irrigation ..... 20
3.2.2 Summary of Base Case Resources ..... 20
3.3 SCENARIO I – AAFC MEDIUM POLICY BASELINE/ OUTLOOK ..... 21
3.3.1 Overview ..... 21
3.3.2 Beef ..... 21
3.3.3 Pork ..... 22
3.3.4 Poultry ..... 22
3.3.5 Dairy ..... 22
3.3.6 Grains ..... 23
3.3.7 Oilseeds ..... 23
3.3.8 Specialty Crops ..... 23
3.3.9 Horticultural Crops ..... 24
3.4 SCENARIO II – CONSENSUS OF INDUSTRY EXPERT OPINIONS ..... 24
3.4.1 Overview of Scenario II ..... 24
3.4.2 Beef ..... 25
3.4.3 Pork ..... 25
3.4.4 Poultry ..... 25
3.4.5 Dairy ..... 25
3.4.6 Grains ..... 25
3.4.7 Oilseeds ..... 26
3.4.8 Specialty Crops ..... 26
3.4.9 Horticultural Crops ..... 26
3.5 SUMMARY OF ASSUMPTIONS FOR THE TWO SCENARIOS ..... 26

**4.0 ANALYSIS AND RESULTS ..... 28**

4.1 BASE CASE ..... 29
4.2 SCENARIO I – AAFC'S MTO SCENARIO RESULTS ..... 29
4.3 SCENARIO II - CONSENSUS OF INDUSTRY EXPERT OPINIONS RESULTS ..... 32
4.3.1 Overview ..... 32
4.3.2 Results ..... 32
4.4 CONSTRAINTS TO GROWTH ..... 34
4.4.1 Beef ..... 34
4.4.2 Pork ..... 34
4.4.3 Poultry and Dairy ..... 35
4.4.4 Grains ..... 35
4.4.5 Oilseeds ..... 35
4.4.6 Specialty Crops ..... 35
4.4.7 Horticultural Crops ..... 35
4.4.8 General ..... 36

**5.0 SUMMARY ..... 36**

5.1 OVERVIEW ..... 36
5.2 RESULTS ..... 37
5.2.1 Grains and Oilseeds ..... 37
5.2.2 Forages ..... 38

Note: The Appendix Document is bound under a separate cover and is available from PFRA.

# LIST OF FIGURES AND TABLES

Figure 2.1 Methodology ..... 4
Figure 2.2 Scenario Analysis Model ..... 7
Figure 3.1 Percent Change in Beef Cattle Numbers from 1981 to 1996 ..... 11
Figure 3.2 Inventory of Beef Cattle Numbers From 1996 Census ..... 11
Figure 3.3 Beef Processing as of April, 1999 ..... 12
Figure 3.4 Percent Change in Hog Numbers From 1981 to 1996 ..... 12
Figure 3.5 Inventory of Hog Numbers From 1996 Census ..... 13
Figure 3.6 Pork Processing as of April, 1998 ..... 13
Figure 3.7 Percent Change in Poultry Numbers From 1981 to 1996 ..... 14
Figure 3.8 Inventory of Poultry Numbers From 1996 Census ..... 14
Figure 3.9 Poultry Processing as of April, 1998 ..... 15
Figure 3.10 Percent Change in Dairy Cattle Numbers from 1981 to 1996 ..... 15
Figure 3.11 Inventory of Dairy Numbers From 1996 Census ..... 15
Figure 3.12 Dairy Processing as of April, 1999 ..... 15
Figure 3.13 Percent Change in Grain Crop Hectare Numbers From 1981 to 1996 ..... 16
Figure 3.14 Inventory of Grain Hectares From 1996 Census ..... 16
Figure 3.15 Grain Processing as of April, 1998 ..... 16
Figure 3.16 Percent Change in Oilseed Hectares From 1981 to 1996 ..... 17
Figure 3.17 Inventory of Oilseed Hectares From 1996 Census ..... 17
Figure 3.18 Oilseeds Processing as of April, 1999[1] ..... 18
Figure 3.19 Percent Change in Specialty Crop Hectares From 1981 to 1996 ..... 18
Figure 3.20 Inventory of Specialty Crop Hectares From 1996 Census ..... 18
Figure 3.21 Percent Change in Horticultural Crop Hectares From 1981 to 1996 ..... 19
Figure 3.22 Inventory of Horticultural Hectares From 1996 Census ..... 19
Figure 3.23 Inventory of Forage and Pasture Hectares From 1996 Census ..... 20

Table 3.1 Numbers of Cows and Feeders by Province (1996 Census) ..... 11
Table 3.2 Sow and Total Pig Inventory Numbers by Province (1996 Census) ..... 12
Table 3.3 Total Inventory of Hens and Chickens by Province (1996 Census) ..... 14
Table 3.4 Inventory of Dairy Cows by Province (1996 Census) ..... 15
Table 3.5 Number of Hectares by Crop and Province (1996 Census) ..... 16
Table 3.6 Hectares of Oilseed Production by Province (1996 Census) ..... 17
Table 3.7 Specialty Crop Hectares by Crop and Province (1996 Census) ..... 18
Table 3.8 Horticultural Crop Hectares by Province (1996 Census) ..... 19
Table 3.9 Forage/Pasture/Fodder Hectares by Province (1996 Census) ..... 19
Table 3.10 Irrigation by Prairie Region ..... 20
Table 3.11 Provincial Breakdown of Agricultural Resources ..... 20
Table 3.12 Percent Change in Livestock Units/Hectares From Base Case Scenario ..... 27
Table 3.13 Percent Change in Productivity From Base Case Scenario ..... 27
Table 3.14 Percentage of Bulk and Processed Product Exported by Scenario ..... 27
Table 4.1 Export Revenue by Industry Cluster ..... 29
Table 4.2 Scenario I Results, 1996 to 2005 ..... 29
Table 4.3 Scenario I Export Revenue Projection – Western Canada ..... 30
Table 4.4 Future Capital Outlay Required – Other Factors ..... 31
Table 4.5 Scenario II Results, 1996 to 2005 ..... 32
Table 4.6 Scenario II Export Revenue Projection – Western Canada ..... 33
Table 4.7 Capital Outlay - Other Factors ..... 33
Table 5.1 Productivity Changes (%) Required in Order to Balance Resource Availability (Scenario I) ..... 38
Table 5.2 Productivity Changes (%) Required in Order to Balance Resource Availability (Scenario II) ..... 38
Table 5.3 Shortage/Excess of Forage by Province and by Production Type – Scenario I ..... 39
Table 5.4 Shortage/Excess of Forage by Province and by Production Type – Scenario II ..... 39
Table 5.5 Summary Comparison of Available vs Required Hectares (000,000 ha) ..... 40

# EXECUTIVE SUMMARY

## NATURE OF THE STUDY

The Canadian Agri-Food Marketing Council (CAMC) established a target of 4% of world trade ($40 billion) for the agricultural and agri-food sectors of Canada by the year 2005. The target was accepted by the Federal and Provincial Ministers of Agriculture in July, 1998. Agriculture and Agri-Food Canada developed a macroeconomic outline of Canadian agriculture and agri-food exports, based on these CAMC projections.

PFRA has teamed up with the Rural Secretariat of Agriculture and Agri-food Canada (AAFC), to commission a study to address the impacts of CAMC's targets on the prairie provinces. The overall study has been divided into three separate components: scenario development; environmental implications; and rural implications.

Serecon Management Consulting, with the assistance of an appointed Technical Committee, was charged with the responsibility of conducting the first phase of the overall study; scenario development.

## DEFINED PURPOSE

The stated purpose of the study was:

- *"To develop one base line and three future scenarios for the agriculture and agri-food industry on the prairies based on increasing Canadian exports of agriculture and agri-processed products. The scenarios will include detail on changes to prairie cropping patterns, livestock numbers and concentrations, value-added processing, infrastructure, labour, and other key inputs needed to meet increased export targets. The scenarios will provide information to analyze the environmental and socio-economic impacts on rural areas of the prairies in future studies.*
- *To identify, discuss, and prioritize key constraints to meeting increased export targets for the agriculture and agri-processing industry on the prairies."*

The consulting team and the Technical Committee agreed that the study would encompass a baseline and two fully developed scenarios.

## STUDY PROCESS

The study process involved four distinct phases of activity. The first phase included the development of a benchmark profile of the industry that could be used as the basis on which to evaluate different growth scenarios.

The second phase of the study involved identifying the implications of two scenarios for the future direction of agriculture and agri-food production in the prairie provinces (including the British Columbia Peace River region). The first scenario was based on an analysis of the output from Agriculture and Agri-food Canada's (AAFC) Medium Term Policy Baseline (MTO), while the second scenario was developed from a consensus among industry experts regarding the future direction of prairie agriculture.

This "industry consensus" was obtained using a number of methods, including both telephone and in-person interviews. The general concept involved the use of a technique similar to the Delphi approach. In this specific application, a panel of industry experts were asked to respond to a set of questions regarding the potential for growth (by geographical region) for their specific industry. This information was then tabulated by sector in order to identify significant differences in opinion. When there were obvious differences, these individuals were then asked to reconsider and possibly revise their previous response in light of the group information that had been provided. This basic process was reproduced until some degree of consensus was reached. It is important to note that the goal of this approach is to produce a relatively narrow spread of opinions within which the majority of experts concur.

The third phase included the assessment of the two scenarios identified in Phase II, and the final phase involved a scenario workshop with the Technical Committee that was used to refine the approach.

## STUDY RESULTS

The results of the analysis examined both the anticipated impacts on export revenue generated by the prairie provinces, as well as the projected pressures on the land base under the two scenarios evaluated.

The output from Scenario I indicated an increase of export revenue from Western Canada by 36% over 1996, to $17.1 billion. If the prairies share of the national production was to increase to approximately 63% as suggested in the interviews, this value would correspond to a Canadian export revenue of $27 billion (assuming 1996 price levels).
The following table provides a breakdown of the results in terms of export revenue predictions for the prairie provinces.

**Scenario I Export Revenue Projection – Western Canada**

| Export Revenue | 1996 Revenue | Revenue Change | 2005 Revenue |
|---|---|---|---|
| Feeders | $ 1,675,794,648 | $ 528,855,479 | $ 2,204,650,127 |
| Pork | 674,914,464 | 937,753,082 | 1,612,667,546 |
| Poultry | 16,485,791 | 105,613,784 | 122,099,575 |
| Dairy | 105,690,986 | -29,857,902 | 75,833,083 |
| Grain | 6,003,824,134 | 323,757,933 | 6,328,299,699 |
| Oilseeds | 2,226,868,816 | 1,492,830,885 | 3,719,699,700 |
| Specialty Crops | 828,535,380 | 305,826,998 | 1,134,362,378 |
| Hort. Crops | 237,637,950 | 195,277,225 | 432,915,175 |
| Other Ag. Prod. | 800,000,000 | 700,000,000 | 1,500,000,000 |
| **Total Export Revenue** | **$12,569,752,168** | **$4,560,057,484** | **$17,130,527,284** |

There is an anticipated $2.5 billion in direct capital investment, and 8,648 more people required by the primary industry in order to obtain the goals as stated in Scenario I.

The output from Scenario II projects an increase of export revenue from Western Canada by 55% to $19.6 billion over the 1996 Base Case. If the relative percentage of Western Canadian exports was to increase to 63% as suggested by industry interviewees, this figure would be representative of a Canadian export revenue of approximately $31.3 billion.

**Scenario II Export Revenue Projection – Western Canada**

| Export Revenue | 1996 Revenue | Revenue Change | 2005 Revenue |
|---|---|---|---|
| Feeders | $ 1,675,794,648 | $1,099,003,566 | $ 2,774,798,214 |
| Pork | 674,914,464 | 1,443,557,751 | 2,118,472,215 |
| Poultry | 16,485,791 | 1,648,579 | 18,134,370 |
| Dairy | 105,690,986 | -42,276,654 | 63,414,332 |
| Grains | 6,003,824,134 | 530,151,881 | 6,544,622,361 |
| Oilseeds | 2,226,868,816 | 2,407,670,584 | 4,634,539,399 |
| Specialty Crops | 828,535,380 | 640,988,187 | 1,469,523,567 |
| Hort. Crops | 237,637,950 | 265,106,831 | 502,744,781 |
| Other Ag. Prod. | 800,000,000 | 700,000,000 | 1,500,000,000 |
| **Total Export Revenue** | **$12,569,752,168** | **$7,045,850,725** | **$19,626,249,239** |

Scenario II anticipates a $3.9 billion direct capital investment, and 18,576 additional people to attain the projected growth, and export revenue of $19.6 billion.

The industry also provided input on a number of factors that they felt to be critical in achieving the scenario growth projections.

The following tables outline the projected hectares required to support the two scenarios by province for field crops and forage production. These figures identify areas of projected land base constraints.

**Summary Comparison of Available Crop Hectares[1] vs Required Hectares (000,000 ha)**

| Region | Available | Scenario I Surplus (Shortage) | Scenario II Surplus (Shortage) |
|---|---|---|---|
| British Columbia | 0.138 | +0.03 | +0.028 |
| Alberta | 7.6 | (628) | (582) |
| Saskatchewan | 13.3 | (1.294) | (1.753) |
| Manitoba | 3.9 | (0.433) | (424) |
| **Total** | **25.0** | **(2.4)** | **(2.8)** |

[1] Alfalfa and fodder hectares are included under the forage category for this analysis.

**Summary Comparison of Available Total Forage vs Required Hectares (000,000 ha)**
*(aggregated based on average productivity)*

| Region | Available | Scenario I Surplus (Shortage) | Scenario II Surplus (Shortage) |
|---|---|---|---|
| British Columbia | 0.499 | +0.259 | +0.216 |
| Alberta | 10.5 | (0.276) | (1.252) |
| Saskatchewan | 7.4 | (0.523) | (2.688) |
| Manitoba | 2.8 | +0.547 | +0.346 |
| **Total** | **21.13** | **+0.079** | **(3.377)** |
| Total Surplus (Shortage) | | **(2.32)** | **(6.18)** |

The number of crop hectares required to achieve the Scenario I forecast would increase by about 2.8 million over the 1996 base projections, resulting in a total shortfall of 2.4 million hectares, while Scenario II projections would see an increase of 3.2 million hectares over the 1996 base, with an estimated shortfall of over 2.8 million hectares.

While a slight surplus of forage production area (7.9 thousand hectares) is projected in Scenario I, a deficit of 3.4 million hectares is projected under Scenario II.

The total projected shortfall would jump from 2.3 million hectares under Scenario I to 6.2 million hectares in Scenario II. Since the actual land base is relatively fixed, the shortfall actually represents an overall resource constraint that would have to be addressed through increased management efficiency, technological improvements, and/or imported products.

An analysis of the necessary increase in productivity for grain, oilseeds, and forage production was completed. The results are reported on an individual province basis and for the prairie region in total. It is important to note the efficiency increases that were estimated are in addition to the estimates provided by industry experts during the consensus building process.

The analysis suggested that projected industry expansion would require a significant increase in effort in order to address productivity and management practice improvements in prairie agriculture and agri-food production.

# 1.0 INTRODUCTION

## 1.1 BACKGROUND

Canada's agricultural production and food distribution system continues to undergo major structural changes. Western Canadian agricultural policy reform assists industry as it competes in the global marketplace. Much emphasis has been placed on the promotion of increased competitiveness and expansion in the agri-food value-added sector, which would allow Canada to capitalize on new and emerging markets while still ensuring a solid penetration of traditional markets.

The agriculture and agri-food sector in Canada, and more specifically Western Canada, is poised for significant growth which will be influenced by a variety of factors:

- Global population is expected to be 6 billion by 2000, and 8.1 billion by 2025. The population growth in Canada will increase modestly at 0.9% annually, while world growth will be at 1.5% annually, suggesting that much of the demand for Western Canadian products will grow through exports.
- While currently experiencing economic problems, the expectations for income growth in Asia is forecasted at between 6-12% annually over the long term. This growth rate, coupled with a huge population base, opens up food and fibre opportunities in this region.
- Trade agreements are facilitating the international movement of goods and services between Canada and the developing regions of the world, including China, the APEC countries, and Latin American countries. In addition, technology and modern communication techniques are lowering the costs of communication and transportation.
- Environmental issues are becoming more important to both Canada and her trading partners. This could lead to possible trade barriers, but more likely will lead to increased market differentiation opportunities for clean, safe, and wholesome products.
- Demographics and consumer attitudes toward nutrition, health, and food quality are leading to the development of new products and industries such as nutraceuticals, functional foods, health foods, and generally value-added and enhanced food products. With the world's population aging, new types of food and packaging are required.
- The world food supply/demand balance will be challenged as the available farmland is declining. World water resources are increasingly limited, and agricultural production technologies will experience difficulties replicating the rates of productivity growth achieved over the past 50 years. The implications for long term real growth in agricultural commodities is significant.
- Global commerce is increasingly being dominated by long term strategic alliances, and supply chain partnerships. Such alliances allow companies the critical market access, infrastructure, competitive intelligence, and capacity for risk diversification to survive in the complex international marketplace.

There is significant potential for the prairie provinces to share in the expected growth of domestic and international food and fibre markets. The region has a significant and diversified supply of raw materials (cattle, hogs, grain and mixed crops, pulses and oilseeds, forages, and many other crops); a strong technical, educational, and research infrastructure; a supportive political climate; and is developing and attracting the industrial corporate base.

The Canadian Agri-Food Marketing Council (CAMC) has established a target of 4% of world trade ($40 billion) for the agricultural and agri-food sectors of Canada by the year 2005 in an attempt to provide guidance to the industry. The target was accepted by the Federal and Provincial Ministers of Agriculture in July, 1998. Reaching this level of trade involves significant change to both the size and structure of the agriculture and agri-food industry. In fact, the magnitude of the figures proposed by the CAMC for the meat industry suggests that the increase in processed exports would require all domestic production to be processed in Canada. Additionally, the CAMC has identified the need to change the ratio of bulk to value-added exports from 60:40 to 40:60.

The trade growth projections raise a number of issues of critical importance to the prairie provinces:

- What is the prairies' share of the 2005 export target for primary and processed products?
- Under what conditions are these targets realistic and achievable?
- In what specific sectors within the agriculture and value-added sector is this growth likely to occur?
- What are the implications of this growth on the needs for capital investment, human resource development (skill development, labour, management), and on other sectors in the economy.
- What are the resource implications on the primary agriculture sector? In particular, does the primary sector have the capacity to produce the quantity and quality of products which the existing and new growth industries will require?
- What are the implications on the location of production, and the related environmental issues?

Agriculture and Agri-Food Canada has developed a macroeconomic outline of Canadian agriculture and agri-food exports, based on the CAMC projections, but little work has been completed that looks at the microeconomic impacts suggested changes will have. The implications of these shifts in the agriculture and agri-food industry are of significant importance to the prairie provinces, and need to be evaluated from economical, sociological, and environmental perspectives.

PFRA has teamed up with the Rural Secretariat of Agriculture and Agri-food Canada (AAFC), to commission a study to address the impacts of CAMC's targets on the prairie provinces. The overall study has been divided into three separate components: scenario development; environmental implications; and rural implications. Each component of the project is to be contracted separately, with the results of the scenario development phase being used in the subsequent phases. This study addresses the first component, scenario development.

A Technical Committee consisting of nine individuals was created in order to facilitate this study. This Committee included:

- Dean Smith, Land Resources Coordinator, PFRA;
- George Brown, Senior Policy Analyst, PFRA;
- Aurelie Mogan, Senior Economist and Rural Secretariat, AAFC;
- Jim Atcheson, Assistant Director, Marketing and Information Services Branch (MISB), AAFC;
- Bob MacGregor, EPAI Domestic Agricultural Policy, AAFC;
- Bob Zentner, Scientist Agricultural Economics, Semi-arid Prairie Agricultural Research Centre, AAFC;
- Glen Werner, Director, Rural Development Division, AAFRD;
- Rick Burton, Saskatchewan Agriculture and Food; and,
- Janet Honey, Manager Marketing Analysis and Statistics, Manitoba Agriculture.

## 1.2 Objectives And Scope

The overall objectives of the project are:

- *"To develop one base line and three future scenarios for the agriculture and agri-food industry on the prairies based on increasing Canadian exports of agriculture and agri-processed products. The scenarios will include detail on changes to prairie cropping patterns, livestock numbers and concentrations, value-added processing, infrastructure, labour, and other key inputs needed to meet increased export targets. The scenarios will provide information to analyze the environmental and socio-economic impacts on rural areas of the prairies in future studies.*
- *To identify, discuss, and prioritize key constraints to meeting increased export targets for the agriculture and agri-processing industry on the prairies."*

During the second meeting between the consulting team and the Technical Committee in Regina, Saskatchewan on April 17th, 1999, it was decided that there would only be the baseline and two scenarios fully developed.

The scenarios are developed as follows:

- Scenario I: from the AAFC Medium Term Policy Baseline; and,

- Scenario II: from a consultative process with the agriculture and agri-food industry of Western Canada.

This information is to be used as a key input in Phase II of the evaluation of socio-economic and environmental implications to be completed subsequent to this analysis.

The analysis completed in this study combined existing quantitative data, with expert opinion/ consensus, and specific resource constraints at a Census Division level. A number of assumptions were made in order to accomplish this and are clearly stated at the outset. One of the most important outcomes of this analysis is providing a methodology, at a sub-regional level, which would identify potential constraints to growth, and allocate projected growth to the respective geographic regions of the prairies.

Secondary data were used throughout this analysis and the results are heavily related to the accuracy of this information. This data has been verified where possible by industry experts, but in many cases this level of industry expertise was at a more macro level. This was not a limiting factor as numerous cross-checks were used to verify the relative accuracy of the raw data used.

One of the key assumptions made in this analysis was the consistency of relative prices, exchange rates, and production practices, unless otherwise suggested in the industry consensus building exercise. It was also assumed that increased production would be able to find markets at the going market price. As discussed in the initial meeting with the Technical Committee, this analysis was not intended to be a dynamic economic modelling exercise to predict industry behaviour/response to market signals.

# 2.0 STUDY METHODOLOGY

## 2.1 OVERVIEW

The study methodology involved four distinct Phases as outlined in Figure 2.1. The first Phase included the development of a benchmark profile of the industry that could be used as the basis on which to evaluate different growth scenarios.

The second Phase of the study involved forecasting the future direction of agriculture and agri-food production in the prairie provinces (including the British Columbia Peace River region). One part of this process included an analysis of the output from Agriculture and Agri-food Canada's (AAFC) Medium Term Policy Baseline (MTO), while the second part of the process involved developing a consensus among other industry experts regarding the future direction of prairie agriculture. This consensus was obtained using a number of methods including both telephone and in-person interviews.

Once these tasks were accomplished, estimates of the specific micro impacts of these AAFC and industry forecasts were then established at the Census Division (CD) level using a Scenario Analysis Model (SAM). These estimates were then presented to the Technical Committee and further refined prior to incorporating the results into this final report.

It should be emphasized that a SAM is just a tool that is used to help quantify the opinions of industry experts at the CD level, and should not be considered the ultimate end product of this analysis. However, a thorough discussion of its operation is outlined in order to provide a general understanding of how it works, and what assumptions are made. A detailed discussion of how the industry consensus was reached is also provided in the following sections.

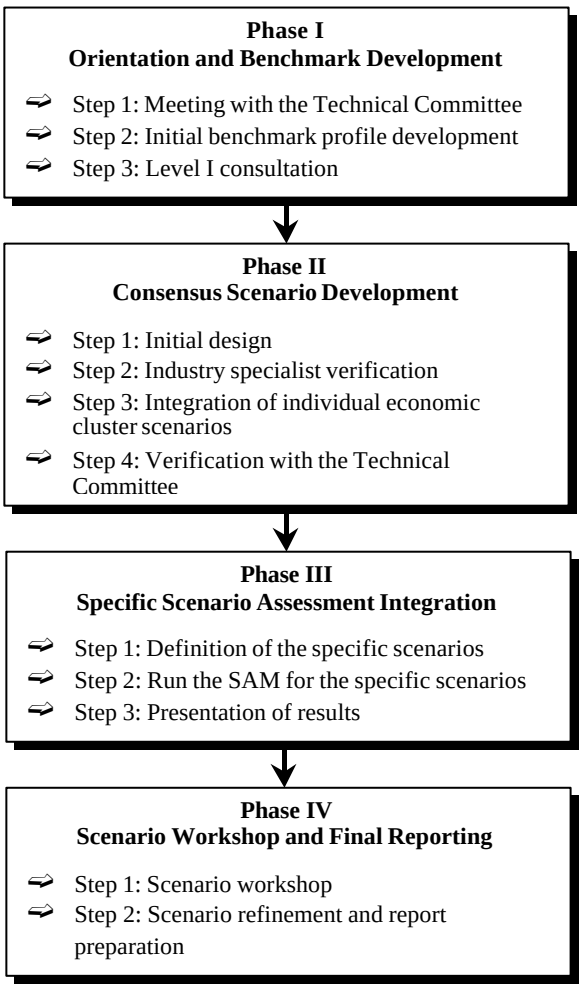
## 2.2 METHODOLOGY

Figure 2.1 outlines the four Phases and corresponding work steps that were followed in completing the analysis. A detailed discussion of specific project activities follows.

A Base Line data set was developed from 1996 statistics, and trends were defined using currently available information. Two separate scenarios were then developed:

- Scenario I – AAFC's MTO; and,
- Scenario II: Consensus of Industry Expert Opinions (not considering resource constraints).

**Figure 2.1**
**Methodology**




The scenario analysis determined the direct and indirect outputs, employment, and investment levels at each primary and intermediate economic activity stage to meet the targets.

Due to the extensive amount of data generated, results have been aggregated to the provincial level

for reporting purposes. Results at the CD level are presented in the Appendices. Further presentation of data at CD level will be done by PFRA.

**Phase I: Orientation and Benchmark Development**

The consulting team, in conjunction with the Technical Committee and provincial and industry representatives, formulated a benchmark profile that was used as the foundation on which the various scenarios were modelled.

The agriculture and agri-food sector was broken into a group of industries (or clusters) defined by functional and strategic linkages both within product and input markets. For example, the pork sector industry was modelled and analyzed within each scenario. The pork sector was inclusive of the final and intermediate processing sub-sectors (slaughtering and final processing), plus the primary hog production sector, together with the input requirements (feed, concentrates, land base, etc.) for production of hogs. Other industry clusters included beef, poultry, dairy, grains, oilseeds, speciality crops, and horticultural crops.

The benchmark year design was heavily reliant on point-in-time data, but a historical information series was analyzed. The most consistent data source by province that can provide reliable comparisons of production and livestock numbers across the country is the 1996 Census of Agriculture. The Census data also has the advantage that it is used as one of the primary inputs to the MTO. Using the Census as the primary source of data for benchmark development allowed the analysis to be conducted at the CD level.

The 1996 MTO data for export values for the various product segments was also used in generating the baseline for this analysis. This data created difficulties, as it was not broken down by province, and in some cases not even by an east/west split. A significant amount of effort was spent ensuring that an appropriate amount of revenue was allocated to the respective provinces based on their relative primary production levels and processing capacities. These estimates were also refined during the following Phases of the project after discussions with industry experts.

The Technical Committee was provided with a short report outlining the details of the benchmark profile which would allow them to provide critical input on its content. A consultation was held with the Technical Committee via video conference call with three primary objectives; to ensure the appropriate bench-mark profile was agreed to; to undertake an identification of the priority opportunity sectors to be analyzed in the scenarios; and to discuss the proposed scenario analysis design.

**Phase II: Consensus Scenario Development**

The process used to derive the scenarios involved developing a consensus among agriculture and agri-industry experts.

This “industry consensus” was obtained using a number of methods, including both telephone and in-person interviews. The general concept involved the use of a technique similar to the Delphi approach that was originally developed by a research group at the Rand Corporation. In this specific application, a panel of industry experts – all of whom were physically separated and unknown to each other – were asked to respond to a set of questions regarding the potential for growth (by geographical region) for their specific industry. This information was then tabulated by sector in order to see if there were significant differences in opinion. When there were obvious differences, these individuals were then asked to reconsider and possibly revise their previous response in light of the group information that had been provided. This basic process was reproduced until some degree of consensus was reached. It is important to note that the goal of this approach is to produce a relatively narrow spread of opinions within which the majority of experts concur.

The key to developing useful scenarios is to ensure that the technical coefficients (things that will vary) are properly established so that the flexibility of the process is ensured. This was of critical importance in this project since the development of the various scenarios required multiple iterations. Industry experts were asked to provide input on these coefficients during the interviews conducted for the development of consensus. For example, beef industry experts provided the estimates of the dry matter consumption for feeders, and the death loss during calving, while pork industry experts suggested the appropriate levels of market pigs per sow. Industry experts also suggested how these coefficients would be expected to change over the next few years.

One of the key factors in ensuring consensus in scenario development is to provide a tool that quickly evaluates impacts so that those involved in the consensus can determine the relative importance of constraints – thus determining if their minimum requirements are met. As a result, a SAM was developed for this study.

The SAM developed for this analysis does not predict any industry behavioural characteristics in response to either changes in production practices and/or economic variables. Rather than predicting how production will adjust to some shift in exchange rates, trade issues, or other exogenous factors, the SAM model simply provides an analysis of how many acres of land or units of livestock are required in order to produce a specified level of output. This analysis is conducted at the CD level across the prairie region.

The SAM is based on an integrated spreadsheet model that calculates the total available land base (by CD) that is available for agriculture and agri-food production. As a result of the design, the model allows for substitution among crops and livestock units based on the technical coefficients specified by industry. The available landbase reflects both cultivated and non-cultivated land (native and tame pasture), but there is no automatic substitution between these two parameters if a scenario runs out of cropland, although the model can be adjusted for this if necessary. The efficiency of production/ processing can be adjusted within a specific CD in order to observe the relative impacts. The model does not attempt to balance the result, rather it demonstrates the magnitude of the excess or shortage of the primary factors of production. In this way, the number of scenarios that can be evaluated is virtually limitless. For example: if there is a shortage of pasture in order to feed the number of cattle, based on the current carrying capacity, the necessary adjustments to pasture efficiency for specific CD's can be calculated; increased use of fertilizer and/or the use of genetically modified crops may also increase the productive efficiency of the land base.

The SAM design included the identification of all linkages between the processing, input and primary sectors as provided in the expert interviews by industry segment. The SAM is designed within the framework of integrating the full value chain from the final processing sub-sector, backward or downward through any intermediate processing levels, to the primary agriculture sector, and further to the input demanded by the primary agriculture sector. These steps in the value chain are termed economic sectors.

Within each of these economic sectors, three types of activities were identified and measured; output (expressed in both physical units, and dollar value), employment (number of people employed or operating the businesses), and inputs (hectares, etc.).

The scenario model development was based on the concept, verified in the expert interviews, that each economic sector is linked directly to the output of the final processing sector. By way of example within the pork sector, the target and key variable to which the industry's economic activity is linked is the shipments (final processing value) of pork processed in each province. Any changes in this output value, for example, a goal of doubling this output, will result in a multitude of ripple effects throughout the sector. As such, the economic sectors are linked by a set of coefficients. The establishment of these coefficients comprises one of the more important challenges in the design of the analysis model. These linkages were established and estimated in several ways, including: benchmark industry data and expert opinion.

Due to a lack of province specific information, many of the various coefficients were made to be consistent across the provinces. However, as better information becomes available, the SAM allows these coefficients to be varied by province, and in many cases by CD. For example, discussions with the contacts in the pork industry provided the following technical coefficients: In 1996, the expected number of market pigs per sow was 16; the approximate number of hectares used in order to feed a sow and her progeny was estimated to be 1.295; the dressed weight percentage of a slaughter pig was 78%; approximately 27% of all market hogs were exported live, 28% were exported as dressed pork, and 45% were exported as processed pork products; a value of $1.85, $3.24, and $6.86/kg of product were used in calculating revenue from the pork sector for 1996. A projected increase in the size of and/or revenue from, the pork sector would thus have the appropriate impact on the amount of the factors of production for the industry. The model is a powerful tool in that it does not dictate what can and cannot happen, rather it outlines exactly what would have to happen in terms of efficiency of production/feeding/relative product

exports in order to attain the goals that industry outlines.

In addition to the linkages, the scenario model provided a total of the output and resource requirements (usage). These included the total output of each of the economic sectors, the employment, income, investment, and the quantity and amount of land use.

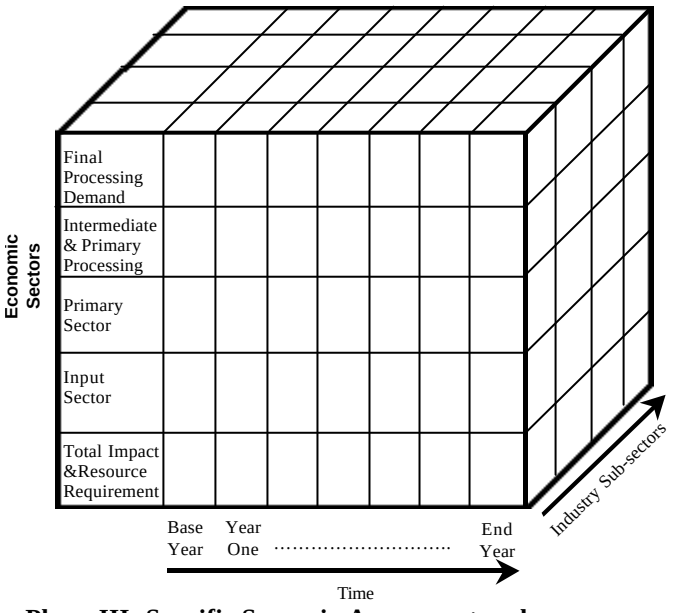
Output from the individual industry clusters by CD was then integrated to assess the impacts on the economy as a whole. Integration of the various sectors was based on the requirement for productive land, which is the single most common factor of production for each of the sectors. If the efficiency of beef processing increases, then fewer slaughter cattle may be required in order to achieve export projections which would then result in fewer hectares required for feed grains and pasture; or a significant increase in the forecasted revenue from the beef sector may in fact require an increase in the number of slaughter cattle which would increase the demands on the landbase.

The base assumption of the model was that the amount of productive land in the prairies is a limited resource. Consequently, each of the economic sectors must draw from this pool of land in order to obtain their goals. The SAM does not allocate a priority ranking to any specific sector, and, as a result, a negative balance in the land base can result if the sum of the resource requirements for the sectors is greater than the current land base. Since the model is generated from the CD level, there may be specific CDs that have excess land capacity even though the prairie provinces have a negative balance in total and visa versa. The real power of the model is in illustrating the impact of various efficiency changes (again either at the CD, provincial, regional, and/or economic sector level) in terms of ensuring there are sufficient primary resources available in order to meet the demands of the agricultural industry. A significant number of factors can have an impact on the productivity of land use, including fertilizer and chemical use, biotechnology, management, crop rotation, and water availability. Response to these factors will vary dramatically by agroecological zone and the actual response functions are not clearly developed at this time. However, the model is set up in a fashion that allows it to be imported into a more specialized Geographic Information System (GIS) package in the future as the response functions become more useable.

Figure 2.2 provides an overview of the basic structures of the integrated model. Each component of the various sectors was evaluated in terms of its contribution to export revenue and its use of the primary resource inputs. The economic (dollar) output is then totalled along with resource use to get the base year requirements. This is then extended across time (columns in matrix) to get a total dollar output and resource requirement as of 2005 for each of the two scenarios. The sum total of these figures for all the sectors provided the total for the prairie provinces as a whole.

As a final component of this analysis, elements of a qualitative assessment were considered, including the implications of growth, particularly as they impact upon supporting infrastructure requirements.

**Figure 2.2**
**Scenario Analysis Model**
**Integrated Model**




**Phase III: Specific Scenario Assessment and Integration**

While the process of developing an effective SAM is difficult and time consuming, once developed it allows for the impacts of numerous factors to be easily tested. As a result, there was a great deal of flexibility available in the process of defining the specific scenarios to be evaluated.

***Scenario I – AAFC's Medium Term Outlook***

This scenario was developed directly from the AAFC Medium Term Policy Baseline prepared by the Economic and Policy Analysis Directorate, Policy Branch, AAFC. The base for this analysis is the 1996 Census of Agriculture information, with macro data for each sector and a summary of exports and imports. The projection incorporates information available to February 1, 1998 and is described as "a plausible view of the future, and not a forecast of future events".

This analysis outlook was broken down into regional/ provincial components. The sub-regional breakdown was based on production reported in the 1996 Census of Agriculture, at the CD level.

The process of allocating the MTO by CD is difficult since the projections used in the MTO are based on regionally estimated relationships. To the extent that the provinces are not homogenous, it is not necessarily appropriate to break these regional estimates down by province. Consequently, many of the assumptions had to be verified through discussions with industry experts. This is not a serious issue, since the assumptions made are explicitly outlined in the SAM, and can be adjusted, as more accurate information becomes available.

***Scenario II – Consensus of Industry Expert Opinions not Considering Resource Constraints***

This scenario was developed by using the CAMC projections as a reference point. These projections were based on Canada achieving 4% of world agriculture and agri-food trade for the year 2005. The base AAFC utilized to develop the CAMC target was from the Food and Agriculture Organization's (FAO) estimate of world export statistics for 1995. The projections for each of the eight clusters (beef, pork, poultry, dairy, grains, oilseeds, specialty crops, and horticultural crops) were not directly tied to the CAMC targets, but provide the context for evaluating the prairie contribution to the national target.

The targets discussed in the previous paragraph were macro in scope, and had to be disaggregated to a prairie level prior to the discussions with industry experts. Export values by Standard Industrial Classification (SIC) code were used in order to calculate the percent of exports by industry cluster. This data was then converted to basic land use and animal numbers. This process provided a basis on which to estimate the prairie contribution to the CAMC targets by industry sector. This specific CAMC target information was used as the basis on which to go to industry representatives across the Prairies to solicit their feedback and estimates for growth to 2005.

A list of industry experts was collected and a survey instrument was designed to solicit responses from each of the eight clusters (Appendix B found in the Appendix Document). Fifty (50) interviews were completed with a significant coverage for each cluster, the agriculture and agri-food industry, and for the three prairie provinces and the Peace River Region of British Columbia.

The consensus building exercise was of critical importance to this analysis. Industry experts not only were able to provide their insight as to the future direction of the various industry segments, but they were also able to verify the specific technical coefficients used in the SAM. In effect, the SAM became the vehicle by which the opinions of industry were brought back to a common base. The industry participants were asked about the potential industry growth, various constraints, their perspective as to sector strengths/weaknesses/opportunity/threats, and their opinion as to the needs of the industry. Where individual industry responses appeared to contradict that of other industry experts, the respective interviewees were contacted again in order to allow them to outline their opinion regarding the conflicting arguments. This process allowed for the development of an industry driven scenario.

The information provided by industry was then used to develop Scenario II. There are two important features of Scenario II that must be clearly understood. The first is that it represents an optimistic forecast by industry experts, and second it is basically unconstrained by any resource limitations.

**Phase IV: Scenario Workshop and Final Reporting**

A scenario workshop was held on April 27th, 1999 at which time the draft results of the process and analysis were presented and critically examined. The Technical Committee and other selected representatives attended.

The specific purpose of this workshop was:

- to share the conceptual framework and preliminary findings of the integrated model with the participants; and,
- to solicit feedback relative to its replication of the reality of potential future industry growth in the key agricultural sub-sectors.

The model was finalized in the context of input from the scenario workshop. The final report, including the results of the scenario simulations was then prepared.

Deliverables included:

- a final report outlining the results of the study; and,
- a functional scenario model which PFRA can use to evaluate other evolving opportunities.

There has never been a shortage of opinions and projections about the future of prairie agriculture. This analysis presents two more. Despite the best efforts made to correctly identify the most accurate representation of data, there are likely a significant number of opinions about the magnitude of many of the parameters used in this model. The important thing to remember is that any of these parameters can be adjusted (at the CD, provincial, and/or prairie level) in order to observe the impact on the ability of the primary factors of production to attain the stated goals.

The model allows for a significant number of factors to be adjusted at the CD level in order to evaluate the impacts of change in production level/efficiency, processing level/efficiency, export levels, and other factors of production. The results presented in this analysis do not represent the consulting teams' predictions of what is going to happen with prairie agriculture. Rather, the two scenarios represent a sub-regional analysis of the MTO as provided by AAFC, and a consensus of industry expert opinion for the potential for Prairie agriculture. It should be noted that the Prairies are defined to include the Peace River area of British Columbia in this document.

# 3.0 Base Case And Scenario Development

## 3.1 General Assumptions

There were a number of assumptions made in each scenario, and while some were specific to the

individual scenario, others were more general in nature. The majority of these estimates are based on commonly used industry figures for Western Canada. While they can vary by sub-regional area in the model, they were held constant for the purpose of this analysis. The following outlines the majority of general assumptions that were made by cluster.

*Beef:*

- 92% calf crop;
- 17% holdback for replacements (of the 92%)
- 83% for feeders (of the 92%)
- feeders from weaning to finish will require 1,963 kg of feed grain and approximately one tonne of hay or silage;
- a finished animal is estimated to be 500 kg on average; and,
- the finished animal is estimated to have a dressed weight of 58% of live weight.

*Pork:*

- 16 pigs sold for slaughter from each sow for 1996, increasing to 18 per sow by 2005;
- the average finished weight for a slaughter pig is estimated at 100 kg;
- the averaged dressed weight is 78% of live weight; and,
- a total of 283 kg of feed grains is required per pig.

*Poultry:*

- broilers are estimated to be 2 kg per bird;
- layers produce an estimated 280 eggs per year; and,
- there are six broiler cycles in a given year.

*Dairy:*

- there was no fluid milk exported in 1996. All of the dairy products exported were processed products such as butter, skim milk powder, cheeses, and other specialty products and these amounted to 63,100,000 kg. A factor of 10 litres of milk for each kg of processed product was used to arrive at an estimated 6,310,000 hectolitres of milk exported in 1996.

*Grains:*

- in the Base Case, the production of wheat averaged approximately 2.43 tonnes/ha, coarse grains average 3.5 tonnes/ha, for an overall average of about 2.90 tonnes/ha;
- the actual yield figures by sub-region are used based on CD productivity measurement provided by PFRA; and,
- the grains cluster includes wheat, barley, oats, corn and rye.

*Oilseeds:*

- in the Base Case the yield of canola for 1996 averaged 1.47 tonnes/ha, flax averaged 1.48 and soybeans 2.52, for an overall average of 1.56 tonnes/ha; and
- the actual yield figures by sub-region are used based on CD productivity measurement provided by PFRA.

*Specialty Crops:*

- specialty crops are made up of canary seed, field beans, field peas, lentils, mustard, sunflower, safflower, triticale, chick peas, hemp, millet, buckwheat and forage seed.

*Horticultural Crops:*

- horticultural crops for this project include only potatoes and sugar beets. It is assumed that all other vegetables, berries, and fruits are consumed domestically, although some are known to be exported, but they would represent minimal hectares; and,
- using average potato consumption figures for Canada of 68 kg per person, resulted in an approximate 70/30 export to domestic split on production for 1996.

For the purpose of this study, Other Agricultural Products included essentially the same products as outlined under this category in the Standardized Industrial Classification (SIC) code information. In addition, this category would include products like fibreboard, ethanol, pet foods, functional foods, other non-food uses of agricultural products, and beer/ distilled products.

The key issue relating to the data that must be considered is the relative difficulty in working with data from various sources that are at different levels of aggregation. This issue is further complicated when numerous industry clusters are combined. A significant amount of resources were used to ensure that these various series worked together in the most efficient and effective manner possible.

The 1996 Census of Agriculture was used as the starting point in this analysis. While there are certain limitations in using a data set that is over two years old, the Census information is the most consistent set of data available at the CD level of aggregation.

Also, we have included information on the processing capabilities for each cluster as at April 1, 1999 in this base data section.

## 3.2 Base Case Development

Information from the 1996 Census of Agriculture and the MTO were used in defining the Base Case. This information provided a significant amount of detail regarding the amount and value of exports. A breakdown of processed versus raw product exports was also provided. However, this information had to be brought back to the number of hectares of production and the number of animal units required to produce these exports in order to be useful in the model.

The Census information provided the total number of hectares and animal units on a CD and provincial level. The MTO provided details on the number of metric tonnes of production consumed domestically and exported outside Canada, along with a unit value. This information was then used in order to estimate the number of hectares of production required to produce the export versus domestic requirements. An estimate of the percent of production (on a hectare basis) that was exported as bulk product versus processed was provided, along with an average revenue per unit of production for each industry cluster.

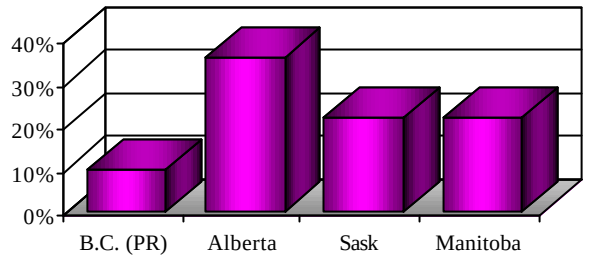
### 3.2.1 Outline of the Industry as of 1996

The following tables and figures provide an overview of the state of the various industry clusters by province in 1996. It should be restated that the prairie totals include the Peace River area of B.C., but that this region is not illustrated on the following maps. The raw data, without the Peace River area of B.C., has been plotted on a map to provide a more visual representation of the data. Processing industry capacities (as of April, 1999) have also been plotted, along with the plant locations.

#### *3.2.1.1 Beef*

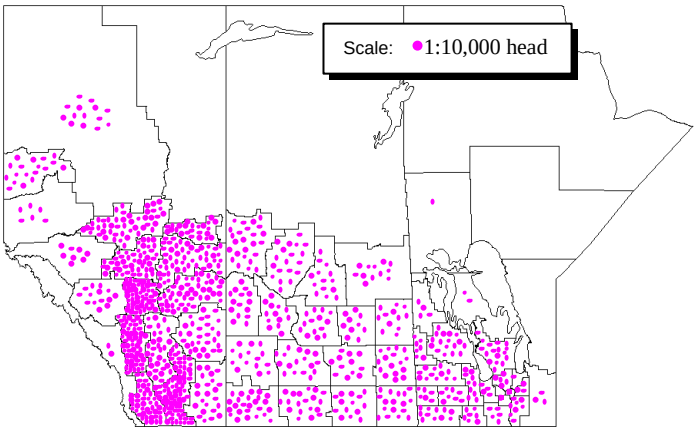
*Production:* Figure 3.1 illustrates the increase in the beef industry that has occurred in Western Canada between 1981 and 1996. While the growth has been most significant in Alberta, the three other regions have also seen a major increase. The specific location of the production by CD for 1996 can be observed in Figure 3.2.

**Figure 3.1**
**Percent Change in Beef Cattle Numbers from 1981 to 1996**




Source: Census of Agriculture.

**Figure 3.2**
**Inventory of Beef Cattle Numbers From 1996 Census**




Source: Census of Agriculture (1996).

As of the 1996 Census of Agriculture, there were a total of 3.7 million cows and 6.0 million feeders in the four regions of interest. A breakdown by location can be seen in Table 3.1

**Table 3.1**
**Numbers of Cows and Feeders by Province (1996 Census)**

| Province | Cows | Feeders |
|---|---|---|
| British Columbia (PR) | 57,360 | 72,308 |
| Alberta | 2,016,889 | 3,703,938 |
| Saskatchewan | 1,135,027 | 1,485,448 |
| Manitoba | 510,197 | 757,412 |
| **Total** | **3,719,473** | **6,019,106** |

The MTO outlined that a total of 3,236,000 cattle were marketed from Western Canada in 1996, with

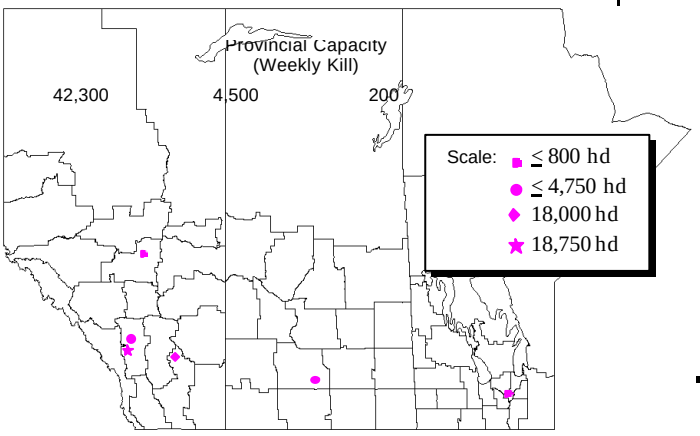
1,123,000 being exported live (35%), and the rest (2,113,000) being processed (65%). The following process was used in order to determine the appropriate amount of feeders that were used for processed export purposes based on data from the MTO.

| | |
|---|---|
| Total Canadian Processed Product (kg) | 311,000,000 |
| Canadian Cattle Equivalents (500 kg/ slaughter animal @ 58% dressed weight) | 1,072,400 |
| Percent of Total Processed Exports From Western Canada | 85%[1] |
| Total Cattle Equivalents Exported (Processed) From Western Canada | 911,540 |
| Total Cattle Equivalents Exported (Live) From Western Canada | 1,123,000 |
| Total Cattle Equiv. Exported (W. Cdn.) | 2,034,540 |
| Percent of Processed Beef Shipped as Carcass | 50%[1] |
| Percent of Processed Beef Shipped as Further Processed | 50%[1] |
| Price for Live Cattle | $79.00/cwt[2] |
| Price for Carcass | $3.48/kg[2] |
| Price for Further Processed | $6.18/kg[2] |

*Processing:* Figure 3.3 outlines the various beef processing facilities that exist on the prairies as of April, 1999, and includes a description of weekly kill capacity levels.

There are a total of six main processors of beef in Western Canada, with four being located in Alberta, one in Saskatchewan, and one in Manitoba. The total weekly kill is estimated to be 47,000 animals. This capacity is expected to increase to 84,500 by 2005, largely due to potential significant increases in processing at Cargill Foods in High River, and Lakeside Packers (IBP) at Brooks, Alberta. Specific details can be found in Appendix A in the Appendix Document.

**Figure 3.3**
**Beef Processing as of April, 1999**




Source: Discussion with industry participants.

### *3.2.1.2 Pork*

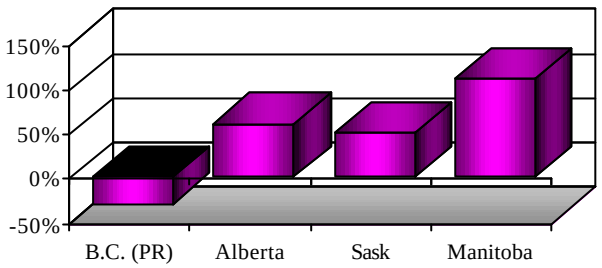
*Production:* Hog production increased significantly in Western Canada between 1981 to 1996, with only British Columbia experiencing a decline in production. Manitoba witnessed an increase of slightly over 100%, while both Alberta and Saskatchewan had an increase of approximately 50%. Table 3.2 outlines the actual 1996 numbers by region. It should also be recognized that there has been a significant expansion in the industry since 1996, and in some cases the MTO 2007 target has already been met.

**Table 3.2**
**Sow and Total Pig Inventory Numbers by Province (1996 Census)**

| Province | Sows | Total Pig Inventory |
|---|---|---|
| British Columbia (PR) | 424 | 5,252 |
| Alberta | 174,195 | 1,729,810 |
| Saskatchewan | 72,239 | 757,027 |
| Manitoba | 177,596 | 1,777,352 |
| **Total** | **424,454** | **4,269,441** |

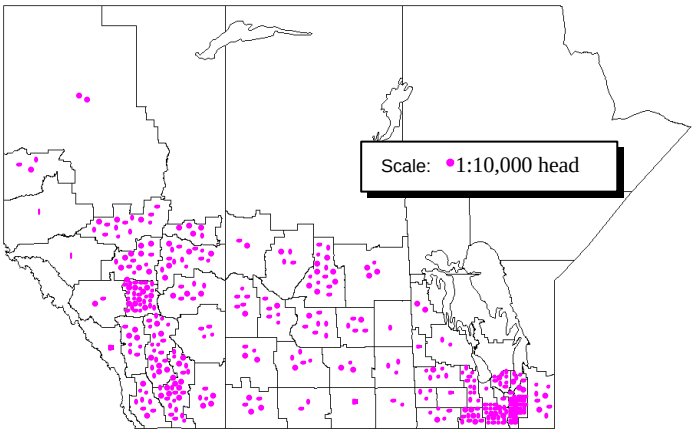
A breakdown of total hog inventory by CD can be observed in Figure 3.5.

**Figure 3.4**
**Percent Change in Hog Numbers From 1981 to 1996**




Source: Census of Agriculture.

**Figure 3.5**
**Inventory of Hog Numbers From 1996 Census**

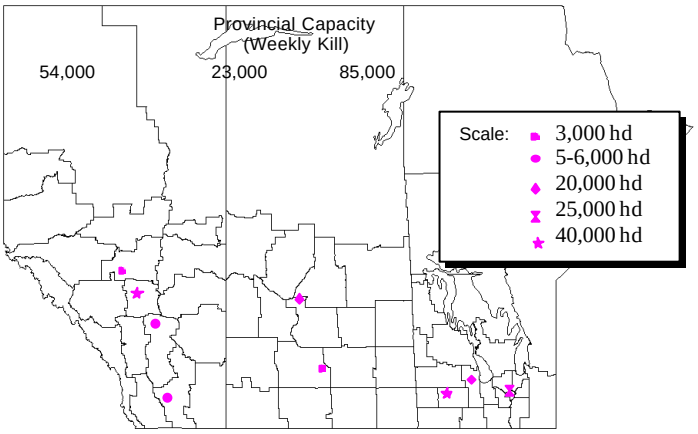



The MTO outlined that a total of 959,000 slaughter hogs and 507,000 weaner hogs were exported from Western Canada in 1996. A total of 5.9 million hogs were slaughtered in Western Canada in 1996. The following process was used in order to determine the appropriate amount of hogs that were used for processed export purposes based on data from the MTO.

| | |
|---|---|
| Total Canadian Processed Product Exported (kg) | 372,000,000 |
| Canadian Sow Equivalents (100 kg/ slaughter animal @ 78% dressed weight, and 16 pigs/sow) | 297,700 |
| Percent of Total Processed Exports From Western Canada | 36%[3] |
| Total Hog Equivalents Exported (Processed) From Western Canada | 107,172 |
| Total Hog Equivalents Exported (Live) From Western Canada | 91,625 |
| Total | 198,797 |
| Percent of Processed Hogs Shipped as Carcass | 38%[3] |
| Percent of Processed Hogs Shipped as Further Processed | 62%[3] |
| Price for Live Hogs | $1.85/kg[4] |
| Price for Carcass | $3.24/kg[4] |
| Price for Further Processed | $6.86/kg[4] |

*Processing:* Figure 3.6 outlines the various pork processing facilities that exist on the prairies as of April, 1999, and includes a description of weekly kill capacity levels.

**Figure 3.6**
**Pork Processing as of April, 1998**




Source: Discussion with industry experts.

There are nine key processing plants in Western Canada, with four being located in Alberta, three in Manitoba, and two in Saskatchewan. Weekly processing capacity is expected to jump from 162,000 to 277,000 by 2005. Specific details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

### *3.2.1.3 Poultry*

*Production:* Poultry numbers declined in Alberta and British Columbia (Peace River Region) between 1981 and 1996, despite increasing in both Saskatchewan and Manitoba. Figure 3.8 outlines the distribution of the total number of hens and chickens

[3] Estimates of industry experts interviewed.

[4] Figures provided in the MTO.

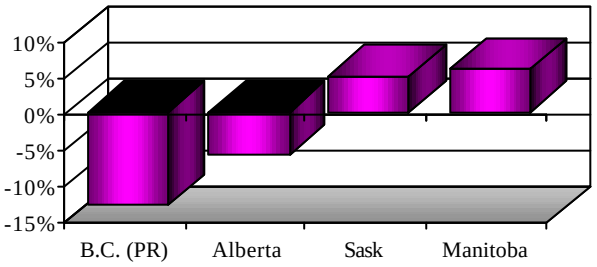
by province by CD, while Table 3.3 provides the total numbers by province as of the 1996 Census.

**Table 3.3**
**Total Inventory of Hens and Chickens by Province (1996 Census)**

| Province | No. of Hens and Chickens[1] *(Inventory at a Point in Time)* |
|---|---|
| British Columbia (PR) | 28,411 |
| Alberta | 9,485,635 |
| Saskatchewan | 3,516,027 |
| Manitoba | 6,403,908 |
| **Total** | **19,433,981** |

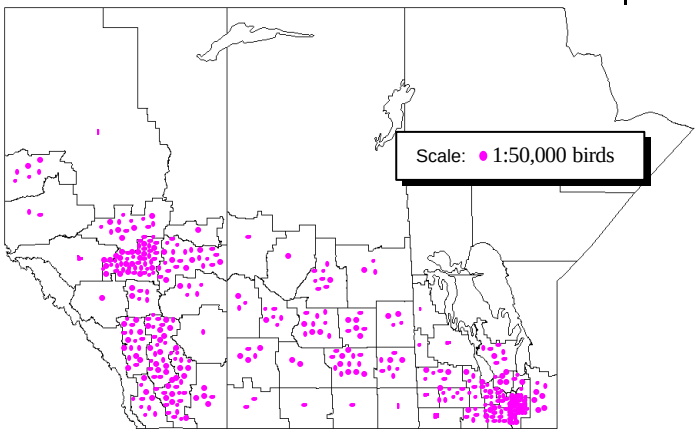
[1] It should be noted that while the layers operate on a 62-66 week cycle, the broilers operate on a 6 to 8 week cycle, meaning that the broiler inventory was multiplied by a factor of 6 in order to get annual production.

**Figure 3.7**
**Percent Change in Poultry Numbers From 1981 to 1996**




Source: Census of Agriculture.

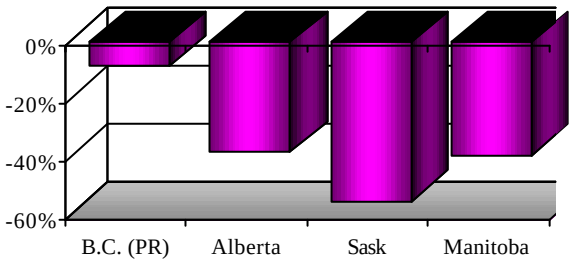
**Figure 3.8**
**Inventory of Poultry Numbers From 1996 Census**




The following process was used in order to determine the percent of total production in bird equivalents that were exported.

| | |
|---|---|
| Total Canadian Exports of Chicken (tonnes) | 33,000 |
| Canadian Broiler Equivalents (at 2 kg/broiler) | 16,500,000 |
| Western Canadian Export Share (at 10%) | 1,650,000[5] |
| Export as a Percent of Total Western Canadian Broiler Production (1,650,000/58,301,946) | 2.8%[6] |
| Total Canadian Exports of Processed Eggs ('000 boxes of 15 dozen) | 1,392 |
| Canadian Layer Equivalent (@ 280/layer/year) for Export | 894,800 |
| Percent of Total Exports From Western Canada | 20%[7] |
| Total Western Canadian Export Layer Equivalents | 178,960 |
| Exports as a Percent of Total Western Canadian Layer Production (178,960/9,716,991) | 1.8%[8] |

| | |
|---|---|
| Wholesale Chicken Price (cents/kg) | 262[9] |
| Breaker Egg Price (cents/dozen) | 84[9] |

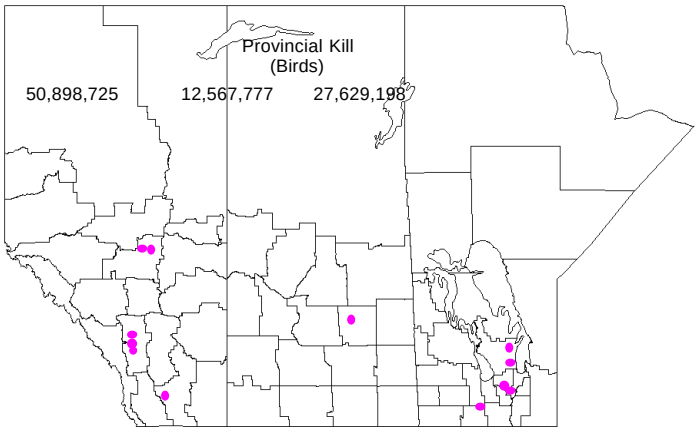



It was assumed that all poultry exports were in processed form based on discussions with industry experts.

imates of industry experts interviewed.
ures based on the estimated total Western Canadian
er production in 1996.
imates of industry experts interviewed.
ures based on the estimated total layer numbers as of
.
ures provided in the MTO.

*Processing:* There are twelve key processing plants in Western Canada, with five being located in Alberta, six in Manitoba, and one in Saskatchewan. Annual processing capacity is not expected to change between now and 2005 according to industry experts. Specific details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

**Figure 3.9**
**Poultry Processing as of April, 1998**




Source: Discussions with industry experts.

### *3.2.1.4 Dairy*

*Production:* Dairy cattle numbers declined in every province in Western Canada between 1981 and 1996. Table 3.4 outlines the 1996 inventory of dairy cows by province, while Figure 3.11 illustrates the dispersion of cattle numbers by CD.

**Table 3.4**
**Inventory of Dairy Cows by Province**
**(1996 Census)**

| Province | Total Dairy Cow Inventory |
|---|---|
| British Columbia (PR) | 3,158 |
| Alberta | 102,830 |
| Saskatchewan | 38,154 |
| Manitoba | 59,404 |
| **Total** | **203,546** |

**Figure 3.10**
**Percent Change in Dairy Cattle Numbers from 1981 to 1996**

Source: Census of Agriculture.

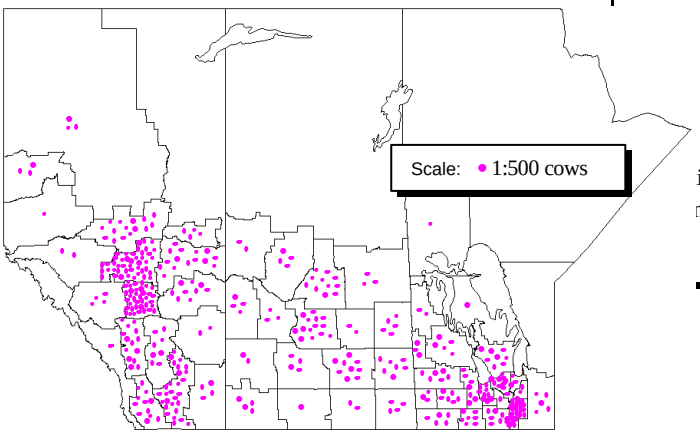



**Figure 3.11**
**Inventory of Dairy Numbers From 1996 Census**

The actual numbers of live dairy cattle exports, generally for genetics purposes, are not recorded in the MTO. As a result, it was assumed that the only exports that occurred were in the form of processed products, with a small amount of exports of milk through the export program. The following process was used in order to estimate the approximate dairy cow equivalents that were exported.

| | |
|---|---|
| Total Amount of Processed Products Exported (Canada) (kt) | 63.1 |
| Assuming 10 L of Milk for 1 kg of Processed Product (hl) | 6,310,000[10] |
| Average Milk Production per Cow (hl/year) | 62.41[10] |
| Canadian Dairy Cow Equivalents for Export | 101,105 |
| Western Canada's Herd as a Percent of Total Canadian Herd | 16.6%[11] |
| Western Canadian Cow Equivalents for Export | 16,783 |
| Average Price for Processed Product (kg) | $4.16[11] |

*Processing:* There are thirty-three key processing plants in Western Canada, with sixteen being located in Alberta, twelve in Manitoba, and five in Saskatchewan. Annual processing capacity is not expected to change between now and 2005 according to industry experts. Specific details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

**Figure 3.12**
**Dairy Processing as of April, 1999**

imates provided by industry experts interviewed.
nsus of Agriculture.

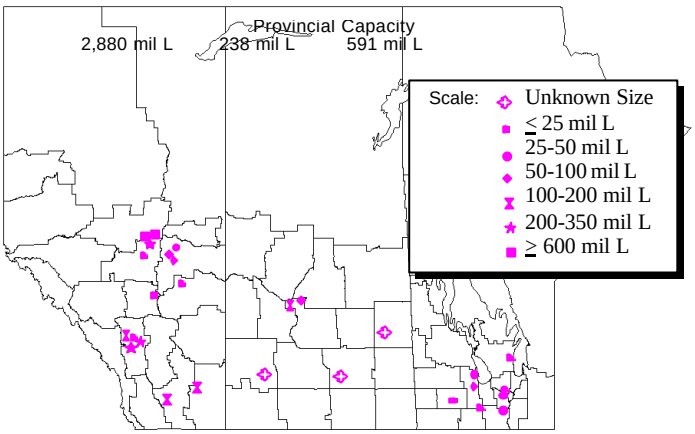



**Figure 3.14**
**Inventory of Grain Hectares From 1996 Census**

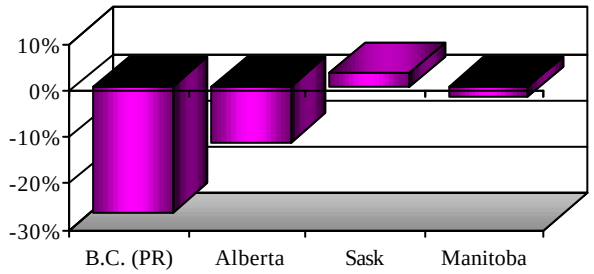
### *3.2.1.5 Grains*

*Production:* The hectares of grains declined in every Western Canadian province between 1981 to 1996 with the exception of Saskatchewan, which had a slight increase. The actual number of hectares by crop and province can be seen in Table 3.5, while the distribution by CD can be observed in Figure 3.14

**Table 3.5**
**Number of Hectares by Crop and Province (1996 Census)**

| Prov. | Wheat | Barley | Oats | Rye | Total |
|---|---|---|---|---|---|
| B.C. (PR) | 34,563 | 30,867 | 23,789 | 1,337 | 90,556 |
| Alta. | 2,964,260 | 2,337,393 | 560,967 | 41,628 | 5,904,248 |
| Sask. | 7,350,846 | 1,910,161 | 883,015 | 82,196 | 10,226,218 |
| Man. | 1,698,321 | 630,332 | 423,134 | 32,326 | 2,784,113 |
| **Total** | **12,047,990** | **4,908,753** | **1,890,905** | **157,487** | **19,005,135** |

**Figure 3.13**
**Percent Change in Grain Crop Hectare Numbers From 1981 to 1996**




Source: Census of Agriculture.

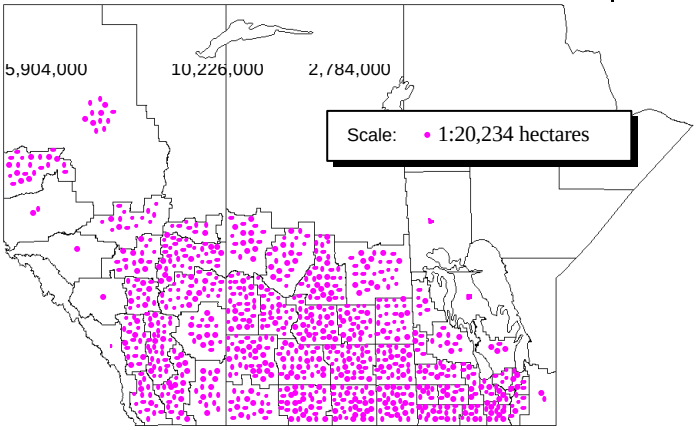
As in the previous categories, export volume estimates have to be calculated from the following data.

The following process was used in order to estimate the export equivalents for grains in hectares for Western Canada:

| | |
|---|---|
| Total Canadian Exports of Bulk Grains | $5,805 m[12] |
| Total Canadian Exports of Processed Grains | $1,084 m[12] |
| Total Export Volume | 29.67 mil t[12] |
| Total Export Volume Bulk (@ 92% of total volume) | 27.296 mil t[13] |
| Total Export Volume Processed (@ 8% of total volume) | 2.37 mil t[13] |
| Bulk Production for Export (@ 2.9 t/ha) | 9,412,414 ha |
| Processed Production for Export (@ 2.9 t/ha) | 817,241 ha |
| Bulk Export Price | $200/t[14] |
| Processed Export Price | $400/t[14] |

*Processing:* There are thirty-two key processing plants in Western Canada, with ten being located in Alberta, nine in Manitoba, and thirteen in Saskatchewan. Daily processing capacity is not expected to increase significantly between now and 2005 according to industry estimates. Details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

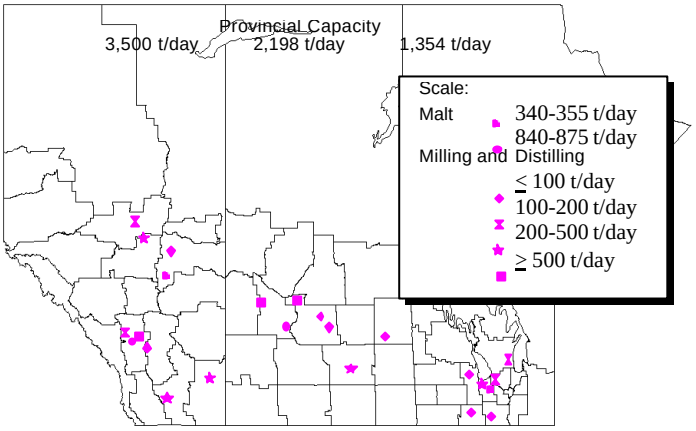
**Figure 3.15**
**Grain Processing as of April, 1998**




sed on figures provided in the MTO.

lculated from figures provided in the MTO and ed by industry experts.

sed on figures provided in the MTO.



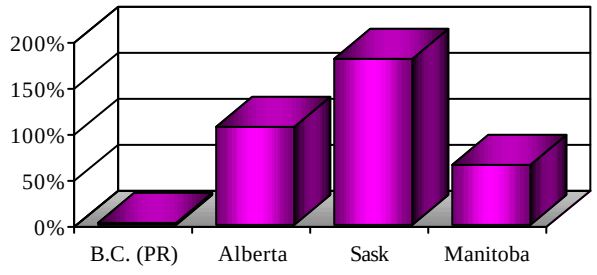

### *3.2.1.6 Oilseeds*

*Production:* There had been a significant increase in oilseed production in all of the Western Canadian provinces from 1981 to 1996. Production in the B.C. Peace River Region declined in 1996 due to weather related issues, but generally has had increased production during this period. As can be observed in Figure 3.16, Saskatchewan led the way with an increase in hectares in excess of 160%, while Alberta had slightly over a 100% increase, and Manitoba a 55% increase. The primary oilseed in terms of both hectares and total production is canola. Table 3.6 outlines the 1996 production of soybeans, flax seed, and canola by province, while Figure 3.17 demonstrates the dispersion of production by CD.

**Table 3.6**
**Hectares of Oilseed Production by Province (1996 Census)**

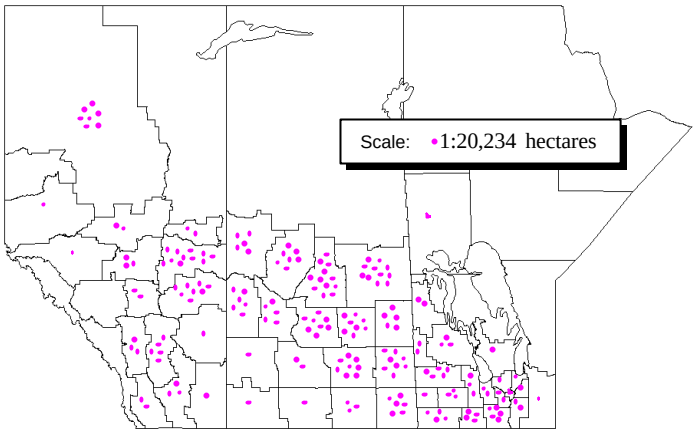
| Province | Canola | Soy | Flax | Total |
|---|---|---|---|---|
| B.C. (PR) | 24,866 | - | 189 | 25,055 |
| Alberta | 1,275,284 | 429 | 13,792 | 1,289,505 |
| Saskatchewan | 1,568,896 | - | 347,097 | 1,915,993 |
| Manitoba | 636,511 | 237 | 230,294 | 867,042 |
| **Total** | **3,505,557** | **666** | **591,372** | **4,097,595** |

**Figure 3.16**
**Percent Change in Oilseed Hectares From 1981 to 1996**




Source: Census of Agriculture.

**Figure 3.17**
**Inventory of Oilseed Hectares From 1996 Census**




The MTO reports the following exports of oilseeds from Canada:

| | |
|---|---|
| Canola Seed (Bulk) | 2.52 mil t |
| Canola Oil | 0.68 mil t |
| Canola Meal | 1.10 mil t |
| Flax | 0.68 mil t |
| Soybeans | 0.48 mil t |
| Total | 5.46 mil t |

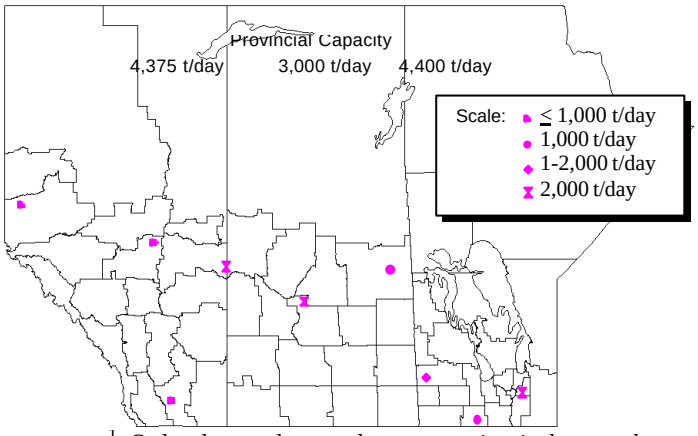
Since soybean production is minimal in Western Canada, and flax and canola production is minimal in Eastern Canada, it was assumed that a total of 4.98 million tonnes of oilseeds/oilseed products were exported from Western Canada. The following process was used in order to determine the appropriate amount of oilseed hectare equivalents for exports of processed and unprocessed oilseed products from Western Canada.

| | |
|---|---|
| Yield of Canola | 1.47 t/ha |
| Yield of Flax | 1.48 t/ha |
| Average Yield | 1.475 t/ha |
| Bulk Export Hectares | 2,169,000 ha |
| Processed Export Equivalent | 1,243,202 ha |
| Percent of Hectare Equivalents Exported Bulk | 64%[15] |
| Percent of Hectare Equivalents Exported Processed | 36%[15] |
| Canola Export Price | $441/t[16] |
| Canola Oil Price | $726/t[16] |
| Canola Meal Price | $244/t[16] |

[15] Estimates of industry experts interviewed.
[16] Figures provided in the MTO.

*Processing:* There are fifteen key processing plants in Western Canada, with five being located in Alberta, four in Manitoba, and six in Saskatchewan. Daily processing capacity is not expected to increase over the next six years according to industry contacts. Specific details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

**Figure 3.18**
**Oilseeds Processing as of April, 1999[1]**




[1] Only those plants whose capacity is known have been located in Figure 3.18.

### *3.2.1.7 Specialty Crops*

*Production:* Specialty crop production increased significantly in Western Canada between 1981 and 1996 as illustrated in Figure 3.19. Table 3.7 outlines the number of specialty crop hectares by crop and province for 1996, while Figure 3.20 shows the dispersion of specialty crop hectares by CD.

**Table 3.7**
**Specialty Crop Hectares by Crop and Province (1996 Census)**

| Crop | BC | Alta | Sask | Man |
|---|---|---|---|---|
| Mustard Seed | - | 37,194 | 197,195 | 4,444 |
| Sunflower | - | 690 | 10,067 | 25,473 |
| Safflower | - | 659 | 837 | - |
| Dry Field Peas | 3,270 | 115,755 | 357,855 | 58,262 |
| Lentils | - | 7,793 | 279,243 | 16,071 |
| Dry White Beans | - | 1,576 | 549 | 13,237 |
| Fababeans | - | 88 | 178 | 1,647 |
| Dry Coloured Beans | - | 9,835 | 4,668 | 12,764 |
| Canary Seed | - | 9,665 | 210,240 | 28,730 |
| **Total** | **3,270** | **183,255** | **1,060,832** | **160,628** |

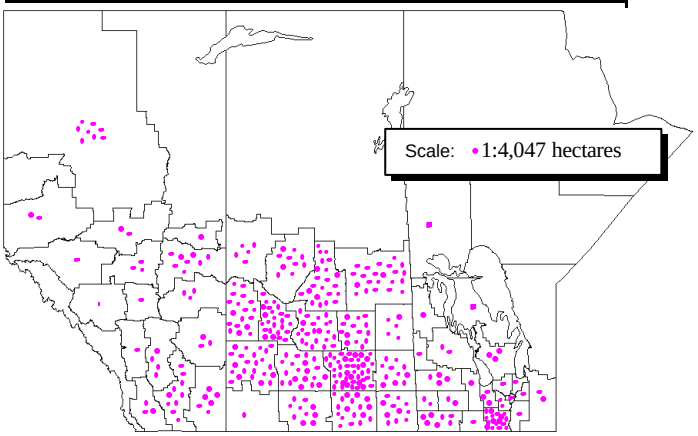
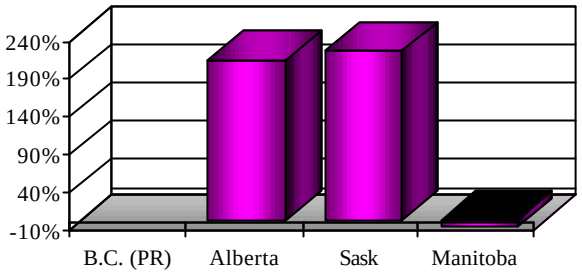



**Figure 3.19**




**Percent Change in Specialty Crop Hectares From 1981 to 1996**

Source: Census of Agriculture.

**Figure 3.20**
**Inventory of Specialty Crop Hectares From 1996 Census**

The percent of processed versus bulk exports of specialty crops is difficult to determine with any degree of accuracy. As a result, it was assumed that 60% of exports are in bulk form, while 40% are processed based on contacts with individuals active in the market.

*Processing:* There are thirteen key processing plants in Western Canada, with six being located in Alberta, four in Manitoba, and three in Saskatchewan. Processing capacity is difficult to estimate, but is expected to increase with crop production.

### *3.2.1.8 Horticultural Crops*

*Production:* For the purpose of this report, horticultural crops were limited to potatoes and sugar beets due to the fact that these are the two crops that take up the most significant amount of production, especially for export. Also, it is assumed all other vegetables and fruit crops are utilized for domestic consumption.

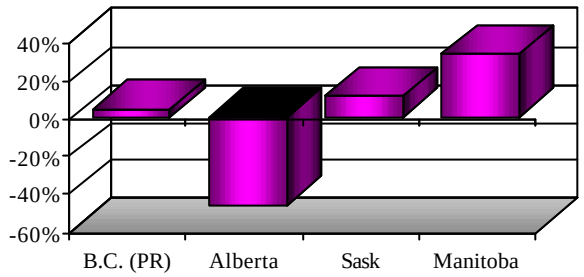
Horticultural crop production increased in all Western Canadian provinces, with the exception of Alberta, from 1981 to 1996. Alberta had a significant decline in the production of sugar beets during this period of time.

Table 3.8 provides details as to the total production of potatoes and sugar beets by province, while Figure 3.22 illustrates the actual location of crops by CD.

**Table 3.8**
**Horticultural Crop Hectares by Province**
**(1996 Census)**

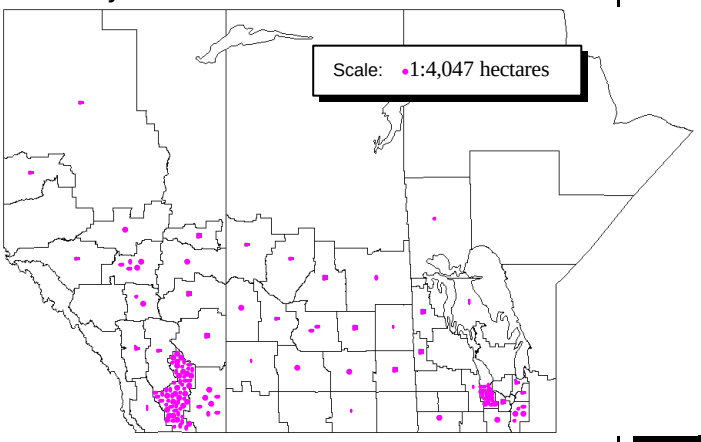
| Province | Potatoes | Sugar Beets | Total |
|---|---|---|---|
| British Columbia (PR) | 26 | - | 26 |
| Alberta | 12,743 | 14,662 | 27,405 |
| Saskatchewan | 2,787 | - | 2,787 |
| Manitoba | 28,353 | 9,204 | 37,557 |
| **Total** | **43,909** | **23,866** | **67,775** |

**Figure 3.21**
**Percent Change in Horticultural Crop Hectares From 1981 to 1996**




Source: Census of Agriculture.

**Figure 3.22**
**Inventory of Horticultural Hectares From 1996 Census**




The following discussion indicates how the proportion of hectares that are exported was calculated.

| | |
|---|---|
| National Domestic Consumption (30 million @ 68 kg/person) | 2.042 b kg |
| Canadian Hectare Equivalent (@ 26.4 tonnes/ha) | 77,338 ha |
| Percent of Canadian Production Consumed Domestically (174,262 ha) | 44% |
| Western Canadian Domestic Consumption (5 million @ 68 kg/person) | 340 m kg |
| Western Canadian Hectare Equivalent (@ 26.4 tonnes/ha) | 12,879 ha |
| Percent of Western Canadian Production Required for Western Canadian Consumption | 19% |

*Processing:* There are a total of eighteen key processing facilities located in Western Canada, with fifteen in Alberta, one in Saskatchewan, and two in Manitoba. Total processing capacity is not easily calculated, but potato processing capacity is forecast to increase dramatically in Alberta and Manitoba due to recent announcements. Specific detail regarding the location of processing facilities can be found in Appendix A in the Appendix Document.

These results suggest that exports of potatoes and sugar beets from Western Canada could potentially be in excess of 80% of production. However, since some of the production from Manitoba could potentially go into Eastern Canada, an export percentage of 70% of production was used. In addition, information collected from Statistics Canada on exports by Standard Industrial Classification suggested that approximately 10% of the exports (by volume) were in processed versus bulk form.

### *3.2.1.9 Forage*

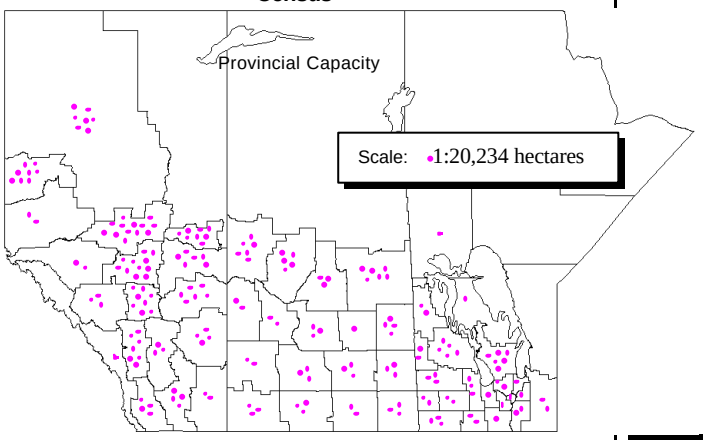
*Production:* The forage category includes four different subcategories: tame hay/pasture; native pasture; and alfalfa production, and all other tame hay and forage crops. Figure 3.23 outlines the tame hay and fodder hectares by CD, while a more detailed breakdown of all four forage categories by province is provided in Table 3.9.

**Table 3.9**
**Forage/Pasture/Fodder Hectares by Province**
**(1996 Census)**

| Province | Tame Pasture | Native Pasture | Alfalfa | All Other Tame Hay/ Fodder |
|---|---|---|---|---|
| BC (PR) | 96,991 | 282,545 | 64,030 | 55,554 |
| Alta | 1,914,603 | 6,615,497 | 1,213,107 | 710,430 |
| Sask | 1,233,306 | 5,093,598 | 814,875 | 274,420 |
| Man | 356,243 | 1,653,812 | 574,144 | 175,168 |
| **Total** | **3,601,143** | **13,645,452** | **2,666,156** | **1,215,572** |

For the purpose of this analysis, no exports of forages are assumed. While this will have a small impact on the export dollars generated, it will not have a significant impact on the amount of hectares required. All the forage production is assumed to be used by the livestock industry and as a result, is not discussed in terms of Scenario I and II projections, other than to report the total amount of production, and the excess/shortage by province, both in terms of hectares of production and tonnes of production. It is important to note that the amount of forage exports tends to be undervalued in Statistics Canada figures due to a $1,250 load rate that eliminates the requirements for truckers to stop and record loads of hay going to the U.S.

**Figure 3.23**
**Inventory of Forage and Pasture Hectares From 1996 Census**




*Processing:* There are twenty-five processing plants in Western Canada, with fourteen being located in Alberta, nine in Saskatchewan, and two in Manitoba. Annual processing capacity is estimated to be 840,000 tonnes. There is not expected to be a significant amount of growth in the processing capacity of this sector between 1996 and 2005. Specific details about the location and capacity of specific plants can be found in Appendix A in the Appendix Document.

#### *3.2.1.10 Irrigation*

While there is a significant amount of irrigated production in some parts of Manitoba, Saskatchewan, and Alberta, the total amount of irrigated crop land is less than 1% of the total crop land available. The B.C. Peace River area has very little irrigation as can be observed in the following table.

**Table 3.10**
**Irrigation by Prairie Region**

| Province | Irrigated Area (ha) |
|---|---|
| British Columbia (PR) | 308 |
| Alberta | 516,600 |
| Saskatchewan | 97,378 |
| Manitoba | 22,190 |
| **Total** | **636,476** |

While occupying only a small fraction of land, irrigation is a very important component of prairie production since its productivity is generally significantly higher than corresponding dryland areas. This area is likely to become even more important in terms of the value produced, since there is expected to be increased pressure to seed higher value specialty crops versus forages in the future. It is important to recognize that an analysis of the impact of irrigation must be completed at the CD level, since it gets lost when aggregated at the prairie level. The SAM allows for this type of micro analysis, as the amounts and productivity of irrigated land are reported by individual CD.

### 3.2.2 Summary of Base Case Resources

The following table provides a summary of the state of Western Canadian agricultural resources as of the 1996 Census of Agriculture. The information forms the basis on which the Base Case was developed.

**Table 3.11**
**Provincial Breakdown of Agricultural Resources**
*(000,000 ha)*

| Province | Crop Land[1] | Summer Fallow | Total Tame & Native Pasture |
|---|---|---|---|
| British Columbia (PR) | 0.257 | 0.030 | 0.379 |
| Alberta | 9.547 | 1.437 | 8.530 |
| Saskatchewan | 14.399 | 4.431 | 6.327 |
| Manitoba | 4.699 | 0.324 | 2.011 |
| **Total** | **28.902** | **6.221** | **17.247** |

[1] For the purpose of this presentation, alfalfa and all other tame hay/fodder was included under crop land, however, it is included with tame pasture for model calculations since it is largely used as forage for livestock production.

Agri-food exports (excluding fish) totalled $20.0 billion in 1996 according to Statistics Canada. The prairie provinces accounted for slightly over 60% of this amount. Based on an analysis of the products by SIC code, it is estimated that the value of primary agricultural production accounted for 76% of total exports from the prairie provinces, while accounting for only 55% of the total Canadian value of exports.

## 3.3 Scenario I – AAFC Medium Policy Baseline/ Outlook

### 3.3.1 Overview

The MTO itself draws on the work of several other publications including the Organization for Economic Co-operation and Development's (OECD) Agri-cultural Outlook (1998), and other world agricultural outlooks. Canadian macroeconomic projections are taken from the Conference Board of Canada's Autumn 1997 forecast. The baseline also incorporates comments received at a government/industry work-shop held in Ottawa on December 15, 1997.

The MTO assumes stable world macroeconomic and political conditions, normal weather patterns, and a status quo international and domestic policy environment. Estimates in the MTO are expressed in terms of single numbers but are best interpreted as midpoints of ranges.

It is fair to say that the MTO is a macro view of Canadian agriculture, and it is difficult to extrapolate MTO results to the CD level. While the backbone of the MTO is formed by a number of models, most of these again are macro in nature and the raw data used as input is generally expressed at the aggregate level.

As previously discussed, this scenario is the result of the sub-regional analysis of AAFC's Medium Term Policy Baseline. The prairie component of this baseline was broken down by CD for each industry cluster. The main difficulty in breaking the MTO results down to a sub-regional level is in the conversion of hectares of crop/numbers of livestock to export dollar values. As previously stated, the SAM requires that each output be explicitly expressed in terms of the amount of landbase required in order to produce one unit of production. There is no reconciliation of this process by sub-region in the MTO. As a result, these conversions have to be estimated based on input from the industry and commonly used conversion ratios.

This process was verified in the SAM by calculating the conversion parameter at the macro level from the MTO, applying it to the base data in the SAM, and then testing the results to observe how close the absolute magnitude of production and exports were to those estimated using the MTO. Once the results of the SAM could replicate the 1996 results for the MTO, it was then used in order to test the sub-regional impacts of the MTO forecasts.

It is important to note that since the MTO does not change the technical coefficients of production by province, that neither did the SAM adjust the specific sub-regional coefficients from their 1996 levels. However, these could be adjusted from 1996 levels (by CD) if accurate data was available. For example, while the reported crop yield represents a prairie average, this is actually calculated by a weighted average crop yield by CD for the four regions being evaluated. If there was a priori information suggesting that the relative yield or area of production would increase more in one CD than another, the SAM could adjust for this.

In general, the process of breaking the MTO estimates down by CD consisted of calculating the magnitude of change forecast by the MTO between 1996 and 2007, converting it to a per unit change in the basic factor of production, and then using the SAM to identify the impact of this change in terms of the primary factors of production. The impact of the changes on levels of investment, amount of labour required, and the impact on the number of operations was also outlined. No attempt at measuring changes in the amount of fertilizer, chemical, or water requirements was made as these change on an annual basis as a result of numerous exogenous factors, including crop prices in the case of fertilizer and chemical use, and natural rain fall and temperature levels in the case of livestock water consumption. Industry experts also suggested that there are no current or foreseeable limitations for these factors causing concern at the present time.

The following discussion outlines some of the key assumptions that were made in modelling this specific scenario. A summary of the assumptions by sector can be observed in Tables 3.12 to 3.14.

### 3.3.2 Beef

Under the beef scenario, the total number of livestock marketings increased by a total of 10% to 3,570,000 head. However, the slaughter numbers increased by

1,037,000 (50%), largely due to a significant decline in the number of live cattle exports (702,000). Beef product exports more than doubled, going from 311 kt to 719 kt.

The following process was used in order to determine the appropriate amount of feeders that were used for processed export purposes.

| | |
|---|---|
| Total Canadian Processed Product (kg) | 719,000,000[17] |
| Canadian Cattle Equivalents (500 kg/ slaughter animal @ 58% dressed weight) | 2,479,310 |
| Total Cattle Equivalents Exported (Processed) From Western Canada | 2,355,345 |
| Total Cattle Equivalents Exported (Live) From Western Canada | 421,000[17] |
| Total | 2,776,345 |
| Percent of Western Canada Beef Shipped Live | 15%[18] |
| Percent of Western Canada Beef Shipped Processed | 85%[18] |
| Percent of Processed Beef Shipped as Carcass | 55%[18] |
| Percent of Processed Beef Shipped as Further Processed | 45%[18] |

### 3.3.3 Pork

As reported in the MTO, the total number of hogs marketed from Western Canada increased from 6.8 million head to 11.2 million, representing an increase of 64%. Slaughter hogs increased by 3.5 million to 9.5 million in total. Exports of slaughter hogs increased by 120%.

The following process was used in order to determine the appropriate amount of hogs that were used for processed export purposes.

| | |
|---|---|
| Total Canadian Processed Product Exported (kg) | 607,000,000[17] |
| Canadian Sow Equivalents (100 kg/ slaughter animal @ 78% dressed weight, and 18 pigs/sow) | 432,336 |
| Percent of Total Canadian Processed Exports From Western Canada | 90%[18] |
| Total Hog Equivalents Exported (Processed) From Western Canada | 389,102 |
| Total Hog Equivalents Exported (Live) From Western Canada | 78,722[18] |
| Total | 467,824 |
| Percent of Western Canada Hogs Shipped Live | 17%[18] |
| Percent of Western Canada Hogs Shipped Processed | 83%[18] |
| Percent of Processed Hogs Shipped as Carcass | 30%[18] |
| Percent of Processed Hogs Shipped as Further Processed | 70%[18] |

### 3.3.4 Poultry

The MTO projected that Canadian chicken production would increase by 31% between 1996 and 2007. Total egg production increased by 15% with table egg production increasing by 5%, and processed egg production up by 70%.

The following process was used in order to determine the percent of total production in bird equivalents that were exported.

| | |
|---|---|
| Total Canadian Exports of Chicken (tonnes) | 45,000[19] |
| Canadian Broiler Equivalents (at 2 kg/broiler) | 22,500,000 |
| Western Canadian Export Share (at 10%) | 2,250,000[20] |
| Export as a Percent of Total Western Canadian Broiler Production (2,250,000/(9,716,991 x 6)) | 3.9% |
| Total Canadian Exports of Processed Eggs ('000 boxes of 15 dozen) | 1,789[19] |
| Canadian Layer Equivalent (@ 280/layer/year) | 1,150,071 |
| Percent of Total Exports From Western Canada | 20%[20] |
| Total Western Canadian Export Layer Equivalents | 230,014 |
| Exports as a Percent of Total Western Canadian Layer Production (230,014/9,716,991) | 2.4% |

### 3.3.5 Dairy

Total Canadian milk production is expected to increase by 4% by 2007 in the MTO, with fluid milk

[17] Source: MTO.
[18] Estimates based on discussion with industry experts.
[19] Source: MTO.
[20] Estimates based on discussion with industry experts.

increasing by 10% and industrial milk decreasing slightly (1%).

As previously mentioned, the actual numbers of live dairy cattle exports, generally for genetics purposes, are not recorded in the MTO. As a result, it was assumed that the only exports that occurred were in the form of processed products. The following process was used in order to estimate the approximate dairy cow equivalents that were exported. Exports of dairy products are expected to decrease, basically because of a large reduction in skim milk powder exports. The expected volume of exports is 52 kt, down from 63.1 kt in 1996.

| | |
|---|---|
| Total Amount of Processed Products Exported (Canada) (kt) | 52[19] |
| Assuming 10 L of Milk for 1 kg of Processed Product (hl) | 5,200,000[20] |
| Average Milk Production per Cow (hl/year) | 71.77[20] |
| Canadian Dairy Cow Equivalents (cows) | 72,453 |
| Western Canada's Herd as a Percent of Total Canadian Herd | 16.6%[20] |
| Western Canadian Cow Equivalents for Export | 12,027 |

### 3.3.6 Grains

Grain production is forecast to increase by 3.8% under the MTO, and yield is expected to increase by 5%. A decline in the value of bulk exports (7%) is projected, while the value of processed exports is forecast to increase by 92%.

The following process was used in order to estimate the export equivalents for grains in hectares.

| | |
|---|---|
| Total Western Canadian Exports of Bulk Grains | $5,390 mil[19] |
| Total Western Canadian Exports of Processed Grains | $2,076 mil[19] |
| Total Western Canadian Export Volume | 30.25 mil t[19] |
| Total Western Canadian Export Volume Bulk (@ 86% of total volume) | 26.02 mil t[20] |
| Total Western Canadian Export Volume Processed (@ 14% of total volume) | 4.24 mil t[20] |
| Bulk Western Canadian Production for Export (@ 2.9 t/ha) | 8,972,413 ha |
| Processed Production for Export (@ 2.9 t/ha) | 1,462,069 ha |

### 3.3.7 Oilseeds

Oilseed production is anticipated to rise by approximately 46% in the MTO, although yield is expected to decline by about 4% since the 1996 yield was significantly higher than the long term average due to a good production year in most of the regions (with the exception of the B.C. Peace area).

The following outlines the process that was used in order to determine the appropriate export percentages and production from Western Canada.

| | |
|---|---|
| Canola Seed (Bulk) | 2.95 mil t[21] |
| Canola Oil | 0.88 mil t[21] |
| Canola Meal | 1.64 mil t[21] |
| Flax | 0.78 mil t[21] |
| Soybeans | 0.49 mil t[21] |
| Total | 6.74 mil t[21] |

Since soybean production is minimal in Western Canada, and flax and canola production is minimal in Eastern Canada, it was assumed that a total of 6.25 mil t of oilseeds/oilseed products were exported from Western Canada. The following process was used in order to determine the appropriate amount of oilseed hectare equivalents for exports of processed and unprocessed oilseed products.

| | |
|---|---|
| Yield of Canola | 1.41 t/ha[21] |
| Yield of Flax | 1.47 t/ha[21] |
| Weighted Average Yield | 1.43 t/ha |
| Unprocessed Export Hectares | 2,590,277 ha |
| Processed Export Equivalent | 1,750,000 ha |
| Percent of Hectare Equivalents Exported Unprocessed | 60%[22] |
| Percent of Hectare Equivalents Exported Processed | 40%[22] |

### 3.3.8 Specialty Crops

There is virtually no discussion of special crops in the MTO, and the only data provided is the total forecast production and a farm price. Specialty crop production is forecast to increase by 12% between 1996 and 2007, and the estimated increase in productivity was 7%. While not explicitly stated in the MTO, it is expected that the relative percent of processed versus bulk exports is likely to increase

[21] Estimates based on discussion with industry experts.
[22] Source: MTO.

due, for example, to the recent increase in the number of pulse cleaning, splitting, and bagging facilities in Western Canada. This expectation was verified by a number of individuals who handle/trade peas, beans, and lentils.

#### 3.3.9 Horticultural Crops

The value of potatoes and potato product exports is forecast to increase by 104% in the MTO. With domestic population expected to increase to 33.4 million, domestic consumption of potatoes is forecast to increase by 229 thousand tonnes. Productivity and total potato production in Western Canada were forecast to increase by 10% and 25% respectively.

The following discussion indicates how the proportion of hectares that are exported was calculated.

| | |
|---|---|
| National Domestic Consumption (33.4 million people @ 68 kg) | 2.271 b kg |
| Canadian Hectare Equivalent (@ 26.4 tonnes/ha) | 86,030 ha |
| Percent of Canadian Production Consumed Domestically (217,827 ha) | 40%[20] |
| Western Canadian Domestic Consumption (5.56 million people @ 68 kg) | 370 m kg |
| Western Canadian Hectare Equivalent (@ 26.4 tonnes/ha) | 14,321 ha |
| Percent of Western Canadian Production Required for Western Canadian Consumption | 17% |

These results suggest that exports of potatoes and sugar beets from Western Canada could potentially be in excess of 80% of production. However, since some of the production from Manitoba could potentially go into Eastern Canada, an export percentage of 70% of production was used. Statistics Canada estimates of exports by Standard Industrial Classification suggested that approximately 10% of the exports (by volume) were in processed versus bulk form in 1996. This figure was increased to 40% as a result of the additional processing capacity currently being built in Western Canada.

## 3.4 Scenario II – Consensus Of Industry Expert Opinions

#### 3.4.1 Overview of Scenario II

One of the main purposes of developing a consensus based scenario is to allow industry experts to incorporate the opinions of others from their industry in formulating their opinions. This was accomplished by incorporating various components of the Delphi approach which obtains forecasts through "group consensus". In this application, the industry experts – all of whom were physically separated and unknown to each other – were asked to respond to a series of questions. These responses were evaluated and where there was a significant difference of opinion, respondents were asked to reconsider and potentially revise their opinion in light of information provided by other experts. This process continued until a narrow spread of opinions was generated within which the majority of the respondents agreed. This approach is quite insightful as it allows individuals to potentially respond to questions with increased knowledge since they have the opportunity to incorporate others expertise. An individual who gets the opportunity to respond to the opinions expressed by others may or may not change their opinions once they have the information from others in the industry.

Over fifty industry experts (Appendix B found in the Appendix Document) from the various industry clusters were interviewed and asked their opinion regarding the future direction of their specific industry. Information and projections prepared from the CAMC projections were used as a starting point for discussion and reaction. Successive interviewees were asked to comment on previous statements made by others in the industry. This process was continued until a consensus regarding future industry direction was reached. In most cases, the information obtained from the industry experts was consistent in terms of expectations of future growth and constraints to growth. In fact, when the consensus scenarios were measured in the SAM, the resulting export revenue fell between the two figures projected in the estimates of the CAMC targets, despite the fact that 1996 values were used in the SAM. This suggests that the industry experts in Western Canada are conservatively optimistic based on the CAMC projections.

While the industry experts were asked about their main concerns and industry constraints, the main point of discussion was on their opinions as to the magnitude of change that is likely to occur between 1996 and 2005. Scenario II outlines how the industry growth, predicted by the interviewees, would affect

the basic factors of production at the CD level. Part of the discussion with the industry experts included soliciting their opinion as to potential changes in the various technical coefficients. These opinions have been incorporated in terms of increases in efficiency, increased value added, and changes in other explicit parameters. Where industry experts could not offer an opinion the technical coefficients remained at 1996 levels. The various changes in the coefficients, as dictated in the interviews, can be observed in Tables 3.12 to 3.14.

The following discussion outlines a brief summary of the general nature of the various industry expert opinions by industry cluster and by geographic location where relevant. A summary of specific constraints to growth can be found in Section 4.4.

### 3.4.2 Beef

Thirteen individuals representing a wide geographic region and a broad cross-section of industry players commented on the prospects for the beef industry in Western Canada.

In general, there were no specific comments made regarding the feed conversion efficiency of livestock. One comment was made regarding the trend over the past few years to go to heavier finished animals. A heavier finished animal results in both an increase in the feeding period required in order to finish and in the amount of feed used. These changes were incorporated in the analysis. However, interviewees suggested that there would be an increase in the number of cows and consequently, the number of feeders marketed from 1996 levels by approximately 20% in Alberta, 40% in Saskatchewan, 20% in Manitoba, and 30% in the Peace River Region of British Columbia. Interviewees also indicated that the processing sector would increase the percent of further processing being completed in Western Canadian plants by 5%.

### 3.4.3 Pork

The hog industry is expected to see a significant amount of growth in Western Canada. Saskatchewan is forecasting a 100% increase over the 1996 Base Case, while Alberta and Manitoba are expecting a 40% increase, and British Columbia (PR) is forecasting a 50% increase.

There is a general feeling that the efficiency of hog production is likely to increase to 22 or 23 market pigs per sow in the newer facilities, however, the overall provincial average is more likely to only increase to around 18 market pigs per sow from 16 by 2005. Processors indicated that they expect to see a significant rise in the percent of fully processed pork produced in Western Canada, rising to 70% from approximately 60% under the Base Case Scenario.

### 3.4.4 Poultry

The industry does not appear to have a clear consensus as to the potential impacts of quota removal in the poultry industry. A few interviewees suggested that the six year time span from now to 2005, is simply not long enough in order to see a change in supply management. Those who suggested that supply management would be gone by 2005, had no clear vision as to what the industries potential under a free market could be. Some did express the view that exports of processed chicken could increase significantly without supply management, but did not put a figure on the growth potential.

The only figure that could be agreed on was a 10% increase in poultry production, both for broilers and layers. There was no change in the forecast percent of processing.

### 3.4.5 Dairy

The response from those interviewed from the dairy sector was similar to that received from the poultry sector. The potential impacts of the removal of supply management do not appear to be thoroughly developed at this point in time. Interviewees felt that with no change to supply management, production efficiency would increase by approximately 8 to 10%, but this would likely be offset by a reduction in the total herd size. There was some optimism expressed about the potential for a few of the processed milk products, however, the ultimate impact on the amount of land base of Western Canada was negligible.

### 3.4.6 Grains

Industry players suggested that the estimated growth in grain production area would be much more conservative than that for oilseeds. Estimates ranged from slight declines to about a 5% increase, and as a result a total production increase of 2.5% was used. Productivity increases were forecast to be in the 10% range from the Base Case Scenario.

The forecast for processing levels indicated that there is an expectation that the percentage processed

exports will more than double from the baseline figures.

#### 3.4.7 Oilseeds

Industry experts were unanimous in indicating that there would be increased production of oilseed crops versus the Base Case Scenario. The forecast increase in production area ranged from 45% in Manitoba and Alberta, to 50% in British Columbia (PR) and 65% in Saskatchewan. Interviewees also indicated that developments in genetics would result in increased plant productivity of approximately 10% by 2005. While some individuals were much more aggressive in this estimate, there was a great deal of concern about the difficulties associated with gaining consumer acceptance of the genetically modified varieties.

Industry players also indicated that they hoped the volume of product processed versus exported in bulk, would increase to 60% of total production from approximately 40% at the present time.

#### 3.4.8 Specialty Crops

There is tremendous optimism in the specialty crops area. Interviewees suggested there would be a substantial increase (approximately 33%) in every province. Poor prices for traditional crops combined with significant market demand, were the main drivers given to justify the forecasted market growth.

There appeared to be the feeling that there is an excellent opportunity to increase the export of specialty crops, both into traditional markets as well as Japan, South Korea, and the U.S. While the greatest potential for marginal volume increases is with lentil and garbonzo bean exports, the best opportunity in terms of the absolute increase in volume is felt to be in the pea market, with the bean market following closely behind. While difficult to achieve, significant increases in the short-run due to agronomic constraints, experts suggested that by 2005 the 33% increase could be achievable.

#### 3.4.9 Horticultural Crops

Both Alberta and Manitoba are expecting to have a significant expansion in the potato industry as a result of the prospects for significant investment in processing facilities. Industry experts suggested that horticultural crop hectares are forecast to increase by 12,500 in Alberta (46%), 11,300 hectares in Manitoba (30%), and 5,000 in Saskatchewan (179%). The increase in processing capabilities in Western Canada is forecast to increase the ratio of bulk to processed exports from 90:10 to 40:60.

## 3.5 Summary Of Assumptions For The Two Scenarios

The following tables outline the major changes from the Base Case that are forecast to occur under the two scenarios. It bears repeating that the figures in the following tables come from the MTO in Scenario I and the industry consensus in Scenario II. More complete details for the two scenarios can be found in the Appendices.

There was no change in the amount of irrigation that was used to produce product under any of the scenarios. As previously discussed, the SAM does not predict changes in patterns of production. There is likely to be a change in the use of irrigation on a crop production basis. Once there are reliable estimates of the magnitude of this change, the SAM can be used in order to evaluate the impacts on a CD basis.

The number of acres of summer fallow was not changed from the 1996 base, and there was no conversion of natural to tame pasture. In addition, the productivity of pasture was not changed from the 1996 basis, since there was not a reliable source for predicting this. As a result, the model can be used in order to determine how much the efficiency of pasture would have to improve, if any, in order to meet the demands that industry is placing on it.

Table 3.12 outlines the percent changes in the amount of livestock and hectares produced from the 1996 Base Case, while Table 3.13 outlines the change in efficiency that is anticipated to occur. Table 3.14 outlines the percent processed vs. bulk product exported in 1996 and under the two scenarios.

For example, as outlined in Table 3.12, the MTO suggests an increase of 10% in the number of fed cattle produced in the prairie region, which is well below the forecast by industry at 30% growth in BC, 20% in Alberta, 40% in Saskatchewan, and 20% in Manitoba. There is not expected to be any gains in the efficiency of feed conversion for cattle, as can be seen in Table 3.13, but the percent of exports shipped live vs. carcass and further processed is expected to

decline to 15% under Scenario I and 25% under Scenario II.

**Table 3.12**
**Percent Change in Livestock Units/Hectares From Base Case Scenario**

| Cluster (% Change) | Scenario I[1] | Scenario II | | | |
|---|---|---|---|---|---|
| | Western Canada | PR of British Columbia | Alberta | Saskatchewan | Manitoba |
| Beef Feeders | 10% | 30% | 20% | 40% | 20% |
| Pork | 30% | 50% | 40% | 100% | 40% |
| Broilers | 31% | 10% | 10% | 10% | 10% |
| Layers (Eggs) | 15% | 10% | 10% | 10% | 10% |
| Dairy (Cows) | -11% | 0% | 0% | 0% | 0% |
| Dairy (Milk) | 15% | 0% | 0% | 0% | 0% |
| Grains | 4% | 3% | 3% | 3% | 3% |
| Oilseeds | 46% | 50% | 45% | 65% | 45% |
| Specialty Crops | 12% | 33% | 33% | 33% | 33% |
| Horticultural Crops | 25% | 0% | 46% | 179% | 30% |

[1] MTO projections are made on an East/West basis with few exceptions. As a result, productivity and yield changes are presented as averages for Western Canada as a whole.

**Table 3.13**
**Percent Change in Productivity From Base Case Scenario**

| Cluster (% Change) | Scenario I[1] | Scenario II | | | |
|---|---|---|---|---|---|
| | Western Canada | PR of British Columbia | Alberta | Saskatchewan | Manitoba |
| Beef Feeders | 0% | 0% | 0% | 0% | 0% |
| Pork | 0% | 0% | 0% | 0% | 0% |
| Broilers | 13% | 13% | 13% | 13% | 13% |
| Layers (Eggs) | 0% | 0% | 0% | 0% | 0% |
| Dairy (Cows) | 0% | 0% | 0% | 0% | 0% |
| Dairy (Milk) | 15% | 9% | 9% | 9% | 9% |
| Grains | 5% | 10% | 10% | 10% | 10% |
| Oilseeds | -4% | 10% | 10% | 10% | 10% |
| Specialty Crops | 7% | 0% | 0% | 0% | 0% |
| Horticultural Crops | 10% | 0% | 0% | 0% | 0% |

[1] MTO projections are made on an East/West basis with few exceptions. As a result, productivity and yield changes are presented as averages for Western Canada as a whole.

**Table 3.14**
**Percentage of Bulk and Processed Product Exported by Scenario**

| Cluster | | Base | Scenario I | Scenario II |
|---|---|---|---|---|
| Beef | Live | 30% | 15% | 25% |
| | Carcass | 35% | 47% | 38% |

| | | | | |
|---|---|---|---|---|
| | Processed | 35% | 38% | 38% |
| Pork | Live | 27% | 27% | 17% |
| | Dressed | 28% | 28% | 25% |
| | Processed | 45% | 45% | 58% |
| Poultry - Broilers | Bulk | 0% | 0% | 0% |
| | Processed | 100% | 100% | 100% |
| Poultry - Layers | Bulk | 0% | 0% | 0% |
| | Processed | 100% | 100% | 100% |
| Dairy | Bulk | 0% | 0% | 0% |
| | Processed | 100% | 100% | 100% |
| Grains | Bulk | 92% | 86% | 75% |
| | Processed | 8% | 14% | 25% |
| Oilseeds | Bulk | 64% | 60% | 40% |
| | Processed | 36% | 40% | 60% |
| Specialty Crops | Bulk | 60% | 40% | 40% |
| | Processed | 40% | 60% | 60% |
| Horticultural Crops | Bulk | 90% | 60% | 40% |
| | Processed | 10% | 40% | 60% |

# 4.0 ANALYSIS AND RESULTS

Using the 1996 data as the base, information that was outlined in the previous section is broken down by CD based on the historical production patterns unless otherwise specified in the MTO or the expert interviews. Data is ultimately converted into a per land unit equivalent in order to determine the impacts at the micro level. It should be restated that all the information for each sector had to be converted back to a common basis (land equivalent) in order to allow for comparisons, and to enable the consultants to estimate the impacts at the sub-regional level. For example, a given value of beef exports is converted back to an estimated number of feeder cattle based on the relative amount of processing, estimated finishing and process weight, and the relative value at each level as provided by industry experts. This figure is then converted back to a land based figure based on the number of hectares required in order to feed that animal to its finished weight. Data is then aggregated to a provincial level for reporting purposes. There were no constraints placed on the ability to produce, however, the projected surplus/deficits in land base were calculated by CD, and aggregated to the provincial level. CD level analysis to be provided by PFRA can be observed in the Appendix Document.

The 1996 data is used to calculate domestic consumption by removing exports and ending stocks from total production. These figures for domestic consumption are increased by a total of 10% between 1996 and 2005, and are accounted for in determining the excess or shortage of the land base. Once everything is converted to a common land based equivalent, it allows for an evaluation of the impacts of increased production in any given sector. The changes that are outlined under the two scenarios discussed are converted back to a land based equivalent in order to evaluate the ability of the land base to support the growth, given the level of productivity available/forecast. A given amount of increase in the number of livestock produced must be associated with a corresponding increase in the amount of forage/cereals produced. This increase in production can ultimately come from increased hectares of production, increased efficiencies of

production on the same or less hectares of land, and/or increased imports of feed stuffs.

The model identifies projected deficiencies/surpluses of the amount of land available for production under the two scenarios. These figures should be seen as representing a bundle, or package of opportunities facing the industry. The deficits in crop hectares can be overcome in a number of ways including increasing the base productivity, or the level of inputs, or by substitution with other crops. It is also important to recognize that since the analysis is conducted at the CD level, it outlines various opportunities for inter-regional trade. The model helps to identify the most logical CD's in which to increase livestock vs cereal production, based on the relative efficiencies of production in each area. Certain CD's have a very high cereal, oilseeds, and/or specialty crop productivity rating vs other areas, whereas other CD's are very efficient at producing forage/fodder crops. There are some CD's with a significant amount of tame and natural pasture and these could provide an excellent area for cattle expansion.

A final consideration is the fact that prices used for calculating export revenue by commodity category are left at the 1996 levels. This allowed for a more direct comparison of the value of exports between the two scenarios.

The following section provides a brief discussion of the results of the two scenarios. A short synopsis of the Base Case is provided for comparative purposes.

## 4.1 Base Case

The Base Case Scenario produced a total of $12.6 billion in export sales from Western Canada. Table 4.1 illustrates the breakdown of revenue by industry cluster. It should be reiterated that the Base Case was run in the SAM using the technical coefficients as defined previously. The reproduction of the 1996 MTO results by the SAM provided a verification process.

**Table 4.1**
**Export Revenue by Industry Cluster**

| Industry Cluster | 1996 Revenue |
|---|---|
| Beef | $ 1,675,794,648 |
| Pork | 674,914,464 |
| Poultry | 16,485,791 |
| Dairy | 105,690,986 |
| Grains | 6,003,824,134 |
| Oilseeds | 2,226,868,816 |
| Specialty Crops | 828,535,380 |
| Horticultural Crops | 237,637,950 |
| Other Agricultural Products | 800,000,000 |
| **Total Export Revenue** | **$12,569,752,168** |

A total of 24.6 million hectares of crop land and 14.9 mt of forages were required in order to produce this output. Ending stocks equated to a surplus of 440 thousand hectares of crop land and 1.76 million tonnes of forage production.

## 4.2 Scenario I – AAFC's MTO Scenario Results

The output indicates that this scenario would result in an increase of export revenue from Western Canada by 36% over 1996, to $17.1 billion. If the prairies share of the national production was to increase to approximately 63% as suggested in the interviews, this value would correspond to a Canadian export revenue of $27 billion (again remembering this is assuming 1996 price levels). The number of crop hectares required to achieve this would increase by about 2.8 million, resulting in a total shortfall of 2.4 million hectares. A provincial breakdown can be seen in Table 5.5.

It is estimated that the forage production would be just adequate to cover the increased demand under Scenario I. There is forecast to be slightly over 270 thousand excess tonnes remaining which only represents 1.4% of total usage. Both Alberta and Saskatchewan were short of forage production at a provincial level, and many individual CD's within all four regions were also short. This suggests the need for intraprovincial movement of forage in order to meet the demands as expressed under Scenario I.

Table 4.2 outlines the numbers of animals/tonnes of production for each industry cluster, both in the Base Case and at the end of Scenario I. The absolute change is also provided.

**Table 4.2**
**Scenario I Results, 1996 to 2005**

| British Columbia (PR) | Unit | 1996 | Change | 2005 |
|---|---|---|---|---|
| Beef Cows | # | 57,400 | 5,740 | 63,140 |
| Beef Feeders | # | 72,308 | 7,231 | 79,539 |
| Market Hogs | # | 6,784 | 3,138 | 9,922 |
| Broilers | # | 85,236 | 12,785 | 98,021 |

| | | | | |
|---|---|---|---|---|
| Layers | # | 14,206 | 2,131 | 16,337 |
| Dairy Cows | # | 3,158 | -347 | 2,811 |
| Grains Total | t | 251,838 | 22,628 | 274,466 |
| Grains Processed | t | 20,147 | 18,278 | 38,425 |
| Grains Bulk | t | 231,691 | 4,350 | 236,041 |
| Oilseeds Total | t | 37,482 | 15,053 | 52,535 |
| Oilseeds Processed | t | 13,494 | 7,520 | 21,014 |
| Oilseeds Bulk | t | 23,989 | 7,532 | 31,521 |
| Specialty Crops | t | 9,408 | 1,866 | 11,274 |
| Horticultural Crops | t | 125 | 47 | 171 |
| Forage | t | 229,600 | 22,960 | 252,560 |
| **Alberta** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 2,016,889 | 201,689 | 2,218,578 |
| Beef Feeders | # | 3,703,938 | 370,394 | 4,074,332 |
| Market Hogs | # | 2,787,120 | 1,289,043 | 4,076,163 |
| Broilers | # | 28,458,018 | 8,821,986 | 37,280,004 |
| Layers | # | 4,743,003 | 1,470,331 | 6,213,334 |
| Dairy Cows | # | 102,830 | -11,311 | 91,519 |
| Grains Total | t | 16,992,509 | 1,469,495 | 18,462,004 |
| Grains Processed | t | 1,359,401 | 1,225,280 | 2,584,681 |
| Grains Bulk | t | 15,633,108 | 244,215 | 15,877,323 |
| Oilseeds Total | t | 1,893,776 | 718,164 | 2,611,939 |
| Oilseeds Processed | t | 681,759 | 363,017 | 1,044,776 |
| Oilseeds Bulk | t | 1,212,016 | 355,147 | 1,567,164 |
| Specialty Crops | t | 534,856 | 100,381 | 635,236 |
| Horticultural Crops | t | 136,769 | 50,085 | 186,854 |
| Forage | t | 8,067,556 | 806,756 | 8,874,312 |
| **Saskatchewan** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 1,135,027 | 113,503 | 1,248,530 |
| Beef Feeders | # | 1,485,448 | 148,545 | 1,633,993 |
| Market Hogs | # | 1,155,824 | 534,569 | 1,690,393 |
| Broilers | # | 10,548,120 | 3,261,514 | 13,809,634 |
| Layers | # | 1,758,020 | 543,586 | 2,301,606 |
| Dairy Cows | # | 38,154 | -4,197 | 33,957 |
| Grains Total | t | 24,018,956 | 2,153,354 | 26,172,311 |
| Grains Processed | t | 1,921,517 | 1,742,607 | 3,664,124 |
| Grains Bulk | t | 22,097,440 | 410,747 | 22,508,187 |
| Oilseeds Total | t | 2,678,829 | 1,070,426 | 3,749,255 |
| Oilseeds Processed | t | 964,378 | 535,324 | 1,499,702 |
| Oilseeds Bulk | t | 1,714,450 | 535,102 | 2,249,553 |
| Specialty Crops | t | 2,569,217 | 507,640 | 3,076,857 |
| Horticultural Crops | t | 11,386 | 4,235 | 15,621 |
| Forage | t | 4,540,108 | 454,011 | 4,994,119 |
| **Manitoba** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 510,197 | 51,020 | 561,217 |
| Beef Feeders | # | 757,412 | 75,741 | 833,153 |
| Market Hogs | # | 2,841,536 | 1,314,210 | 4,155,746 |
| Broilers | # | 19,211,748 | 5,955,642 | 25,167,390 |
| Layers | # | 3,201,958 | 992,607 | 4,194,565 |
| Dairy Cows | # | 59,404 | -6,534 | 52,870 |
| Grains Total | t | 7,644,058 | 685,731 | 8,329,789 |
| Grains Processed | t | 611,525 | 554,646 | 1,166,170 |
| Grains Bulk | t | 7,032,534 | 131,085 | 7,163,619 |
| Oilseeds Total | t | 1,292,625 | 516,193 | 1,808,819 |
| Oilseeds Processed | t | 465,345 | 258,182 | 723,527 |
| Oilseeds Bulk | t | 827,280 | 258,011 | 1,085,291 |
| Specialty Crops | t | 474,494 | 93,795 | 568,288 |
| Horticultural Crops | t | 171,118 | 63,753 | 234,871 |
| Forage | t | 2,040,788 | 204,079 | 2,244,867 |
| **Western Canada** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 3,719,513 | 371,951 | 4,091,464 |
| Beef Feeders | # | 6,019,106 | 601,911 | 6,621,017 |
| Market Hogs | # | 6,791,264 | 3,140,960 | 9,932,224 |
| Broilers | # | 58,303,122 | 18,051,927 | 76,355,049 |
| Layers | # | 9,717,187 | 3,008,655 | 12,725,842 |
| Dairy Cows | # | 203,546 | -22,390 | 181,156 |
| Grains Total | t | 48,907,361 | 4,331,208 | 53,238,570 |
| Grains Processed | t | 3,912,589 | 3,540,811 | 7,453,400 |
| Grains Bulk | t | 44,994,772 | 790,398 | 45,785,170 |
| Oilseeds Total | t | 5,902,712 | 2,319,836 | 8,222,548 |
| Oilseeds Processed | t | 2,124,976 | 1,164,043 | 3,289,019 |
| Oilseeds Bulk | t | 3,777,736 | 1,155,793 | 4,933,529 |
| Specialty Crops | t | 3,587,973 | 703,682 | 4,291,655 |
| Horticultural Crops | t | 319,397 | 118,120 | 437,517 |
| Forage | t | 14,878,052 | 1,487,805 | 16,365,857 |

A detailed breakdown of export revenue by industry cluster is illustrated in Table 4.3

Export revenue increased for every industry cluster with the exception of dairy. While milk production efficiency per cow increased by 15%, the actual number of cows declined by 11%. When this was combined with the 10% increase in domestic consumption, it resulted in a reduction in the litres of exports.

**Table 4.3**
**Scenario I Export Revenue Projection – Western Canada**

| Export Revenue | 1996 Revenue | Revenue Change | 2005 Revenue |
|---|---|---|---|
| Feeders | $ 1,675,794,648 | $ 528,855,479 | $ 2,204,650,127 |
| Pork | 674,914,464 | 937,753,082 | 1,612,667,546 |
| Poultry | 16,485,791 | 105,613,784 | 122,099,575 |
| Dairy | 105,690,986 | -29,857,902 | 75,833,083 |
| Grain | 6,003,824,134 | 323,757,933 | 6,328,299,699 |
| Oilseeds | 2,226,868,816 | 1,492,830,885 | 3,719,699,700 |
| Specialty Crops | 828,535,380 | 305,826,998 | 1,134,362,378 |
| Hort. Crops | 237,637,950 | 195,277,225 | 432,915,175 |
| Other Ag. Prod. | 800,000,000 | 700,000,000 | 1,500,000,000 |
| **Total Export Revenue** | **$12,569,752,168** | **$4,560,057,484** | **$17,130,527,284** |

The overall increase in output has a significant impact, both on the number of people employed in the industry, as well as the capital outlay required, and the number of production units. Table 4.4 outlines the net impacts in these areas.

**Table 4.4**
**Future Capital Outlay Required – Other Factors**

| | BC-(PR) | Alberta | Saskatchewan | Manitoba | W-Canada |
|---|---|---|---|---|---|
| Beef Increase | | | | | |
| Cow Numbers | 5,740 | 201,689 | 113,503 | 51,020 | 371,951 |
| Feeder Numbers | 7,231 | 370,394 | 148,545 | 75,741 | 601,911 |
| Capital Required (cows) (@ 1,600/cow) ($) | 9,184,000 | 322,702,240 | 181,604,320 | 81,631,520 | 595,122,080 |
| Capital Head (feeders) (@ 300/feeder ($)) | 2,169,240 | 111,118,140 | 44,563,440 | 22,722,360 | 180,573,180 |
| Total Capital Required ($) | 11,353,240 | 433,820,380 | 226,167,760 | 104,353,880 | 775,695,260 |
| # of 200 Head Cow Herds | 29 | 1,008 | 568 | 255 | 1,860 |
| # of 10,000 Head Feedlots | 1 | 37 | 15 | 8 | 60 |
| Labour/Cow Herd (@ 3/200 head herd) | 86 | 3,025 | 1,703 | 765 | 5,579 |
| Labour/Feedlot (@ 6/10,000 head feedlot) | 4 | 222 | 89 | 45 | 361 |
| Sow Numbers Increase | 196 | 80,565 | 33,411 | 82,138 | 196,310 |
| Market Hog Numbers Increase | 3138 | 1,289,043 | 534,569 | 1,314,210 | 3,140,960 |
| Capital Required (Farrow/Finish) [(@ $5,000/sow] ($) | 980,500 | 402,825,938 | 167,052,688 | 410,690,750 | 981,549,875 |
| # of 1,200 Sow Units | 0 | 67 | 28 | 68 | 164 |
| Labour/Sow Unit (@ 10/1,200 sow unit) | 2 | 671 | 278 | 684 | 1,636 |
| Poultry Numbers Increase | 4,262 | 2,940,662 | 1,087,171 | 1,985,214 | 6,017,309 |
| Capital Costs (@ $50/bird) ($) | 213,090 | 147,033,093 | 54,358,572 | 99,260,698 | 300,865,453 |
| Quota Costs (@ $45/bird) ($) | 191,781 | 132,329,784 | 48,922,715 | 89,334,628 | 270,778,908 |
| Total Capital Required ($) | 404,871 | 279,362,877 | 103,281,287 | 188,595,326 | 571,644,361 |
| Labour Requirements (@ 1.5/10,000 bird) | 1 | 441 | 163 | 298 | 903 |
| | **BC-(PR)** | **Alberta** | **Saskatchewan** | **Manitoba** | **W-Canada** |
| Dairy Cow Number Change | - | - | - | - | - |
| Dairy Litres of Milk Change (L) | 463,163 | 15,081,408 | 5,595,799 | 8,712,399 | 29,852,769 |
| Capital Costs (@ $5,000/head) ($) | - | - | - | - | - |
| Quota Cost (@ $2.8/L) ($) | 1,298,727 | 42,288,837 | 15,690,832 | 24,429,895 | 83,708,292 |
| Total Capital Required ($) | 1,298,727 | 42,288,837 | 15,690,832 | 24,429,895 | 83,708,292 |
| Labour (@ 3/100 head) | - | - | - | - | - |
| Horticultural Crops Increase (ha) | 7 | 6,851 | 697 | 9,389 | 16,944 |
| Total Capital Required (Capital Bldg & Equip Costs (@ $7,900/ha)) ($) | 51,396 | 54,172,834 | 5,509,202 | 74,240,800 | 133,974,231 |
| Labour (2 people/200 ha) | 0 | 68 | 7 | 94 | 169 |
| Capital Outlay Summary | | | | | |
| Beef ($) | 11,353,240 | 433,820,380 | 226,167,760 | 104,353,880 | 775,695,260 |
| Pork ($) | 980,500 | 402,825,938 | 167,052,688 | 410,690,750 | 981,549,875 |
| Poultry Building &Equipment ($) | 213,090 | 147,033,093 | 54,358,572 | 99,260,698 | 300,865,453 |
| Poultry Quota ($) | 191,781 | 132,329,784 | 48,922,715 | 89,334,628 | 270,778,908 |
| Dairy Facility ($) | - | - | - | - | - |
| Dairy Quota ($) | 1,298,727 | 42,288,837 | 15,690,832 | 24,429,895 | 83,708,292 |
| Horticultural Crops ($) | 51,396 | 54,172,834 | 5,509,202 | 74,240,800 | 133,974,231 |
| **Totals** | **14,088,734** | **1,212,470,865** | **517,701,769** | **802,310,651** | **2,546,572,019** |

In summary, there is an anticipated $2.5 billion in direct capital investment, and 8,648 more people required by the primary industry in order to obtain the goals as stated in Scenario I. The figures for the

capital expansion in the dairy industry were not provided since there is expected to be a decline in the number of animals. However, since there is an increase in dairy cow productivity, there would be a corresponding increase in quota costs.

## 4.3 Scenario II - Consensus Of Industry Expert Opinions Results

### 4.3.1 Overview

This Scenario reflects an aggregation of the sub-regional impacts of the opinions expressed by specific industry representatives during the interview process. This process included input from representatives of the various provincial governments. There was no attempt made to restrict either provincial and/or Western Canada's production based on any physical limitation within any of the provinces.

### 4.3.2 Results

The output (Table 4.5) indicates that this Scenario would result in an increase of export revenue from Western Canada by 55% to $19.6 billion over the 1996 Base Case. If the relative percentage of Western Canadian exports was to increase to 63% as suggested by industry interviewees, this figure would be representative of a Canadian export revenue of approximately $31.3 billion. The number of hectares of crop land required in order to achieve this would increase by about 3.2 million, with an estimated shortfall of over 2.8 million hectares.

This figure uses 1996 prices, and is still slightly above the $30 billion estimate, 3% of the FAO 2005 estimates of world agriculture and agri-food trade, made by CAMC, but less than CAMC's higher estimate of $40 billion, 4% of world trade.

In addition to a deficit in crop land, there was a deficit in the amount of forages (2.1 mil t) required in order to handle the livestock increase for Western Canada. The largest single deficit was in the Province of Saskatchewan which had a shortfall of 1.7 mil t, followed by Alberta with a shortfall of slightly over 1 mil t. Manitoba and B.C. both had sufficient forage tonnes (351,000 t and 228,540 t), but this was not sufficient to offset the deficits in Alberta and Saskatchewan on an aggregate prairie basis.

**Table 4.5**
**Scenario II Results, 1996 to 2005**

| British Columbia (PR) | Unit | 1996 | Change | 2005 |
|---|---|---|---|---|
| Beef Cows | # | 57,400 | 17,220 | 74,620 |
| Beef Feeders | # | 72,308 | 21,692 | 94,000 |
| Market Hogs | # | 6,784 | 4,664 | 11,448 |
| Broilers | # | 85,236 | 8,524 | 93,760 |
| Layers | # | 14,206 | 1,421 | 15,627 |
| Dairy Cows | # | 3,158 | 0 | 3,158 |
| Grains Total | t | 251,838 | 32,107 | 283,945 |
| Grains Processed | t | 20,147 | 50,839 | 70,986 |
| Grains Bulk | t | 231,691 | -18,732 | 212,959 |
| Oilseeds Total | t | 37,482 | 24,363 | 61,846 |
| Oilseeds Processed | t | 13,494 | 23,614 | 37,107 |
| Oilseeds Bulk | t | 23,989 | 750 | 24,738 |
| Specialty Crops | t | 9,408 | 3,104 | 12,512 |
| Horticultural Crops | t | 125 | 0 | 125 |
| Forage | t | 229,600 | 68,880 | 298,480 |
| **Alberta** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 2,016,889 | 403,378 | 2,420,267 |
| Beef Feeders | # | 3,703,938 | 740,788 | 4,444,726 |
| Market Hogs | # | 2,787,120 | 1,602,594 | 4,389,714 |
| Broilers | # | 28,458,018 | 2,845,802 | 31,303,820 |
| Layers | # | 4,743,003 | 474,300 | 5,217,303 |
| Dairy Cows | # | 102,830 | 0 | 102,830 |
| Grains Total | t | 16,992,509 | 2,126,479 | 19,118,988 |
| Grains Processed | t | 1,359,401 | 3,420,346 | 4,779,747 |
| Grains Bulk | t | 15,633,108 | -1,293,867 | 14,339,241 |
| Oilseeds Total | t | 1,893,776 | 1,079,296 | 2,973,071 |
| Oilseeds Processed | t | 681,759 | 1,102,084 | 1,783,843 |
| Oilseeds Bulk | t | 1,212,016 | -22,788 | 1,189,229 |
| Specialty Crops | t | 534,856 | 161,764 | 696,619 |
| Horticultural Crops | t | 136,769 | 60,901 | 197,670 |
| Forage | t | 8,067,556 | 1,613,511 | 9,681,067 |
| **Saskatchewan** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 1,135,027 | 454,011 | 1,589,038 |
| Beef Feeders | # | 1,485,448 | 594,179 | 2,079,627 |
| Market Hogs | # | 1,155,824 | 1,444,780 | 2,600,604 |
| Broilers | # | 10,548,120 | 1,054,812 | 11,602,932 |
| Layers | # | 1,758,020 | 175,802 | 1,933,822 |
| Dairy Cows | # | 38,154 | 0 | 38,154 |
| Grains Total | t | 24,018,956 | 3,058,316 | 27,077,273 |
| Grains Processed | t | 1,921,517 | 4,847,802 | 6,769,318 |
| Grains Bulk | t | 22,097,440 | -1,789,485 | 20,307,954 |
| Oilseeds Total | t | 2,678,829 | 2,174,516 | 4,853,345 |
| Oilseeds Processed | t | 964,378 | 1,947,628 | 2,912,007 |
| Oilseeds Bulk | t | 1,714,450 | 226,887 | 1,941,338 |
| Specialty Crops | t | 2,569,217 | 842,463 | 3,411,680 |
| Horticultural Crops | t | 11,386 | 20,154 | 31,540 |
| Forage | t | 4,540,108 | 1,816,043 | 6,356,151 |
| **Manitoba** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 510,197 | 102,039 | 612,236 |
| Beef Feeders | # | 757,412 | 151,482 | 908,894 |
| Market Hogs | # | 2,841,536 | 1,633,883 | 4,475,419 |
| Broilers | # | 19,211,748 | 1,921,175 | 21,132,923 |
| Layers | # | 3,201,958 | 320,196 | 3,522,154 |
| Dairy Cows | # | 59,404 | 0 | 59,404 |
| Grains Total | t | 7,644,058 | 973,604 | 8,617,662 |
| Grains Processed | t | 611,525 | 1,542,891 | 2,154,416 |
| Grains Bulk | t | 7,032,534 | -569,287 | 6,463,247 |
| Oilseeds Total | t | 1,292,625 | 765,833 | 2,058,459 |
| Oilseeds Processed | t | 465,345 | 769,730 | 1,235,075 |
| Oilseeds Bulk | t | 827,280 | -3,897 | 823,383 |
| Specialty Crops | t | 474,494 | 155,697 | 630,191 |
| Horticultural Crops | t | 171,118 | 50,882 | 221,999 |
| Forage | t | 2,040,788 | 408,158 | 2,448,946 |
| **Western Canada** | **Unit** | **1996** | **Change** | **2005** |
| Beef Cows | # | 3,719,513 | 976,648 | 4,696,161 |
| Beef Feeders | # | 6,019,106 | 1,508,142 | 7,527,248 |

| | | | | |
|---|---|---|---|---|
| Market Hogs | # | 6,791,264 | 4,685,921 | 11,477,185 |
| Broilers | # | 58,303,122 | 5,830,312 | 64,133,434 |
| Layers | # | 9,717,187 | 971,719 | 10,688,906 |
| Dairy Cows | # | 203,546 | 0 | 203,546 |
| Grains Total | t | 48,907,361 | 6,190,507 | 55,097,868 |
| Grains Processed | t | 3,912,589 | 9,861,878 | 13,774,467 |
| Grains Bulk | t | 44,994,772 | -3,671,371 | 41,323,401 |
| Oilseeds Total | t | 5,902,712 | 4,044,008 | 9,946,720 |
| Oilseeds Processed | t | 2,124,976 | 3,843,056 | 5,968,032 |
| Oilseeds Bulk | t | 3,777,736 | 200,952 | 3,978,688 |
| Specialty Crops | t | 3,587,973 | 1,163,029 | 4,751,002 |
| Horticultural Crops | t | 319,397 | 131,936 | 451,334 |
| Forage | t | 14,878,052 | 3,906,592 | 18,784,644 |

As in Scenario I, the total export revenue from dairy products declined in Scenario II. It is also interesting to note that while the total export revenue from grain increased, the export revenue from bulk grain exports declined. This is not surprising since the industry experts projected that the percent of exports being sold as bulk products would decline from 92% to 75% during the period in question.

The overall increase in output has a significant impact, both on the number of people employed in the industry, as well as the capital outlay required, and the number of production units. This is portrayed in Table 4.7. Investment calculations indicated for the dairy industry reflect the fact that while the productivity per cow is increasing, the decline in the total number of animals is expected to offset this quota cost. In effect, there will be individuals buying quota, but industry experts suggested that this will be offset by those selling quota, leaving net quota investment at zero.

**Table 4.6**
**Scenario II Export Revenue Projection – Western Canada**

| Export Revenue | 1996 Revenue | Revenue Change | 2005 Revenue |
|---|---|---|---|
| Feeders | $ 1,675,794,648 | $1,099,003,566 | $ 2,774,798,214 |
| Pork | 674,914,464 | 1,443,557,751 | 2,118,472,215 |
| Poultry | 16,485,791 | 1,648,579 | 18,134,370 |
| Dairy | 105,690,986 | -42,276,654 | 63,414,332 |
| Grains | 6,003,824,134 | 530,151,881 | 6,544,622,361 |
| Oilseeds | 2,226,868,816 | 2,407,670,584 | 4,634,539,399 |
| Specialty Crops | 828,535,380 | 640,988,187 | 1,469,523,567 |
| Hort. Crops | 237,637,950 | 265,106,831 | 502,744,781 |
| Other Ag. Prod. | 800,000,000 | 700,000,000 | 1,500,000,000 |
| **Total Export Revenue** | **$12,569,752,168** | **$7,045,850,725** | **$19,626,249,239** |

**Table 4.7**
**Capital Outlay - Other Factors**

| | BC-(PR) | Alberta | Saskatchewan | Manitoba | W-Canada |
|---|---|---|---|---|---|
| Beef Increase | | | | | |
| Cows | 17,220 | 403,378 | 454,011 | 102,039 | 976,648 |
| Feeders | 21,692 | 740,788 | 594,179 | 151,482 | 1,508,142 |
| Capital Required (cows) (@ 1,600/cow) ($) | 27,552,000 | 645,404,480 | 726,417,280 | 163,263,040 | 1,562,636,800 |
| Capital Head (feeders) (@ 300/feeder) ($) | 6,507,720 | 222,236,280 | 178,253,760 | 45,444,720 | 452,442,480 |
| Total Capital Required ($) | 34,059,720 | 867,640,760 | 904,671,040 | 208,707,760 | 2,015,079,280 |
| # of 200 Head Cow Herds | 86 | 2,017 | 2,270 | 510 | 4,883 |
| # of 10,000 Head Feedlots | 2 | 74 | 59 | 15 | 151 |
| Labour/Cow Herd (@ 3/200 head herd) | 258 | 6,051 | 6,810 | 1,531 | 14,650 |
| Labour/Feedlot (@ 6/10,000 head feedlot) | 13 | 444 | 356 | 91 | 905 |
| Sows Increase | 291 | 100,162 | 90,299 | 102,118 | 292,870 |
| Market Hogs Increase | 4,664 | 1,602,594 | 1,444,780 | 1,633,883 | 4,685,921 |
| Capital Required (Farrow/Finish) (@ $5,000/sow) ($) | 1,457,500 | 500,810,625 | 451,493,750 | 510,588,500 | 1,464,350,375 |
| # of 1,200 Sow Units | 0 | 83 | 75 | 85 | 244 |
| Labour/Sow Unit (@ 10/1,200 sow unit) | 2 | 835 | 752 | 851 | 2,441 |
| Poultry Increase | 2,841 | 948,601 | 351,604 | 640,392 | 1,943,437 |
| Capital Costs (@ $50/bird) | 142,060 | 47,430,030 | 17,580,200 | 32,019,580 | 97,171,870 |
| Quota Costs (@ $45/bird) | 127,854 | 42,687,027 | 15,822,180 | 28,817,622 | 87,454,683 |
| Total Capital Required ($) | 269,914 | 90,117,057 | 33,402,380 | 60,837,202 | 184,626,553 |
| Labour Requirements (@ 1.5/10,000 bird) | 0 | 142 | 53 | 96 | 291 |
| Dairy Cow Change | - | - | - | - | - |
| Dairy Litres of Milk Change | - | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| Capital Costs (@ $5,000/head) | - | - | - | - | - |
| Quota Cost (@ $2.8/L) | - | - | - | - | - |
| Total Capital Required ($) | - | - | - | - | - |
| Labour (@ 3/100 head) | - | - | - | - | - |
| Horticultural Crops Increase | 0 | 12,606 | 4,989 | 11,267 | 28,862 |
| Total Capital Required (Capital Building & Equip. Costs (@ $7,907/ha) ($) | 0 | 99,688,014 | 39,445,888 | 89,088,960 | 228,212,862 |
| Labour (2 people/200 ha) | 0 | 126 | 50 | 113 | 289 |
| Capital Outlay Summary | | | | | |
| Beef | 34,059,720 | 867,640,760 | 904,671,040 | 208,707,760 | 2,015,079,280 |
| Pork | 1,457,500 | 500,810,625 | 451,493,750 | 510,588,500 | 1,464,350,375 |
| Poultry Buildings & Equip. | 142,060 | 47,430,030 | 17,580,200 | 32,019,580 | 97,171,870 |
| Poultry Quota | 127,854 | 42,687,027 | 15,822,180 | 28,817,622 | 87,454,683 |
| Total Poultry Capital Requirements: | - | - | - | - | - |
| Dairy Facility | - | - | - | - | - |
| Dairy Quota | - | - | - | - | - |
| Total Dairy Capital Requirements | - | - | - | - | - |
| Horticultural Crops | 0 | 99,678,014 | 39,445,888 | 89,088,960 | 228,212,862 |
| **Totals** | **35,787,134** | **1,558,246,456** | **1,429,013,058** | **869,222,422** | **3,892,269,070** |

In summary, Scenario II anticipates a $3.9 billion direct capital investment, and 18,576 additional people to attain the projected growth, and export revenue of $19.6 billion.

## 4.4 Constraints To Growth

Industry contacts were asked to provide input as to the most critical constraints to growth that they would face over the next 5 to 10 years. While there were many responses which were very similar across industry categories, many were specific to the cluster. The following discussion provides a summary of constraints mentioned by industry cluster. In general, it was difficult to rank constraints in terms of the relative impact (importance) to industry. Each individual has their own perception on what specific issue is most important to them, but these issues tended to vary based on the type of facility that the individual operated and the segment of the industry sector that the individual came from. As a result, importance is related to the number of times the constraint was mentioned in the interview process.

### 4.4.1 Beef

One of the key concerns for the beef industry was the impact that environmental regulations were going to have on the development of intensive livestock operations. While the industry is concerned that they manage their resources in a sustainable fashion, there is concern that regulations may be influenced by factors that are not necessarily related to scientific research. This issue is important in terms of manure management for feedlots, as well as for the management of riparian areas for the cow-calf industry.

Beef industry growth may be constrained by slow cow-calf herd development. Recent growth in feedlot capacity appears to have been greater than growth in the cow-calf industry. As a result, effective trade negotiations are required by the industry to ensure they are able to efficiently access feeders from the U.S. when necessary, in addition to the efforts currently being made in attempting to promote the increase in the cow herd in the prairies.

Forage availability appears to be a major concern for the industry. There is the feeling that significant increases in the efficiency of pasture management are required in order to facilitate industry growth.

Finally, there is a concern that feed grain prices are no longer providing Western Canadian livestock producers with a comparative advantage in beef production when compared to the U.S.

### 4.4.2 Pork

Environmental concerns were felt to be a potentially significant constraint to industry expansion. While there is a substantial amount of suitable land for hog

production in Western Canada, some of the most desirable in terms of hog production is felt to be close to urban areas, where there is a significant amount of resistance to hog expansion.

Industry experts also expressed concern over the fact that current low prices may reduce the willingness on the part of primary producers to expand production. Processors are concerned that they will not be able to get the appropriate amount of hogs in order to allow them to process efficiently, and primary producers are concerned that once they build larger production units, they may be tied in terms of price flexibility because it will be more difficult to shut down production in times of low prices.

There is a concern regarding the availability of management expertise for the larger production units. This type of production requires management expertise not only in terms of agronomics, but also in terms of managing vertically and horizontally integrated production units.

#### 4.4.3 Poultry and Dairy

It was virtually impossible to obtain consensus as to the constraints facing the supply managed industries. Interviewees either felt that the main constraint to expansion of exports was the cost of production in the primary sector, or they felt the processing sector could not compete in the international market.

There does appear to be a consensus that very little will change in the supply managed industries until after the next round of WTO negotiations.

#### 4.4.4 Grains

The major constraint consistently identified by the experts was the concern over the European Union's (EU's) export subsidies. Industry contacts were convinced that if they were allowed to compete in a totally open market, that Canadian export potential would increase substantially. There was concern expressed by a couple of the interviewees over the potential negative impact of the Canadian Wheat Board (CWB) in terms of Western Canadian export potential, however these individuals were still convinced Canada had the ability to compete in the international marketplace, given a level playing field.

A second concern/constraint identified was the downturn in the economic situation in Asia. It was felt by some that this geographic region represents our greatest opportunity for exports and that continued economic stress in this area of the world would have a significant impact on our ability to increase exports.

There was some concern expressed regarding the unwillingness of the primary production sector to adopt new varieties and production practices due to the low margins in farming at the current time. While precision agriculture and GMO inputs may have an impact on yield, farmers are not convinced that these increased yields result in increased net profits.

#### 4.4.5 Oilseeds

The main constraint to growth continues to be the tariffs on oil imports in our major markets. China and Japan continue to have a domestic economic policy that makes it more attractive to import raw seed versus processed product.

There is also a concern about the level of competition coming from both Australia and the U.S. Both countries appear to be on the verge of having a significant impact on the market. This could have an impact on the Canadian industry. The industry also raised the concern of a new variety of soybean that would have the same qualities as canola, thereby reducing the demand for canola.

The acceptance of GMO oilseed products continues to be a concern for the industry. Since it is virtually impossible to separate GMO and non-GMO canola once it gets past the farmgate, consumer backlash against this type of production could create significant damage to the industry.

#### 4.4.6 Specialty Crops

One of the major constraints for the specialty crops cluster is the agronomic adaptability of production. Experience over the past five years has demonstrated that producers are very willing to include these crops in their rotation, if crops provide a positive economic return. As a result, more research is needed in order to determine which varieties are best suited for specific geographic areas.

#### 4.4.7 Horticultural Crops

The single most important potential constraint for horticultural production remains the availability of irrigation hectares. Increases in processing capabilities for potatoes in Alberta and Manitoba are likely to significantly increase the amount of production, thus increasing the amount of irrigation

land required for these crops. This then results in reduced hectares for other crops, i.e., grains, oilseeds, forages, etc.

#### 4.4.8 General

In general, industry contacts did not appear overly concerned about the capital requirements or labour issues they were facing. The general consensus was that if the concept is a valid business concept, there is sufficient capital available. Industry contacts suggested that while the availability of fresh water was a concern, that this was such a regional issue that it would have to be dealt with at that level.

There was a general feeling that the efficiency of land use was going to have to improve in order to achieve the gains that the industry felt plausible, and this concern was proven to be relevant by the results from this analysis.

Irrigation area is going to increasingly become a hot issue as the demand for production increases. Higher valued crops like potatoes and specialty crops will provide better returns to the producers, and are expected to shift some of the livestock production to alternate areas of the respective regions.

In summary, the industry contacts would not be very surprised by the fact that their estimates suggest a shortage of land without significant changes in productivity. They suggest that the key role for government is in working with producers in order to assist them to ensure that they are efficiently using their resources so as to maximize the output produced. The industry interviewees also stressed the importance of science based and consistently applied regulatory development. This was felt to be essential in ensuring that a level playing field was generated for the prairie industry.

# 5.0 SUMMARY

## 5.1 OVERVIEW

The results of the analysis identified a number of interesting issues to consider when looking at the prospects for growth in prairie agriculture. The two scenarios represent potential production in Western Canada, as identified in the MTO, and by industry experts. It is important to emphasize that although projections are generally made with the best intentions, the complexity of the agricultural industry is such that it is common to see a wide divergence in the estimates of production and/or revenue. However, despite the divergence of opinions, there is a general understanding that industry growth, regardless of its magnitude, will require increased efficiencies in terms of resource usage. The SAM model used in this project is a tool that allows for the analysis of the requirements, by CD, for a number of productive inputs, but the discussion in this document focuses on the land base, which is the ultimate base factor of production.

The use of the 1996 Census of Agriculture as the base for the analysis, while having a number of drawbacks, does allow for a consistent source of base data in all industry sectors. It must be re-emphasized that the SAM was not designed as a macro industry forecasting tool, as there are already a number of these dynamic models in existence, in both the public and private sector. Instead, this analysis provides a systematic process by which the impacts of industry projections can be brought back to the CD level in terms of the ultimate impact on the land base. The model is not limited to using 1996 production and/or productivity patterns, and as better raw data becomes available, it can be incorporated at the CD level.

Projected exports from prairie agriculture increased from $12.6 billion in the base case to $17.1 billion in Scenario I and a maximum of $19.6 billion in Scenario II. It should be noted that these figures are directly related to current market access, prices, and exchange rates. In addition, a significant increase in the production of high value products, currently identified under the Other Agricultural Production category, could have an impact on this dollar figure. However, the key issue of concern is the relative availability of the natural resource base for production purposes, and not a discussion of how these forecasts could change as a result of supply/ demand or other market response factors. Clearly, a significant increase in prairie production of specific

commodities could have a price impact. A dynamic feedback process that projects the impact of a significant increase in prairie feeder cattle production, canola production, and/or the production of any commodity on prices and then on production patterns is beyond the scope of this project. However, it is possible to evaluate the various projections of these macro-economic impacts at the CD level using the SAM.

## 5.2 RESULTS

The success in attaining the goals outlined in both Scenario I and II were constrained by the available land base in Western Canada, and by specific levels of productivity as identified by the MTO in Scenario I and by industry contacts in Scenario II. There was a shortage of 2.4 million hectares of crop land in Scenario I, and 2.8 million hectares of crop land and 2.1 million tonnes of forages in Scenario II. Tables 5.3 to 5.5 clearly illustrate the specific geographical areas of shortage/excess. It is important to remember that the term "shortage" only refers to the SAM model output, and that these figures actually represent an opportunity for increased efficiencies or productivity increases that are required, above and beyond those predicted by industry contacts, in order to meet the projections outlined.

There are a large number of changes that could occur in the agri-food industry in order to reduce and/or eliminate the projected shortage of land: increase and/or adjust input use intensity whether it be capital, fertilizers, chemicals, water use, or rotational considerations. However, the ultimate impact of any of these changes would be an increased productive efficiency of the land base. Rather than doing an analysis of a significant number of potential changes that could be made, the SAM was used to estimate the level of efficiency increase that would be required in order to meet the industry projections as identified in the SAM output, regardless of how it was accomplished. This process was used in the interests of parsimony, since the SAM could, in fact, be used to look at the impacts of increased fertilizer use on specific sub-regional areas, or increased water efficiency in the irrigation regions. A sensitivity analysis on a number of key factors (grain, oilseed, forage productivity, and livestock numbers) was conducted in order to determine how they impact the industries ability to grow to targeted levels, and is discussed in the following sections.

### 5.2.1 Grains and Oilseeds

As a total, the prairie region had a deficit of over 2.4 million hectares under Scenario I, and 2.8 million hectares under Scenario II. These deficits would require a significant productivity increase in order to generate the production forecast in the MTO and by industry experts for the prairies.

Table 5.5 illustrates the impact of the two scenarios on a provincial basis, with only British Columbia being able to achieve the forecast set for it. Alberta is projected to have a deficit of approximately 600,000 hectares under Scenario 1, falling to 580,000 hectares largely due to increased productivity projections for Scenario II as provided by industry contacts during the consensus building process. Under Scenario I, Saskatchewan is short 1.3 million hectares, and this jumps to 1.8 million under Scenario II. Manitoba's shortage drops slightly (433,000 hectares to 424,000 hectares) from Scenario I to Scenario II largely due to the fact that the change in hectares forecast by the industry was less than that projected in the MTO.

The SAM was used in order to determine the productivity changes required in order to eliminate the shortage of production projected under the two scenarios. These productivity changes are in addition to those identified by industry contacts for Scenario II and in the MTO for Scenario I. This was completed on a crop-by-crop basis for comparative purposes, but it is important to keep in mind that the objective of balancing the land base could be achieved by increasing the productivity of various crops at the same time. The results from changing the productivity in cereals and oilseeds are reported, since they represent the largest crops. There were two basic components to the approach used: deficits were addressed at a provincial level by increasing the relative productivity within a province in order to balance the provincial total; and deficits were then addressed at the prairie level by increasing the productivity at a consistent level in all four production regions.

For example: there is a projected deficit of 2.4 million cropping hectares under Scenario I, and this is largely a result of deficits in three individual provinces. A provincial analysis was completed using the SAM where the productivity of grain production, by individual province, was increased until the projected provincial hectare deficit was eliminated. The Prairie analysis was completed by increasing the

average productivity level for all four regions until the total deficit for the prairies was eliminated. During this analysis, the productivity of all other product sector clusters (oilseeds, specialty crops, etc.) was held constant.

This process was then completed using only the oilseed cluster as the basis to restore balance to the projected results. Since there were far fewer oilseed acres, it would be expected that the productivity increase required would be much greater than in the cereals.

The following tables outline the results of the analysis, by Scenario, for cereals and oilseeds, and by province.

**Table 5.1**
**Productivity Changes (%) Required in Order to Balance Resource Availability (Scenario I)**

| | Grains | Oilseeds |
|---|---|---|
| British Columbia (PR) | NA | NA |
| Alberta | 11 | 46 |
| Saskatchewan | 15 | 81 |
| Manitoba | 17 | 50 |
| Western Canada | 14 | 60 |

**Table 5.2**
**Productivity Changes (%) Required in Order to Balance Resource Availability (Scenario II)**

| | Grains | Oilseeds |
|---|---|---|
| British Columbia (PR) | NA | NA |
| Alberta | 10 | 47 |
| Saskatchewan | 22 | 135 |
| Manitoba | 19 | 56 |
| Western Canada | 17 | 83 |

The results suggest that under Scenario I (Scenario II) Alberta would have to increase grain productivity by 11% (10%) in order to balance land resource availability given the production demands. These figures are in excess of the 5% (10%) increases in productivity already incorporated in the SAM model as per the MTO projections (industry input). Saskatchewan would have to increase productivity by 15% (22%), and Manitoba would have to increase productivity by 17% (19%) in order to balance their resource supply and product demand. In total, the Prairie Provinces would have to increase their grain productivity by an average of 14% (17%).

The required increase in productivity in oilseed production would be significantly higher if they were to be used in isolation in order to balance the projected production with the landbase available. These figures can also be observed in Tables 5.1 and 5.2. It is important to remember that the required productivity could be achieved with a number of different combined cereal and oilseed (and other crops) productivity increases.

### 5.2.2 Forages

Forage production is generated from three separate sources: tame hay, alfalfa and fodder, and native pasture. While the productivity in terms of tonnes/ hectare of tame hay and alfalfa/fodder produced is similar, the productivity of native pasture is generally significantly lower. This fact is further complicated since the productivity of forages on irrigated tame pasture/alfalfa/fodder is different yet again.

The exports of forage/forage products is assumed to come from the tame hay/alfalfa/fodder production, as is the forage used by feeder animals. However, the forage requirement for cows can also be served by native pasture. The number of cows and feeders, and the use of tame versus native pasture, varies by CD. In many cases, data on the number of cows by CD includes livestock that are trucked to native pasture areas in other CD's during the summer months. While it is relatively straight forward to estimate the excess/shortfall of total forage production, it is difficult to estimate the excess/shortage of forage hectares by CD by type of production.

The following process is used in order to provide estimates of the shortage/excess of forage hectares by type of production:

- the total volume of forage required is estimated by CD considering net exports and use by livestock;
- the total potential production of forages by CD is estimated considering the productivity of native pasture, tame hay/alfalfa/fodder, and the impact and amount of irrigation;
- the difference in terms of total volume produced and consumed is calculated;
- a weighted average of forage productivity by CD is used to provide an aggregate estimate of the shortfall/excess hectares of forage production; and,

- finally, the productivity of each type of production is used in order to convert the excess/shortfall into total hectares of native pasture, or non-irrigated tame hay/alfalfa/fodder, or irrigated tame hay/alfalfa/fodder for comparative purposes.

The results of the analysis suggest that there is a projected shortage of forage production in Scenario II, and that there is barely enough under Scenario I. In fact, Alberta and Saskatchewan are in a deficit position under both Scenarios.

The issue for Alberta appears to be the large number of cattle, while Saskatchewan, despite having a significant land base, has very low productivity in many of its native pastures. This low productivity is not necessarily due to management practices, as there are numerous climatic factors that have to be considered, especially in the brown soil zone. The deficit in irrigation acres used for forage in Alberta may in fact be higher than reported if there is a more significant shift to potato production than projected by the industry experts.

Tables 5.3 and 5.4 outline the results of the forage analysis under Scenarios I and II on a production area basis, by production type.

Using the currently available production base and a weighted average yield, there is a small surplus of 7.9 thousand hectares of forage in the prairies (Table 5.3). This is made up of a shortage of 60 thousand hectares of natural/native pasture, 4.3 thousand hectares of irrigated tame pasture/alfalfa, and a surplus of 71.2 thousand hectares of dryland tame pasture/alfalfa/fodder. A breakdown of these figures by province is also provided.

**Table 5.3**
**Shortage/Excess of Forage by Province and by Production Type – Scenario I**
*('000 ha)*

| | BC (PR) | Alta | Sask | Man | Total |
|---|---|---|---|---|---|
| Excess (Shortage): Weighted Average | | | | | |
| Natural pasture | 147 | (175) | (359) | 328 | (58.9) |
| Tame pasture and alfalfa (dryland) | 112 | (97) | (163) | 218 | 71.1 |
| Tame pasture and alfalfa (irrigation) | 0.1 | (4) | (1) | 0.8 | (4.3) |
| **Total** | **259.1** | **(276)** | **(523)** | **547** | **7.9** |
| Excess (Shortage): Expressed as One Source | | | | | |
| Natural pasture | 558 | (655) | (1,088) | 1,129 | (56) |
| Tame pasture and alfalfa (dryland) | 153 | (143) | (246) | 310 | 75 |
| Tame pasture and alfalfa (irrigation) | 71 | (78) | (152) | 143 | (16) |

**Table 5.4**
**Shortage/Excess of Forage by Province and by Production Type – Scenario II**
*('000 ha)*

| | BC (PR) | Alta | Sask | Man | Total |
|---|---|---|---|---|---|
| Excess (Shortage): Weighted Average | | | | | |
| Natural pasture | 123 | (792) | (1,846) | 207 | (2,309) |
| Tame pasture and alfalfa (dryland) | 94 | (441) | (835) | 138 | (1,045) |
| Tame pasture and alfalfa (irrigation) | 0 | (18) | (6) | 0.4 | (24) |
| **Total** | **216** | **(1,252)** | **(2,688)** | **346** | **(3,377)** |
| Excess (Shortage): Expressed as One Source | | | | | |
| Natural pasture | 462 | (2,970) | (5,589) | 714 | (7,381) |
| Tame pasture and alfalfa (dryland) | 127 | (647) | (1,262) | 196 | (1,585) |
| Tame pasture and alfalfa (irrigation) | 59 | (354) | (781) | 91 | (986) |

Table 5.4 outlines the situation for the production outlined under Scenario II. Under the current production weighted/average scenario, an additional 3.4 million hectares of forage production would be required to meet the projected demand. If the deficiency was to be corrected using only one forage category, it would require an additional 7.4 million hectares of natural/native pasture, 1.6 million hectares of tame pasture/alfalfa (dryland), or .99 million hectares of irrigated forage production.

It should be reiterated that all of these figures only address the "deficiency" of production, and they must be added to the available amount in order to get the total demand under each scenario.
There are two key drivers that can be altered in order to achieve a balance in forage production, forage efficiency, and livestock numbers: forage efficiency was adjusted by province, keeping targeted livestock numbers constant, until a balance was achieved between forage demand and forage production (by production type); and the number of animals was adjusted to bring the provincial totals into balance.

Alberta would have to increase overall forage efficiency by an average of 3% (12%) from the 1996 baseline in order to meet the livestock demand by 2005 under Scenario I (Scenario II). Saskatchewan would have to increase productivity by 7% (37%) in order to balance forage requirements under Scenario I (II). Manitoba and British Columbia (PR) still had a surplus under Scenario II, and thus would not have to increase forage efficiency in order to meet their requirements.

Alberta and Saskatchewan were unable to increase their beef production from the Base Case since they were virtually in balance to begin with. The model suggested that Manitoba could increase livestock production by a total of 27%, more than the 10% identified under Scenario I and 17% more than the 20% identified in Scenario II. British Columbia could increase their production by 119% more than in Scenario I and 99% more than the Scenario II figure.

If Western Canada was evaluated as a single production unit, forage production efficiency would have to be increased by 13% in order to achieve the necessary level of production under Scenario II.

Table 5.5 summarizes the available hectares by province for crops, and total pasture and hay/fodder, in addition to outlining the surplus/shortage for the two scenarios. It is important to recognize that the current land base is fixed, and that existing forages/native pasture should not be broken since industry experts' suggested that this would not currently be environmentally and economically viable. As a result improved management practices and production efficiencies remain the best vehicles for accomplishing the targeted growth.

The information outlined in the table illustrates the potential physical land constraints that may impact the ability of the industry to expand. The net deficit of land available for crop and forage production, increases from 2.32 million hectares in Scenario I to 6.18 in Scenario II.

In summary, the intent of the project was to examine the changes in agriculture and pressures on the land base under different agricultural growth scenarios.

Two growth scenarios were identified, with one being based on a consensus of industry experts' opinions. A SAM was then used as a tool to identify and quantify the relative pressures on the land base at the CD level, as a result of these scenarios. This information suggests that projected industry expansion will require increased efforts addressing productivity and management practice improvements in prairie agriculture and agri-food production.

**Table 5.5**
**Summary Comparison of Available vs Required Hectares (000,000 ha)**

| | | Available | Scenario I Surplus (Shortage) | Scenario II Surplus (Shortage) |
|---|---|---|---|---|
| Crop Hectares [1] | British Columbia | 0.138 | +0.03 | +0.028 |
| | Alberta | 7.6 | (628) | (582) |
| | Saskatchewan | 13.3 | (1.294) | (1.753) |
| | Manitoba | 3.9 | (0.433) | (424) |
| | **Total** | **25.0** | **(2.4)** | **(2.8)** |
| | | **Available** | **Scenario I Surplus (Shortage)** | **Scenario II Surplus (Shortage)** |
| Total Forage (aggregated based on average productivity) | British Columbia | 0.499 | +0.259 | +0.216 |
| | Alberta | 10.5 | (0.276) | (1.252) |
| | Saskatchewan | 7.4 | (0.523) | (2.688) |
| | Manitoba | 2.8 | +0.547 | +0.346 |
| | **Total** | **21.13** | **+0.079** | **(3.377)** |
| Total Surplus (Shortage) | | | **(2.32)** | **(6.18)** |

[1] Alfalfa and fodder hectares are included under the forage category for this analysis.